3. Scheme Need, Alternatives and Iterative Design Process

3.1 Need for the Project

3.1.1 As set out in the **revised Planning Statement 2020** and **EIA Chapter 5**, Scottish planning and energy policy provides strong support for wind development in principle and encourages local authorities to guide developments towards appropriate locations.

3.1.2 The Onshore Wind Policy Statement (December 2017) confirms the continuing importance of onshore wind, for meeting climate change targets; confirming that onshore wind is a vital component of the economic opportunity that renewables more generally create for Scotland. The Policy Statement identifies that the important role for onshore wind means that development in the right places must be supported, and – increasingly – the extension and replacement of existing sites, where acceptable, with new and larger turbines, based on an appropriate, case by case assessment of their effects and impacts.

3.1.3 The Scottish Energy Strategy (December 2017) and the Onshore Wind Policy Statement both recognise the role of onshore wind as a key contributor to the delivery of renewable energy targets – specifically the new 2030 50% energy from renewable sources target.

3.1.4 The Proposed Development would represent a significant contribution, not just in terms of renewable energy output, but in the savings associated with $C0_2$ output (see **AI Appendix 9H: Peat Management Plan** for calculations and information) and the **revised Planning Statement 2020**. The increase in renewable energy output as a result of the Proposed Development would ensure further progress towards meeting the national and international targets in limiting the amount of greenhouse gas emissions outlined in **EIA Chapter 5**.

3.1.5 The Scottish Government target to deliver the equivalent of 100% of Scottish electricity consumption from renewables by 2020 equates to around 16GW of installed renewables capacity. However, the 50% energy from renewable sources by 2030 target in the Scottish Energy Strategy may require in the region of 17GW of installed renewables capacity by 2030.

3.1.6 Figures released in the Energy Statistics for Scotland (December 2019) show that as of September 2019, 11.7GW of renewable electricity capacity was operational in Scotland (an increase of 0.9GW compared with September 2018). The installed capacity of the Proposed Development would help to reduce the still significant shortfall predicted against the Scottish 2020 renewable energy generation target. It would make an important contribution to the 2030 target, which the Scottish Government has identified may require renewable electricity to generate 140% of Scotland's electricity needs for the energy target to be met.

3.1.7 In addition to the above, it is important to note, that the targets and policies were set prior to the 'climate emergency' which was declared by the First Minister in Scotland in April 2019, and in UK Parliament in May 2019 and the new 'net zero' target now in force through the Climate Change (Emissions Reduction Targets)(Scotland) Act 2019. The "Net Zero- The UK's contribution to the stopping global warming May 2019 Report" states that "*In Scotland, we recommend a net-zero date of 2045, reflecting Scotland's greater relative capacity to remove emissions than the UK as a whole.*"

3.1.8 Following the First Minister's declaration of a global climate emergency in April 2019, and receipt of advice from the UK Committee on Climate Change in May 2019, the Scottish Government lodged amendments to the Bill to set a net-zero emissions target for 2045, and to increase the targets for

2030 [to 70% reduction] and 2040 [to 90% reduction]. The Scottish Parliament's Environment Committee voted in favour of these targets at Stage 2 in June 2019.

3.2 Site Selection Process and Consideration of Alternatives

3.2.1 The careful selection of potential wind farm sites is a critical aspect of the overall wind farm development process. In this instance, the Development Site was originally identified through a study commissioned in 2008 by the Scottish Government and undertaken by Halcrow Group Ltd with the key objective *"…to help the Western Isles to deliver economic and community benefit by identifying renewable energy potential, including the role for different scales of energy generation compatible with environmental obligations"*.

3.2.2 In January 2009, results of the study were published in the *Economic and Community Benefit Study, Final Report* (the 'Halcrow Report'). The study was undertaken in conjunction with key economic and environmental stakeholders: Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), Comhairle nan Eilean Siar (CnES), Highland and Island Enterprise (HIE) and the Scottish Government.

3.2.3 A sustainability appraisal undertaken as part of this study identified that there was strong stakeholder support for a large-scale commercial wind farm development near Stornoway, but less so in most rural areas of Lewis. The sustainability appraisal identified that the only feasible area for a large-scale onshore wind farm development in North Lewis was an area south-west of Stornoway, outside of the Lewis Peatlands Special Protection Area (SPA).

3.2.4 The Stornoway Wind Farm site is based on this area identified in the Halcrow Report. The Development Site boundary lies immediately to the south-east of the Lewis Peatlands SPA and RAMSAR site and at its closest approximately 900m south-east of the Lewis Peatlands Special Area of Conservation (SAC).

3.2.5 The Applicant has been involved with the development of the Development Site for a number of years and has found that it remains suitable for a wind farm due to the following factors:

- Good wind speeds;
- Suitable separation distance from residential properties and an absence of settlements within 1.5km;
- Availability of land;
- Potential grid connection;
- Ability of landscape area to accommodate wind farm development of the scale proposed;
- Suitable land area to accommodate wind turbines;
- Nature of land uses;
- Access;
- Ground conditions;
- The absence of internationally and nationally designated ecological and landscape sites within the Development Site;
- Aviation considerations in terms of the ability to provide suitable mitigation.

3.2.6 Detailed feasibility studies were carried out by the Applicant to closely examine the suitability of the Development Site in terms of the above criteria and in summary:

- The national wind speed database (known as the Numerical Objective Analysis Boundary Layer (NOABL)) estimated that wind speeds across the Development Site were in the range of 7.8-8.7m/s for the 45m above ground layer dataset;
- The Development Site consists of a mixture of open moorland with areas of stunted woodland and includes many watercourses and lochs. Parts are used for livestock grazing and have been man-modified by the operational Beinn Grideag Wind Farm and current and historic peat-cutting;
- The Development Site does not have any landscape or nature conservation designations and there are no Scheduled Monuments, Listed Buildings, Conservation Areas or Gardens and Designed Landscapes within it;
- The Development Site lies within the Boggy Moorland Landscape Character Type that is considered to be of "Low-Medium Sensitivity" from a landscape perspective, is resilient to change and is able to absorb development in many situations without significant character change;
- Electrical connection is feasible;
- The Development Site is accessible from adjoining roads.

3.2.7 For the above reasons, the Development Site was considered suitable for detailed investigation as a wind farm location.

3.2.8 The Consented Development provides confirmation that the Development Site is suitable for a commercial-scale wind farm development. The design evolution for the Proposed Development commenced with the Consented Development (the 36 turbine wind farm), but with a technical objective of utilising larger and more productive turbines that reflected the latest technological advances for manufacture and design. A number of design iterations for the Development Site were prepared, which are discussed in **Section 3.5**.

3.3 Site Context

3.3.1 The Development Site is located to the west of the town of Stornoway on the Isle of Lewis, with the nearest residential property found around 1.8km from the nearest turbine location. **Figure 1.1** and **1.2** illustrate the Development Site location in local and regional contexts.

3.3.2 The topography of the Development Site ranges between approximately 50 – 150m Above Ordnance Datum (AOD); with three hillocks in its northern, central and southern areas. There are some areas of stunted woodland within the Development Site; however, the majority of vegetation comprises blanket bog and associated mosses and heather. There are a number of watercourses and lochs/lochans within the Development Site, none of which are designated. The former Bardon Quarry, (which is now a landfill) and Marybank Quarry (an active site) are located within the northern section of the Development Site, near Loch Airigh na Lic.

3.3.3 Other than the residential area of Stornoway to the east, the area surrounding the Development Site consists of boggy, undeveloped peatland.

3.3.4 The closest occupied residential property to the Proposed Development is situated within the settlement of Marybank, and is located 1.8km from the nearest turbine (T20). Immediately to the west of the Development Site lies the Lewis Peatlands RAMSAR, SPA and SAC, however the Development Site itself is not subject to any environmental designations.

3.3.5 The Proposed Development for which consent is sought and to which this EIA relates, is described in **AI Chapter 4 Project Description**.

3.4 Wind Farm Design Strategy

3.4.1 This section details the approach to wind farm design that was adopted for the Proposed Development. The more detailed phases of the development design of the Proposed Development has evolved taking into account the principles outlined in PAN 68: Design Statements (Scottish Executive Development Department 2006). This balance between maximising renewable electricity generation and avoiding environmental and engineering constraints is driven by an iterative wind farm design process, informed at a number of stages by the findings of the EIA. The final design proposed in this application submission has therefore taken account of the environmental and engineering constraints, maximising the energy yield and providing a coherent scheme that can be accessed and constructed.

3.4.2 The design process has taken account of the broad and strategic guidance in SNH '*Guidance on Siting and Designing Windfarms, Version 3a*' August 2017, the SNH spatial planning guidance 2015, the SNH cumulative guidance 2012, and the SNH landscape capacity study for onshore wind energy development in the Western Isles (SNH, 2004) as well as consultation with SNH, SEPA and CnES during key EIA stages (See the Pre Application Consultation (PAC) Report **Volume 6 2019**).

Design Objectives

3.4.3 Key factors influencing the design of the Proposed Development included a number of landscape related design objectives which are set out here, along with consideration of reducing the quantities of peat disturbed during the construction and operation of the Proposed Development, ornithological interests, ecological interests and existing communication links, infrastructure and utilities. The Development Site constraints are shown in **EIA Figure 3.1.**

3.4.4 The design evolution for the Proposed Development is illustrated in **EIA Figure 3.2**. The process commenced with the consented 36 turbine Stornoway Wind Farm, but with the aim of utilising larger, higher power output turbines that reflected the latest technological advances for turbine manufacture and design in order to maximise energy yield whilst taking account of impacts on the environment.

Energy Yield

3.4.5 It is important that wind turbines are sited to capture the best available wind resource. This means maximising exposure to the prevailing winds, consideration of predicted turbulence levels, and appropriately spacing the turbines to minimise wake effects. In converting the energy from wind into electricity, there is a reduction in wind speed and an increase in turbulence immediately behind each turbine. This 'wake effect' can reduce the output of subsequent turbines in downwind locations, thus reducing the overall output of a wind farm. The wake effect can also impact on the reliability and longevity of turbine components and appropriate spacing is therefore an important consideration to ensure that manufacturers will warrant the turbines once procured. The Proposed Development has therefore been designed with appropriate wake separation spacing.

3.4.6 The Proposed Development also seeks to address issues around turbine availability, with the discontinuation by suppliers of many of the turbine models previously used in the UK. It also seeks to take advantage of significant advances in turbine size and power output to achieve a design that is financially viable given the reliance on and cost implications of the Western Isles Interconnector.

Technical

3.4.7 The following technical constraints were applied where possible:

- Avoid wind turbines and crane pad hardstandings being located on steep slopes (more than 14% slope gradient), in line with **AI Appendix 9.H Peat Management Plan** with regards to peat slide risk and to reduce the potential for major accidents and disasters, specifically landslide, occurring;
- Ensure crane hardstandings, wind farm tracks and turning heads are adequate for the size of turbine proposed, and where possible reduce the land take of infrastructure to the minimum safe width and areas to minimise effects on peat within the Development Site;
- Avoid access tracks and wind farm tracks being located on slopes exceeding 12% slope gradient (perpendicular to contour), in line with **AI Appendix 9.H Peat Management Plan** with regards to peat slide risk and to reduce the potential for major accidents and disasters, specifically landslide, occurring;
- Wind turbines separated at equal to or greater than minimum manufacturer recommended distances to enhance the available wind resource and avoid operational issues, in particular taking into account existing wind farms;
- Avoid identified telecommunications and utility infrastructure through the application of appropriate stand-offs to overhead lines, substations etc to avoid the risk of major accidents and disasters occurring, specifically electricity system and/or telecom links failure, as a result of construction activities or possible turbine collapse;
- Selection of an appropriate access route to the Development site for HGVs and abnormal loads to avoid the risk of major accidents and disasters occurring, specifically transport accidents, as a result of the increase in traffic from construction works; and
- Apply appropriate stand-offs to roads to assure driver safety should severe weather i.e. extreme temperatures cause ice throw or storms cause turbine collapse.

3.4.8 The Applicant is continuing consultation with aviation and radar operators with regard to identifying appropriate mitigation measures to mitigate any potential effects on aviation and radar assets. Further information on aviation effects are set out in **EIA Chapter 10 Telecommunications and Aviation**.

Land Use

3.4.9 The following land use constraints were applied:

- Avoid turbine blades oversailing land neighbouring the Development Site.

Environmental

3.4.10 The following environmental constraints were applied:

- Avoid areas of deepest peat (in excess of 3m) wherever possible, in line with **AI Appendix 9.H Peat Management Plan** with regards to peat slide risk and to reduce the potential for major accidents and disasters, specifically landslide, occurring;
- Avoid areas at high risk of peat slide (see peat slide risk assessment in **Appendix E** of **AI Appendix 9.H Peat Management Plan** with regards to peat slide risk and to reduce the potential for major accidents and disasters, specifically landslide, occurring;
- Apply appropriate stand-offs from watercourses to reduce the potential for major accidents and disasters occurring, specifically flooding, which may damage turbines or infrastructure, or increase flood risk elsewhere. A minimum avoidance buffer zone of 50m has been applied around all watercourses and other natural hydrological features; with the exception of

watercourse crossings, which are minimised as far as practical; Seek to avoid areas of sensitive ecological habitat as defined by the National Vegetation Classification (NVC) on the basis of a vegetation sensitivity classification, which sought to categorise these habitats as high, moderate and low sensitivity:

- High – applies to areas of blanket bog with a higher proportion of wet hollows and pools defined by NVC communities: M1, M17a and M17b;
- Moderate – applies to areas of good condition blanket bog, which does not have a significant amount of hollow/pool habitat and defined by NVC communities: M1, M3, M17a, M17b and M19a; and
- Low – applies to areas of modified blanket bog where it has previously been drained and planted with conifers, usually with a very high purple moor-grass content, defined by NVC communities M17a,b, M17mod and M25a,b.

- Apply an avoidance buffer zone of 100m (from tracks and cable trenches) and 250m from borrow pits and foundations, wherever possible, to potentially sensitive Groundwater Dependent Terrestrial Ecosystems (GWDTE) that are considered by SEPA to contain highly groundwater-dependent NVC communities. Where this buffer is encroached on, mitigation would be incorporated if possible to minimise impacts on both surface and sub-surface water flows;
- Apply an avoidance buffer of 50m to all recorded cultural heritage features as identified from the desk-based assessment and site walkover where possible;
- Avoid areas/apply appropriate buffers where protected species have been identified where possible including otter holts and couches and areas of high activity of high value bird species as far as possible;
- Incorporate flight corridors and widely spaced turbines designed to mitigate potential impacts on red throated divers (See **EIA Figure 3.1**); and
- Achieve a design where noise emissions meet permitted limits individually and cumulatively with other nearby wind farms.

Landscape and Visual

3.4.11 The inherent nature of wind turbines as tall, modern structures means that the form of the wind farm is important. Clear design objectives are necessary and the appearance of the Proposed Development as an object or composition in the landscape has been a factor in generating the layout. In this respect, the design evolution has taken account of the following:

- SNH Guidance on Siting and Designing Windfarms, Version 3a (2017);
- SNH Guidance on Spatial Planning for Onshore Wind Turbines – natural heritage considerations (2015);
- Comments from SNH regarding design advice in its scoping opinion (22 August 2018);
- Comments from CnES in its scoping opinion and at the Design 'Chill' meeting (6 November 2018);
- Location Siting in relation to the SNH Capacity Study (the study, however, was produced in 2004 and does not take into account larger turbine typologies and the most up to date cumulative baseline); and
- Design evolution of the Consented Development.

3.4.12 The landscape and visual design objectives from the Consented Development were reviewed against SNH guidance and amended as necessary (these design objectives are also set out in **EIA Chapter 6 Landscape and Visual Impact**). The design evolution for the Proposed Development is illustrated in **EIA Figure 3.2**. The process commenced with the Consented Development for 36 turbines, but with the aim of utilising larger turbines with a higher power output that reflected the latest technological advances for manufacture and design.

3.4.13 The landscape design principles and evolution from the Consented Development have been reviewed against the current SNH and Capacity Study guidance and have been considered in developing the design of the Proposed Development as follows:

- The design process has sought to create a simple and cohesive wind farm composition within the Boggy Moorland (Boggy Moor 1) LCT either on a solus basis or cumulative, taking account of the existing and consented wind farm developments;
- The design of the Proposed Development has taken into account the location siting and capacity of the Boggy Moorland as described in the SNH Capacity Study. It is acknowledged that this large-scale landscape can accommodate large turbines;
- Consideration has been given to overall turbine height with regards to key visual receptors, with the design development comprising a multiple height option;
- The turbine layout has been largely contained within the currently consented turbine area, except in the northwest. The Consented Development did not have turbines consented in this area because of bird activity previously recorded. More recent surveys suggest that because of the operational 7 turbines at Pentland road, bird activity in this northern area of the Development Site has substantially changed. This northern area is now less sensitive to bird activity and is now available for turbine development. Because of this, it is possible to set back turbines from the outer edge of Greater Stornoway;
- A 1,800m set back from residential properties has been achieved, an increase on the minimum 1,500m set back of the consented turbines;
- The vertical and horizontal scale of the turbines has been limited to appear, as far as practical, compatible with the scale of the landscape;
- The turbine heights of T7, T15, T16, T19, T20, T21, T29, T30, T33, T34, located in the east of the Development Site, have been limited to a maximum of 156m to blade tip to reduce their impact when viewed from Stornoway (including Greater Stornoway) and other receptors in the east and northeast;
- The Proposed Development has continued to maintain very limited visual effects from the Standing Stones of Calanais visitor attraction; and
- The Proposed Development has avoided significant individual or cumulative effects on the landscape character and the special qualities of the South Lewis, Harris and North Uist National Scenic Area (NSA);
- An initial concept layout (33 turbines) was examined with a combination of a maximum of 155m and 187m to blade tip. This initial concept was the subject of the request for a scoping opinion and was examined by all technical and environmental topic leads involved with the EIA. This was followed by the creation, exploration and analysis of a series of iterative layouts responding to a range of technical and environmental constraints;
- The various design layouts have sought to achieve the landscape design principles and mitigate potential landscape and visual effects. This aspect of the design was judged via a panel of three chartered landscape architects, familiar with wind farm design;

- A range of alternative turbine blade tip heights were considered (145m, 150m, 155m, 156m, 175m, 180m, 187m, 200m and 220m) and the corresponding turbine spacing was increased to allow for a greater wake separation requirement resulting in a range of options based on layouts of between 14 and 43 turbines, spread across the Development Site.

3.4.14 The design evolution therefore has taken account of the pattern of development, the landscape capacity and the quality and aesthetics of the design of the Proposed Development. The threshold distance at which significant effects would be realised would broadly be the same as for the Consented Development, i.e. 5km for landscape effects and 14.1km for visual effects.

Design Consideration in Relation to Comments from SNH

3.4.15 The advice listed by SNH in their scoping opinion have been reviewed and considered in the design and assessment of the Proposed Development as follows:

Table 3.1 Consideration of SNH Advice

Consideration of SNH Advice	Design Consideration of the Proposed Development
The position of the windfarm in relation to both the town of Stornoway and the interior peatlands. It will be important that the windfarm does not seem to impinge upon and/ or surround the settlement when seen from key viewpoints within and approaching the town, including from the ferry route. It will also be important that the windfarm does not seem to diminish the characteristic sense of wide open space across the interior peatlands; for example, by being associated with Stornoway yet being seen from the north coast, thereby seeming to reduce the sense of wide open expanse that currently seems to separate these areas.	A key consideration during the design process has been to create a buffer between the Proposed Development and both the Core Settlement and Greater Settlement of Stornoway. This is in line with guidance in '*Siting and Designing Wind Farms in the Landscape, Version 3a*' (SNH, 2017) which states that '*There may be some locations where larger wind turbines can be accommodated near to or within urban and industrial locations. … In these settings, large wind turbines can appear most appropriate where they are separated slightly from buildings; are seen set back against an area of visual simplicity; or are marginal to the urban/industrial area.*' (Para 3.45). Shorter turbines (up to 156m) on the eastern edge of the Proposed Development have also been a key design principle of identifying an appropriate 'fit' with the landscape and to minimise visual effects. Although the design was also influenced by other environmental and technical constraints (see **EIA Figure 3.1** for constraints), views from key viewpoints have been considered to optimise the fit of the turbines in the landscape and in views from within the settlement. Views from within the Core Settlement illustrate that there would be limited visibility of the Proposed Development which was achieved by increasing the distance of the turbines from the settlement (in comparison to the Consented Development) with a reduction in height. The Proposed Development's relation to Stornoway in views looking towards the settlement has also been considered through viewpoint analysis in views from ferries (Viewpoints 8 and 16) and in views across the open moorland from the north (Viewpoints 7 and 21) and from the west (Viewpoint 13).
The varying local landscape character over the windfarm site. This may mean that the character of the windfarm could also vary over the site and thus create a confusing image with sub-groups.	Landscape character has been considered in relation to the SNH LCA (2019) and the SNH Capacity Study (2004) which further subdivides a number of LCTs including the host *Boggy Moorland – Boggy Moor 1 and 2*. During the design process, consideration was given to various local landscape features within the Development Site including lochs, watercourses (maintaining a minimum stand off of 50m) and areas of deep peat (avoiding areas of deepest peat (i.e. more than 3m)) to avoid creating a '*confusing image with subgroups*'. A range of close-range viewpoints (Viewpoints 1, 3, 4 and 5) were considered to unify the wind farm design in terms of landscape character.
The irregular nature of the landform. This may limit the number and position of wind turbines in order to create a simple windfarm image, avoiding variable elevation, spacing, outliers and overlapping of wind turbines within views.	Various constraints were used during the design of the Proposed Development and final positioning of the turbines. These included the use of multiple turbine heights in achieving a more balanced composition of turbines from key viewpoints (2, 4, 7, 8, 17, 24, 25 and 26) which complement the horizontal and vertical scale of the landscape. The design of the Proposed Development has aimed to minimise variable elevation, spacing, outliers and overlapping from key viewpoints.

Consideration of SNH Advice	Design Consideration of the Proposed Development
The location of roads through the windfarm site along which the receptor sensitivity will be high and the scale of the wind turbines would be emphasised at close proximity to high numbers of receptors. Impacts would be limited significantly if the windfarm development could be restricted to one side of key routes.	The positioning of proposed turbines in relation to roads (particularly the A858, A59 and Pentland Road) was a key consideration during the design process. Offset buffers were used to set turbines back from roads. During the design process, True View Visuals 3D software was used to gain an understanding of the turbine positioning and to gain an impression of the scale of the turbines in views from these routes. Locating turbines south of the A859 was avoided, this being a key principle of the design evolution of the Consented Development. It was acknowledged that existing wind farm development was an existing feature on both sides of the A858 and that localised landform provides degrees of partial screening along the route as it passes through the Proposed Development (Pentland Road / A858 sequential viewpoint 4 – **EIA Figure 6.22c-d** in **Chapter 6**).
The impact of existing and consented windfarms within the area. The proposal will need to relate to these in character and location to avoid conflicts of design, including wind turbine size.	The existing turbines (Beinn Ghrideag and Pentland Road) were taken into account in developing the overall composition of the Proposed Development. Separation distances and their place within the overall composition were key elements of the design. Consideration of height difference was also used to identify the turbine layout which resulted in the use of two different wind turbine heights. The Proposed Development is located in the same LCT (Boggy Moor 1) as the existing Beinn Ghrideag and Pentland Road wind farms and is a large-scale, open moorland landscape capable of accommodating large wind farm development. In line with guidance for the siting of wind farms near settlement, the Proposed Development was designed to incorporate existing wind farm development in order to prevent *'...multiple wind farms dominating the landscape surroundings of a settlement'* [in this case, Stornoway]. (paragraph 4.15, Siting and Designing Wind Farms in the Landscape, Version 3a, 2017).
The relationship between wind turbine height and the scale of existing features within the landscape. It will be important that the wind turbines do not seem to dominate the prominence of existing vertical features and landmarks such as the Barvas hills, and structures within and surrounding Stornoway, including the Lews Castle.	The effect on existing features (as illustrated in **EIA Figure 6.15b** in **EIA Chapter 6**) in the landscape were a key part of the design process. Viewpoints were identified to assess the potential effects of the Proposed Development on landmark features and structures including Lewis War Memorial, Gallows Hill (near Lews Castle) and Standing Stones of Calanais (Callanish). More distant views of these landscape features were also used in views from the Eye Peninsula and the ferry where the Barvas hills were also visible. The landscape scale of the Development Site, its landscape character and that of the surrounding landscape context from which the Proposed Development would be viewed has influenced the choice of turbine ratio or turbine proportion.

Design Consideration in Relation to Consultation responses as a result of the 2019 EIA Report

3.4.16 All consultations comments have been assessed by the Applicant and an Interim Response Report was issued in December 2019. A copy of the Interim Reponses Report is attached at **AI Appendix 3A**. Given that SEPA in their consultation response on the Stornoway **EIA Report 2019** objected to the Proposed Development, the Applicant has reviewed the layout, and some minor redesign has been carried out. The comments raised by SEPA are summerised in the table below together with the advice received from SEPA.

Table 3.2 Consideration of SEPA Advice

SEPA Advice	Design Consideration of the Proposed Development
1.2[1] It is not clear whether the blanket bog will be active and regenerating following development. Appendix 9G states that when blanket bog has new drainage ditches created adjacent to it, it will "result in a lowering in the water level and losses of bog specialist plant species being replaced by species that can tolerate drier conditions". It is therefore not clear whether the temporary / indirect habitat loss will result in the peat bog and wetlands no longer sequestering carbon, or if this may alter sequestration potential across larger parts of the bog, resulting in a much larger carbon loss over a much longer time period.	The Ecological Impact Assessment (EcIA) presented in EIA Chapter 9 has been undertaken on the basis that the plant communities within the Development Site are in very good condition with active peat forming across most of the Development Site. The most sensitive blanket bog communities were identified and avoided as far as possible. Carbon sequestration is expected to be unaffected across most of the bog, although it is likely that there will be some reduction in localised areas. Potential reductions in peat excavation are considered in the updated PMP (AI Appendix 9H). The carbon payback calculator has been updated to quantify the effect of any likely changes in carbon sequestration (this is located in appendix F of the PMP AI Appendix 9H).
2.2 The Peat Management Plan presents average peat depths and average range of peat depths, while the only peat depth survey submitted is an interpolated peat depth survey (Figure 3a-3h). Further to this, the supporting site infrastructure (substations, compound/laydown areas, borrow pits etc) has not been overlaid on these peat depth maps. We therefore object until a peat depth survey is provided which shows the depths of individual probing points at an appropriate scale (such as the scale presented in the Peat Probe Locations Figure 2a-2h) of the Peat Management Plan, or larger) and includes information on all proposed temporary and permanent infrastructure.	See Figure AI 3.1A-H Indicative Peat Storage areas located in the PMP (AI Appendix 9H).
2.3 Figures 3.2A-3.2H (Indicative Peat Storage Areas) are not readable and we object until this information is resubmitted in a clearer format.	SEPA may have been issued with a low-res DVD version of the application documentation or have viewed a low resolution version of the documentation on line. A high-res DVD of the EIA Report was provided with the IRR to SEPA for completeness. See also Figure AI 3.1A-H Indicative Peat Storage areas located in the PMP (**AI Appendix 9H**).
2.4 We have compared the NVC survey results with one accompanying a recent planning submission which overlaps this current site boundary and the results suggest that the surveys undertaken eight and nine years ago may no longer reflect the quality or sensitivity of the habitats present. This has the potential to significantly alter the results of the EIAR and therefore we object until the NVC survey and conclusions of the EIAR are updated to reflect the current site conditions.	It is not entirely unexpected that there is likely to be some shift in the type and distribution of specific plant communities, and surveyors rarely come up with exactly the same interpretation of results when carrying out an NVC survey so this is likely to account for some differences. The surveys in 2010 and 2011 recorded a healthy suite of bog communities and it remains SWL's view that this baseline is unlikely to have changed substantially within the past eight to nine years. Carrying out a further NVC survey would not change the level of sensitivity allocated to the bog habitat, nor would it change the level of assessment identified in the EIA Report, which is considered to be significant. Furthermore, the Scoping report (July 2018) at Section 8.3.2, and the response from SEPA (31 July) at section 1.4 confirmed that the existing NVC would be appropriate. We therefore do not propose to submit a further NVC, and this is addressed in **AI Chapter 9 Ecology**.

[1] Number denotes paragraph numbering in SEPA's consultation response.

SEPA Advice	Design Consideration of the Proposed Development
3.1 While Section 3 of the EIAR describes the infrastructure, it has not suggested that environmentally better alternatives have been considered. In such close proximity to Stornoway we would expect alternative locations to be considered, including locating supporting infrastructure on adjacent agricultural land, along existing roads, neighbouring business parks and industrial areas and by utilising existing quarries. We therefore object until reasonable alternatives have been considered, in which we would expect supporting infrastructure to be sited on previously disturbed lands, thereby avoiding deep peats and wetlands.	This **AI** represents a minor re-design of the Proposed Development as submitted in 2019 (**EIA Report 2019**) which was a complete redesign of the consented scheme. If the Proposed Development (**AI**) is consented it would allow SWL the option of which scheme to be construct. Options to move infrastructure off-site are minimal; although opportunities to limit requirements for on-site storage infrastructure have been incorporated into the **AI** Proposed Development, and further amendments to minimise onsite infrastructure has been identified (See **AI Figure 4.1** which incorporates the removal of laydown areas and 2 substations). In addition to the removal of infrastructure, the following measures, to minimise Peat disturbance, were considered when finalising the Proposed Development: ▶ Minimize track width; ▶ Detailed site survey to site infrastructure on areas of shallowest peat; ▶ Selecting borrow pit sites and time their use so that they are dual purpose when possible such as the main site substation (ie siting infrastructure on areas of previously disturbed ground); and ▶ Minimise the number of passing places and using on-site traffic management; ▶ Rock Anchor foundations. It is important to note, as a result of the adoption of the above measures, that the amount of turbines, length of access tracks, and amount of associated excavations have all reduced when compared with the previously consented scheme (see Table 3.2 in the PMP (**AI Appendix 9H**). The crane hardstanding which is essential for the installation of the turbines would be used to temporarily store turbine components as well as for lifting operations. Turbine components would be delivered straight to each turbine location. This is to minimise double handling, additional storage requirements and traffic movements within the site (minimising emissions from vehicle movements). Consideration during the development phase was given to reducing the track widths. It has been confirmed that 5m wide would be the required width for the tracks. The proposed turbines at Stornoway would be among the largest ever installed on an onshore wind farm un the UK. The size of the individual components will also be larger than many of the components transported to wind farm sites in the past. The size of cranes required will also be some of the biggest used for onshore wind sites to date. To reduce track widths as component sizes increase would greatly increase the risk of a vehicle leaving the track due to the reduced margin for driver error. The consequences and associated works required to recover a turbine delivery vehicle that has driven off the track and become stuck in the adjacent peat would be significant. This would result in extra emergency infrastructure and disturbance to surrounding ground.

SEPA Advice	Design Consideration of the Proposed Development
	There is also a corresponding health and safety risk which would increase as a result of reducing track widths. Tracks and turning heads have therefore been reduced to the minimum safe width and area. It should be noted that the 2012 consent accommodated 31km of access track. This current proposal reduces this to 28.7km of access tracks. A comparison with the consented scheme of peat quantities are also set out in the **revised Planning Statement 2020**.
3.2 While alternative locations for borrow pits have been considered within the site boundary, no alternatives have been considered for utilising off-site aggregate sources. There would be significant environmental benefit in this case to utilising existing quarries. We note that Marybank Quarry is an active quarry site which supplies aggregate and is located adjacent to the proposed site entrance. We object until this approach is amended.	This proposal represents the re-design of the Consented Wind Farm, and if the Proposed Development is consented would allow SWL the option of which scheme to be constructed. It is important to note that the number of on-site borrow points have been reduced from 7 to 5 compared with the consented scheme. Consideration is always given to sources of aggregate for the construction of the site infrastructure of the wind farm. Factors such as availability of suitable material on site, traffic movements and cost are all considered to come up with the most practical option. At Stornoway Wind Farm, the initial site access would be constructed using imported aggregates from a local quarry (potentially Marybank), which has reduced the number of onsite borrow pits compared to the consented scheme. Once the main construction works progress, the quantity of stone required is such that even if it were all sourced from the quarries, the supply may not be able to cope with the demand as the aggregates are needed at a rate of up to 2500t per day during the peak construction works. This could amount to between 200-250 HGV movements on the public road network each day. By using borrow pits on site, this reduces vehicle numbers on all parts of the public road network by over 80% (as set out in section 13.1.5 of the **EIA Report 2019**. In addition to this, vehicles are unlikely to be arriving at the site evenly spaced throughout the day, and in practice it is likely that there would be large number of HGV arriving to the site in early morning to ensure that the stone is available for use that day. This is because laydown areas have been minimised, and the construction operations are designed to operate as much as possible to 'just in time' thus minimising the need for storage in areas of peat. The use of on-site borrow pits would also mean that the amount of HGV movements on the A959 would be far less than they would be if all aggregates were imported and therefore disruption to road users and local residents would be minimised. Further benefits include a reduced haul for the aggregate, thus minimising the use of diesel engines and reducing reliance of this fossil fuel resource and air quality immissions. In addition to the above, tracks have been designed to take a certain number of Equivalent Stand Axle loads (ESAL). The ESAL's influence the depth and makeup of the tracks themselves to a degree. The number of vehicle movements on the tracks has a direct impact on their design.

SEPA Advice	Design Consideration of the Proposed Development
	The greater the number of vehicle passes, the greater the depth and quantity of aggregate required to construct the track. If all the aggregate was imported, from the site entrance, then loads that would otherwise only have to be hauled short distances will have to travel all the way across site, in some cases for more than an hr. From an environmental point of view our aim is to always minimise movement of materials to keep vehicle noise, dust, dirty runoff water etc. Therefore the use of evenly spaced borrow pit locations reduce the distance required to be travelled by HGVs within the Development Site. Furthermore, the cost of importing aggregates rather than using on site borrow pits can be more than double the cost of using site won aggregates. If all the aggregates were imported from off-site sources, it is likely that the project would not be financially viable.
3.3 The development proposes 28.7km of new access track. Due to the amount of deep peat and sensitive habitats, including the need to maintain hydrological pathways to these habitats, we would expect as much of the access track to be floated as possible. We note that floating tracks are proposed over peat depths greater than 1m; however, Figure 3.1 demonstrates that there are numerous very short sections of alternating cut and floating track side by side over short distances. It is unclear whether such design will be practicable and it is likely that any changes to this will result in changes to excavated peat volumes. We therefore object until further information is provide that demonstrates that the punctuated change in road type throughout the development will be achievable and practicable.	The proposed new access tracks have been designed by SWL Construction Team to reflect the appropriate construction methodology as determined by underlying ground conditions. The Construction Team have experience of similar ground conditions on sites such as Corriemoillie and Dorenell in the Highlands, on areas of good quality peat. The Construction Team has advised that in their experience of constructing wind farms in environment such as Stornoway, problems for track integrity arise when constructing floating roads on peat of less than 1m in depth hence the alternating sections of excavated and floating roads in the proposed design. The firmer underlying ground conditions are not suitable under load and the thin layer of peat can be displaced under wheel loading to the sides or forced upwards in the middle, often causing failure of the membrane and subsequently the track construction can be contaminated with peat. This results in sections having to be dug out. In more serious cases, there have been incidents where vehicles have tipped over because of failed membrane. It is possible to transition from one track type to another over short sections, whilst still adhering to the guidance document 'Floating Roads on Peat' (Forestry Civil Engineering & SNH, 2010). In some circumstances track design can transition from cut and fill, to punched, to floating over very short distances, and engineers react to the ground conditions on the site on a meter by meter basis. Notwithstanding this, the detailed peat probing gives a clear indication of the type of track that would be suitable, and the Proposed Development has been designed on this basis. The track design would be developed further following detailed design and ground investigation and SWL would be happy for this matter to be conditioned and details to be confirmed pre-construction. The track type layout that has been submitted is a concept design that will be developed further by the successful Civil works contractor in consultation with the EcoW, with priority given to ecological, drainage and peat considerations. The ECoW would be involved in the walkover of the route prior to final design details being agreed so that ecological constraints are observed.

SEPA Advice	Design Consideration of the Proposed Development
	As the peat excavated has to be removed and taken to the point of deposition by the civil contractor, it is not in their interest to remove more than is absolutely necessary and they will ensure that the design chosen is the most practical construction method for each area.
3.5 While we welcome that rock anchorage / cage foundations have been considered as an alternative to gravity based foundations to minimise the quantity of peat required to be removed, it appears that the turbines located on the deepest peat do not benefit from this mitigation. It is not clear why this is the case, and we would expect these turbines to utilise a pile foundation if rock anchor / cage technology is not possible. We therefore object until all turbines locations are re-assessed to demonstrate minimisation of peat excavations through measures such as re-siting of the turbines or utilising pile foundations.	Piled foundations have been considered but have been discounted due to the potential for relatively shallow bedrock. Piled foundations require the individual piles to be able resist tensile forces exerted to them by the rest of the foundation. Piles usually transfer the tensile forces to the ground via 'skin friction' which comes from the contact of the pile with the surrounding soil. If the piles are not long enough (i.e. if the bedrock depth dictates this) then there is not enough skin friction generated and the piles would pull out of the ground rather than resist the tensile forces. Furthermore, the bedrock in site is Lewisian Gneiss, which is very hard and piling into it is impractical. For this reason, traditional gravity or rock anchored foundations have been chosen as the most suitable foundation option.
3.6 We would welcome clarification on whether the different types of rock anchor foundations will impact on the potential excavation volumes presented in Appendix A.	SWL can confirm that different excavated volumes we used in the peat volumes spreadsheet which is presented in Appendix A of the PMP (**AI Appendix 9H**) are representative of the relevant excavated volumes.
3.7 A nearby similar scheme has proposed vibro-compaction floating crane pads, as well as floating all of their access tracks, which would significantly minimise impacts on peat. Could this type of mitigation be investigated for this development?	We have had the possibility of virbro-compaction reviewed by two Geotechnical Engineers. We note that Vibro-compaction is generally suitable for granular soil (medium sand to medium gravel). This technique is not normally used in cohesive soils (clay and silt or peat) and we have not seen any proven works where it has been used in peat. There has been some research carried out on vibro compaction in peat but using geogrid / stone columns such as "a behaviour of reinforced vibro compacted stone column in peat". We would consider this is only the research and not widely comfortable being accepted. In particular, we are not aware of any soil mechanic principles/equation to support this design methodology. The crane work is a high-risk activity both in health and safety and commercially as the consequence of crane turnover is extremely high. Peat can also be extremely compressible, once it reaches the plastic point, the settlement will keep going with minimis resistance eventually causing geotechnical failure. The crane platform or working platform design should follow the industrial best practice and contract requirements including Eurocode 7 and BRE 470 plus additional serviceability (settlement) checks where appropriate. We also note that the construction of the crane pads must be to a specification accepted by wind turbine manufactures and note that "floating" style construction of the crane pads would have a high potential to be rejected by the turbine supplier, and guidance from Turbine suppliers is consistently that floating road principal must not be used for the Hardstand area. We therefore consider that type of mitigation cannot be used for this development on the grounds of health and safety, design requirements and contractual adherence.

SEPA Advice	Design Consideration of the Proposed Development
	The use of floated roads is proposed on site where the peat depth is greater than 1m, otherwise the tracks would be excavated and backfilled. The LWP Construction Team has advised that in their experience of constructing windfarms in environments such as Stornoway, problems for track integrity arise when constructing floating roads on peat of less than 1m. The firmer underlying ground conditions are not suitable under load and the thin layer of peat can be displaced under wheel loading to the side or forced upwards in the middle, often causing failure of the membrane and subsequently the track construction can be contaminated with peat. This results in sections having to be dug out.
3.8 We note that dewatering is likely to be required for the construction of the turbine bases which may then require pumping into settlement lagoons. Lagoons at every turbine location will require a sizable footprint and will likely result in further disturbance to peat and potentially impact sensitive wetland habitats. Their siting should be considered at the planning stage in order to ensure adequate space is achievable and avoidance of constraints is appropriately considered. We therefore object until further information on whether dewatering will require settlement lagoons and, if so, the size as well as location of the lagoons to be provided on a site plan overlaid on NVC and peat depth surveys.	The design for dewatering, collection and settling of suspended sediment (i.e. use of silt traps, fences, straw bales or lagoons) will be developed during the detailed design should consent by granted for the Proposed Development and would be detailed and agreed with SEPA as part of the Construction Site Licence. As stated in paragraph 11.8.44 of **EIA Chapter 11**, it is proposed that dewatering activities are designed and implemented in consultation with SEPA on a foundation-specific basis following completion of detailed ground investigations and micro-siting prior to construction. SWL would be happy for this requirement to be conditioned and details to be confirmed pre-construction. The HMP (**AI Appendix 9I**) include habitat restoration to compensate for such potential effects.
4.2 We note that the estimated peat extraction volume is estimated to balance exactly with re-use proposals. Our experience with many other projects on peat is that estimations of peat extraction volumes are often lower than predicted. SEPA therefore objects until the PMP is amended to set out more realistic volumes of extracted peat and options for its management.	There is no guidance on putting in a buffer to address any potential increase in peat extraction volumes. Notwithstanding this, the habitat loss calculations (**AI appendix 9G**) have been updated to reflect the changes in the Proposed Development Layout. The access tracks include a temporary ground disturbance buffer of 10m either side of the access track (20m buffer), and a 10m buffer for permanent loss of habitat (a 5m track, plus 2.5m either side for additional infrastructure , ie drainage and cables) on top of this, giving a total of 30m width of disturbance. The turbine bases and compound areas comprise a 50m temporary construction buffer.
4.3 We note that much of the habitats consist of bog pools and that peat at this location is likely to be very wet and unconsolidated. We object until the PMP is amended to identify what options for extracted peat are should much of the peat prove not suitable for use in restoration.	In the absence of detailed site investigations, the condition of the peat is unknown. Bog pools and other areas where peat is likely to be very wet and unconsolidated will be avoided where possible. Section 3.2 of the PMP (**AI Appendix 9H**) addresses this point.
4.4 We would expect to see phased restoration of borrow pits with the use of impermeable cell bunds which can be sequentially filled and then overtopped with a layer of acrotelmic peat turves. We would therefore ask that the finished profiles or a sample drawing of this methodology is provided.	See **AI Figures 4.12-16,** for further information about borrow pits.
5.1 It appears that there are very few opportunities for habitat compensation or peatland restoration on site due to the habitat being in such good condition. The PMP needs to be revised to address these apparent limited opportunities.	See **AI Appendix 9H and AI Appendix 9I**.

SEPA Advice	Design Consideration of the Proposed Development
6.1 Section 2.6.3 of Volume 2 of the EIAR states that "if a predicted future is more likely to occur than the current baseline it is used for this assessment". It then states that "in this case, the current baseline is used for the assessment as it is anticipated that current land use management would continue and it is therefore reasonable to assume that the future baseline would be similar to the current baseline". We do not agree with this assessment of the current or predicted baseline. The results of the of the 2018 NVC survey recorded more areas dominated by M17a (sensitive habitats) than the 2010/2011 survey, suggesting that the habitats within the proposed development area are actively re-generating and improving. If the baseline from 2010/2011 to 2018 has improved, it would conversely be reasonable to assume that the future baseline could also improve. We therefore object until this information is revised utilising modern NVC survey results.	The Ecological Impact Assessment (EcIA) presented in **EIA Chapter 9** (replaced by **AI Chapter 9**) has been undertaken on the basis that the plant communities within the site are in very good condition with active peat forming across most of the site. The most sensitive (high quality) plant communities were identified and avoided as far as possible. As stated in response to paragraph 2.4, it is not entirely unexpected that there is likely to be some shift in the type and distribution of specific plant communities, although surveyors rarely come up with exactly the same interpretation of results when carrying out an NVC survey so this is also likely to account for some differences. The surveys in 2010 and 2011 recorded a healthy suite of bog communities and it remains SWL's view that this baseline is unlikely to have changed substantially within the past eight to nine years. Carrying out a further NVC survey would not change the level of sensitivity allocated to the bog habitat, nor would it change the level of assessment identified in the EIA Report, which is considered to be significant based on the existing or future baseline. Furthermore, the Scoping report (July 2018) at Section 8.3.2, and the response from SEPA (31 July) at section 1.4 confirmed that the existing NVC would be appropriate.
7.1 The EIAR states that battery storage facilities will be required as part of the substation compound. A site plan is required which shows that the battery storage area is bunded and has appropriate drainage. Further information is also required on the environmental risks associated with battery storage that need to be mitigated for. While we are happy for aspects of this to be included within the CEMP, we would expect this infrastructure to also avoid sensitive habitats and areas of deep peat with clarification on the size of the footprint required to accommodate a battery storage facility for 35 turbines with appropriate drainage. We therefore object until an updated site plan is provided showing this infrastructure overlaid on the updated NVC and peat depth map.	As set out in SEPA's response, we would be happy for a condition requiring bunding and drainage. As shown on **EIA Figure 4.10**, the battery storage facilities would be housed within single-storey control building which would be situated within the main substation compound. The proposed location of the main substation compound is shown on **AI Figure 4.1**. As stated at paragraphs 3.6.7-3.6.12 of **AI Chapter 3**, the location of this compound has taken account of sensitive ecology areas, peat and hydrology. **AI Figure 3.1** in **Appendix 9H**: PMP shows the location of site infrastructure, including the main substation, overlaid on peat depth data. Finally, it should be noted, that the substation buildings and battery storage facilities would be located in a borrow pit location, which would be previously disturbed ground. **AI Figures 9B8.1a-f** in **Appendix 9B** show the site infrastructure overlain on NVC data, which as stated in reference to 2.4, we consider remains current.
8.1 We note the EIAR proposes micrositing allowances for turbines and crane pads up to 50m and 100m for internal wind farm tracks and other infrastructure. Micrositing to this degree has the capacity to compromise the mitigation requested. We object until the constraints and environmental impacts are investigated more thoroughly and a satisfactory layout agreed prior to determination. We would also request that micrositing be agreed only where it would result a) in less disturbance of peat and b) no loss of sensitive wetland habitat.	The possibility to micro-site infrastructure is requested in the EIA Report to ensure some flexibility is retained should it be determined that the locations of turbines or tracks require to be re-sited as a result of findings from various studies that are undertaken in advance of construction commencing. SWL would be happy for the requirement for micro-siting to be conditioned, with prior written approval of the Planning Authority in consultation with SNH and SEPA a requirement of the condition. Condition worded in such a way that can only microsite into less sensitive area.

SEPA Advice	Design Consideration of the Proposed Development
Section 10 SEPA seek that commitments and/ or amendments are made to the PMP in relation to track verges, cut batters, preservation and re-use of turves and commitment to consult. It is stated that SEPA would be happy for these requirements to be made the subject of a condition.	SWL note the amendments requested and these are addressed in the PMP (**AI Appendix 9H** at section 3.2).
Section 11 SEPA has provided details of the regulatory requirements SWL will be required to comply with in relation to the construction of the proposed wind farm.	SWL notes the regulatory advice provided.

3.5 The Proposed Development Design Evolution

3.5.1 The design evolution for the Proposed Development commenced with the consented 36 turbine wind farm, but with a technical objective of utilising larger and more productive turbines that reflected the latest technological advances for manufacture and design.

3.5.2 The Applicant and its consultants have undertaken a number of discussions with statutory and non-statutory consultees, the local community (see **EIA Chapter 2, Section 2.4)** and the landowners, with the accumulated findings all having an influence over the evolution of the design and the scope of the EIA process.

3.5.3 A number of queries and issues applicable to the Proposed Development have been raised throughout the community engagement process and these are addressed in more detail within the PAC Report in **Volume 6, 2019** of the application submission (see **EIA Chapter 2** for an overview of the consultation process). Comments received relating to location, design and wind farm developments generally covered:

- Chapter 6Landscape and visual effects;
- Chapter 8 Ornithology;
- Chapter 9 Ecology;
- Chapter 11 Hydrology including peat; and
- Cumulative effects (included in each chapter).

3.5.4 **Table 3.3** sets out the primary design iterations, and **EIA Figure 3.2** illustrates the iterations within the Development Site.

Table 3.3 Design Iterations

Design Number	Constraints Influencing Layout	Design Rationale / Summary
Layout 1 **Consented 36 Turbine Layout** **March 2018**	This layout served as a starting point for consideration of the Proposed Development. The turbine locations remained the same but larger, 187m high turbines were used instead of the consented 145m turbines.	The Consented Development was the start point for the design process. This comprised 36 turbines to a height of 145m. The number of turbines was reduced prior to the scoping exercise to 33 turbines, and the turbine heights increased to 187m. (See (**EIA Appendix 2A**). This was the initial concept layout that was examined by all technical and environmental disciplines involved with the project. This was followed by the creation, exploration and analysis of a series of iterative layouts responding to a range of technical and environmental constraints.

Design Number	Constraints Influencing Layout	Design Rationale / Summary
		Turbines were located too close together to allow for an efficient design from a wind energy perspective due to the increased rotor diameter size. Survey data identified an increase in some bird activity that had the potential to cause a barrier to birds using the SPA and the sea. There was also some turbine overlapping in a number of key views including Viewpoints 2, 4, 8, 24 and 25.
Layout 2 **S6 Layout 30 turbines** **July 2018**	This iteration was the outcome of a further landscape and visual focused feasibility exercise, which used a mixture of turbine heights to explore various layout options. The key driver behind this layout was landscape and visual composition, taking into account known technical and environmental constraints.	Turbine numbers and some turbine heights were reduced to account for increased wake requirements for larger turbines. Hydrological, ecological and geological constraints, communication links and residential standoff buffers were considered in this layout design and all others going forward. The extent of the wind farm in the landscape remained largely the same as the consented layout, with the exception of the north-western part of the Development Site. The consented development had no turbines here due to bird activity, but the subsequently operational Pentland Road wind farm appeared to have influenced bird activity on the Development Site and this formerly sensitive area appeared less constrained.
Layout 3 **S9 Layout (Design Day) 35 turbines** **October 2018**	This iteration was the result of the Design Day held in October 2018, whereby all known technical and environmental constraints were considered. Several iterations were produced during this session exploring various options and this iteration was the final outcome. Constraints which influenced the design included sensitive NVC habitats, watercourses, communication links, peat depths, topography and separation distances from Beinn Greidaig Wind Farm.	Further design refinement was undertaken on the layout following further energy yield assessment which allowed the turbine separation to be reduced from 6x4 rotor diameter to 5x3 rotor diameter) and for additional turbines to be incorporated into the same envelope.
Layout 4 **S11 Layout 32 turbines** **November 2018**	This iteration was developed following the provision of additional survey information. A number of turbines were relocated in order to address potential ornithological issues, and three turbines were removed from the western part of the site. A number of turbines were relocated to move them away from deeper peat – T10 and T26 moved out of deep peat. T7 was moved further north west (into shallower peat) to reduce impact on a cultural heritage feature.	Following on from updated ornithological surveys, two 500m corridors were created to accommodate diver flight routes between lochs and feeding grounds. Where possible turbines were removed from these areas entirely, or were located on the periphery of the buffer areas. In addition, larger buffers were applied to Raptor nests, resulting in the removal of one turbine, as well as maintaining bugger zones for water courses where possible and avoiding areas of deepest peat (in excess of 6m).
Layout 5 **S12 Layout 34 turbines** **December 2018**	This iteration contained relatively minor tweaks to turbine locations to address stacking from certain viewpoints, as well as further amendments regarding bird corridors. T30 was relocated into shallower peat.	To remove turbines from identified diver flight corridors and to avoid areas of deepest peat (reduced to deep peat areas of 3m).
Layout 6 **Design Freeze EIA Layout**	This iteration took into account updated peat survey data and sought to avoid areas of deep peat where possible.	Full peat surveys had been ongoing during the design process. Additional peat probing was carried out during January and February 2019 at specific turbine locations to identify peat depths and potential alternative locations.

Design Number	Constraints Influencing Layout	Design Rationale / Summary
35 turbines **January 2019**	In addition, a space for an additional turbine was identified following design review. T17, T24, T32 and T34 were all relocated taking into account the updated peat survey data into shallower peat locations.	The movement of turbines out of deep peat, together with the change in turbine foundation design has reduced the quantity of excavated peat by 37% when compared to the consented scheme.
Layout 7 **Additional Information Layout** **35 turbines** **January 2020**	This iteration took into account further design optimisation work which has enabled the secondary substations and laydown / storage areas to be removed from the site. The turbine locations remain as presented in Layout 6.	Through discussions with WTG suppliers, it has been possible to agree that turbine components will be delivered to each WTG location on the site 'just in time'. This has reduced the need for additional storage space on site and would minimise double handling of components as well as traffic movements. Through reducing the need for laydown / storage areas on site, the area of disturbance has been reduced by 11,750m^2 for peat.

3.6 Additional Wind Farm Infrastructure Design Evolution

Minimising Peat Disturbance

3.6.1 The following measures to minimise peat disturbance were considered when finalising the Proposed Development:

- Minimising track width (ie challenging turbine construction teams on track width for large scale turbines);
- Detailed site survey to site infrastructure on areas of shallow peat (ie avoiding areas of deeper peat where possible based on Phase 2 peat probing survey results);
- Selecting borrow pit sites and time their use so that they are dual purpose where possible such as the main site substation (i.e. siting infrastructure on areas of previously disturbed ground);
- Minimising the number of passing places and using on-site traffic management; and
- The use of rock anchor foundations.

3.6.2 It is important to note that, as a result of the adoption of the above measures, the number of turbines, length of access tracks and amount of associated excavations have all reduced when compared with the previously consented scheme. Further details of these reductions are set out in **AI Chapter 9 Ecology**.

Borrow Pits

3.6.3 The Consented Development proposed to use up to seven on-site borrow pits. The Proposed Development would utilise the onsite stone resource from five identified borrow pits. A separate document (the **revised Planning Statement 2020**) has been produced to accompany the application submission for the Proposed Development and includes an assessment regarding the borrow pits. The Borrow Pit Assessment considers the need for the borrow pits at the Development Site and the potential effects that could result from the construction and operation of the five proposed borrow pits, drawing on the environmental conclusions set out in the **EIA Report 2019**.

3.6.4 Consideration has been given to sources of aggregate for the construction of the site infrastructure on the wind farm. Factors such as availability of suitable material on site, traffic movements and cost were all considered to determine the most practical option.

3.6.5 For the Proposed Development, the initial site access would be constructed using imported aggregates from a local quarry (potentially Marybank), which has reduced the number of on-site borrow pits compared to the consented scheme. Once the main construction works progress, the quantity of stone required is such that even if it were all sourced from off site quarries, the supply may not be able to cope with the demand as the aggregates are needed at a rate of up to 2,500t per day during the peak of the construction works. This could amount to between an additional 200-250 HGV movements on the public road network each day. By using borrow pits on site, this would reduce vehicle numbers on all parts of the public road network by over 80% (as set out in **Section 13.1.5** of **AI Chapter 13 Traffic and Transport**) therefore, disruption to road users and local residents would be minimised. In addition, the principle of 'just in time' has now been designed into the scheme. This principle has allowed the reduction in the number of laydown areas for storage purposes, which in term has reduced the amount of disturbance to peat within the site. Further benefits include a reduced haul for the aggregate as loads would only have to hauled short distances across the site, thus minimising the use of diesel engines and reducing reliance upon this fossil fuel and air quality immissions.

3.6.6 Furthermore, the cost of importing aggregates rather than using on-site borrow pits can be more than double the cost of using site-won aggregates. If all the aggregates were imported from off-site sources, it is likely that the project would not be financially viable.

3.6.7 It is therefore anticipated that most of the rock required for construction would be sourced from borrow pits within the Development Site. It is expected that concrete would be sourced from nearby suppliers, and as such, the EIA has presented a robust worst case assessment. **AI Chapter 13 Traffic and Transport** has assessed both use of onsite borrow pits, and off-site concreting, as well as off-site quarry stone (i.e. no onsite borrow pits) and off-site concreting.

3.6.8 The area of search for the borrow pits are fixed as stone can only be extracted where it is found. After identifying suitable stone resource within the Development Site, the following principles have been used to identify suitable locations for the borrow pits and to minimise environmental effects:

- Aim to locate borrow pit search areas on lower slopes;
- Aim to locate borrow pits in areas that are enclosed by landform i.e. on internal hill slopes;
- Aim to locate in areas where existing extraction has already taken place to minimise further landscape effects; and
- Aim to locate borrow pits more than 1,500m from residential receptors.

Access from Port to the Development Site

3.6.9 The route to the Proposed Development Site for abnormal vehicles is illustrated in **EIA Appendix 13A**. The delivery route for abnormal loads is from Arnish Yard, some 4km to the southeast of the Development Site.

Site Infrastructure and Internal Track Design Evolution

3.6.10 The non-turbine infrastructure required on site was designed and arranged in such a way as to avoid the identified on-site constraints where possible. Whilst the majority of the infrastructure layout was designed following the turbine layout design, some minor iterations to turbine locations and track alignments were necessary to facilitate the optimum on-site infrastructure requirements.

Access track routes in particular are designed to minimise water crossings and to avoid potentially sensitive areas within the Development Site.

3.6.11 Options to move infrastructure off-site are minimal, although opportunities to limit requirements for on-site storage infrastructure have been incorporated into the Proposed Development. Through design optimisation the scheme has been developed to allow both the secondary substation areas and all the proposed laydown / storage areas to be removed and therefore reduce the area of disturbance required. Crane hard-standings across the site, and potentially off-site storage areas at Arnish would be used for the storage of turbine components.

3.6.12 During the design phase, consideration was given to reducing the track widths to less than the 5m width usually specified on wind farm. However, the proposed turbines would be among the largest ever installed on an onshore wind farm in the UK. The size of the components would also be larger than many of the components transported to wind farms in the past and the size of cranes required would also be some of the biggest used for onshore wind sites to date.

3.6.13 To reduce track widths as component sizes increase would greatly increase the risk of a vehicle leaving the track due to the reduced margin for driver error. The consequences and associated works required to recover a turbine delivery vehicle that has driven off the track and become stuck in the adjacent peat would be significant. This would result in extra emergency infrastructure and disturbance to surrounding ground. There is also a corresponding health and safety risk which would increase as a result of reducing track widths. Tracks and turning heads have therefore been reduced to the minimum safe width and area.

3.6.14 Details of these savings are set out in **AI Appendix 9.H Peat Management Plan**, and a comparison with the consented scheme will be located within the **revised Planning Statement 2020**.

3.6.15 The use of floated roads is proposed on site where the peat depth is greater than 1m, otherwise the tracks would be excavated and backfilled. The possibility of floating all access tracks has been explored, however in environments such as the Development Site, problems with track integrity arise when constructing floating roads on peat of less than 1m. The firmer underlying ground conditions are not suitable under load and the thin layer of peat can be displaced under wheel loading to the side or forced upwards in the middle, often causing failure of the membrane and subsequently the track construction can be contaminated with peat. This would result in sections of the road having to be dug out. In more serious cases, there have been incidents where vehicles have tipped over because of failed membrane.

3.6.16 Details of the track construction types are set out in **AI Figures 4.6** and **4.7**, and are shown in **AI Figure 4.1.**

Crane Hardstandings

3.6.17 Similar to the internal access tracks, areas identified for wind turbines and therefore crane hardstandings were identified to avoid areas of deeper peat, sensitive ecology habitats and areas of steeper gradients where possible (See **Table 3.3**). These areas of hard standing are identified on **AI Figure 4.1** and an example of an indicative crane hard standing is included in **AI Figure 4.5**.

3.6.18 Construction operations have been designed to operate as much as possible to 'just in time' thus minimising the need for storage in areas of peat. Through the removal of the storage / laydown areas there is no separate storage areas for turbine components on site. The crane hardstandings, which are essential for the installation of the turbines, would also be used to temporarily store turbine components (for example towers, blades, nacelles) immediately in advance of construction, as well as for lifting operations. This will minimise double handling, additional storage requirements and traffic movements within the site.

3.6.19 Each area would consist of an excavated crushed stone hardstanding. The possibility of vibro-compaction floating crane pads was explored but has been discounted on the basis that this technique is not normally used in cohesive soils (clay, silt or peat) but is generally suitable granular soil (medium sand to medium gravel). Whilst there has been some research carried out on vibro-compaction in peat, it is considered that this is only research and is not widely accepted. In particular there are no soil mechanic principles / equation to support this design methodology.

3.6.20 The crane work is a high-risk in terms of both health and safety and commercially as the consequence of crane turnover is extremely high. Peat can be extremely compressible; once it reaches the plastic point, the settlement will keep going with minimis resistance eventually causing geotechnical failure. Therefore, the crane platform or working platform design should follow the industrial best practice design and contract requirements including Eurocode 7 and BRE 470 plus additional serviceability (settlement) checks where appropriate.

3.6.21 Furthermore, the construction of crane hardstandings must also be to a specification accepted by wind turbine manufacturers and 'floating' style construction would have a high potential to be rejected by the turbine supplier. Guidance from turbine suppliers is consistently that the floating road principle must not be used for the hardstand area.

3.6.22 Therefore, the potential for vibro-compaction floating crane pads as a means of minimising impacts on peat was discounted for the Proposed Development on the grounds of health and safety, design requirements and contractual adherence.

Substation

3.6.23 The Proposed Development would require the construction of a new primary substation to export electricity to the national grid and it was initially proposed to construct two secondary substations for internal grid management. Through further optimisation, the design has been sufficiently developed to allow both secondary substations to be removed from the Proposed Development and therefore reduce the area of disturbance required (by 1,750m^2). The new transformer and control building would be constructed within one substation compound. The location of the substation is identified on **AI Figure 4.1** and an example of the substation is included in **EIA Figure 4.10a**. The location of this compound has taken account of sensitive ecology areas, peat and hydrology by placing the compound in the former Borrow Pit A location.

Construction Compounds

3.6.24 The locations of the main construction compound and the removal of the secondary storage areas previously identified in the EIA Report at **EIA Figure 4.1**) have taken account of sensitive ecology areas, peat and hydrology by siting the compound away from watercourses and areas of peat deeper than 3m. These temporary construction compounds are identified on **AI Figure 4.1** and an example of an indicative construction compound arrangement is included in **EIA Figure 4.11a**.

Wind Turbine Foundations

3.6.25 Rock anchor / cage foundations, as discussed in **AI Chapter 4**, would be used where possible instead of gravity-based foundations to minimise the quantity of peat required to be removed for the turbine foundations. It is anticipated that 8 gravity-based foundations (as illustrated in **EIA Figure 4.3**) and 27 rock anchor / cage foundations could be required for the Proposed Development. An example of a rock anchor design is shown in **EIA Figure 4.4**.

3.6.26 Piled foundations were considered but have been discounted due to the potential for relatively shallow bedrock. Piled foundations require the individual piles to be able to resist tensile forces exerted on them by the rest of the foundation. Piles usually transfer the tensile forces to the

ground via 'skin friction' which comes from the contact of the pile with the surrounding soil. If the piles are not large enough (i.e. if the bedrock depth dictates this) then there would not be enough skin friction generated and the piles would pull out of the ground rather than resist the tensile forces.

3.6.27 Furthermore, the bedrock on site is Lewisian Gneiss, which is very hard and piling into it is impractical. For this reason, traditional gravity or rock anchored foundations have been chosen as the most suitable foundation option.

3.7 References

Lewis Wind Power, Stornoway Wind Farm Environmental Statement, 2011.

Scottish Government (2017), Onshore Wind Policy Statement.

Scottish Government (2017), Scottish Energy Strategy.

4. Description of the Proposed Development

4.1 Introduction

4.1.1 This Chapter provides an overview of the Proposed Development, including a description of the Development Site, infrastructure elements, and the key elements of the construction, operational and decommissioning phases. The Proposed Development, including the mitigation measures outlined in each of the technical chapters, is presented by the Applicant as the basis for the Section 36 application. The extent of the Development Site and its wider geographical context is set out in **EIA Figure 1.1** and **EIA Figure 1.2.**

4.1.2 The description of the Proposed Development presented in this Chapter has been used by the EIA technical specialists as the basis for assessing its effects on the environment.

4.2 Development Description

4.2.1 The Proposed Development is a wind farm consisting of a maximum of 35 wind turbines, each with a three-bladed rotor with a radius of up to 150m. Two maximum turbine heights are proposed to be deployed within the Development Site to accord with the surrounding landscape and views from residential areas (the design evolution is discussed in **AI Chapter 3: Scheme need, alternatives and iterative design process**). Along the eastern side of the Site, ten turbines have proposed heights of up to 156m to blade tip, whilst the remaining 25 turbines would consist of wind turbines of up to 180m to blade tip (**see EIA Figures 4.2a-b,**). **Table 4.1** provides the maximum tip heights for each turbine.

4.2.2 The two turbine types would have an estimated generating capacity of approximately 5.6MW giving a combined generating capacity of 196MW.

4.2.3 The application also comprises associated infrastructure including internal wind farm tracks, watercourse crossings (including bridges), crane pads, borrow pits, temporary construction compounds, laydown and storage areas and grid connection infrastructure (including up to 3 substations and battery storage facilities).

Site Location

4.2.4 The Development Site is approximately centred on National Grid Reference (NGR) E 137149, N 933373 to the west of Stornoway on the Isle of Lewis. The A859 borders the east and south eastern boundary of the Development Site, and an unclassified road runs through it in an east / west alignment and then along the western boundary, heading south-west.

Existing Site and Surroundings

4.2.5 The Development Site predominantly consists of a mixture of open moorland with areas of woodland and includes a large number of streams and lochs. There is evidence of historical peat extraction across the Development Site, with much of this in close proximity to the A859. The Development Site encloses an area approximately 1,700 hectares and is shown in **EIA Figure 1.1** and **EIA Figure 1.2**.

4.2.6 The town of Stornoway is located to the east of the Development Site, with the nearest residential property found around 1.5km from its boundary.

4.2.7 There is consent for the 36-turbine Stornoway Wind Farm on the Development Site (the Consented Development).

4.2.8 An operational wind farm (Beinn Gredaig), consisting of 3 wind turbines is located in the western part of the Site (see **AI Figure 4.1**). This wind farm became operational in May 2015 and is not connected to the Applicant's proposal, although it does fall within the Development Site.

4.2.9 The 7 turbine Pentland Road scheme is located directly to the north, north west of the Development Site. The three turbine Arnish Moor wind farm is located 1.2km to the south, south east of the Development Site.

4.2.10 Marybank Quarry is located approximately 50m to the east of the Development Site and 2.2km from the nearest turbine location, and a landfill and recycling centre is located within the Development Site boundary, approximately 650m from the nearest turbine location.

4.2.11 A council depot including salt storage areas is located within the Development Site boundary, along the access route from the A859. The Creed Business Park is located 50m to the east of the Development Site, approximately 1.9km from the nearest turbine location.

4.2.12 The site of the former Lewis Chemical works is located between Marybank Quarry and the Development Site.

4.2.13 The Lewis Peatlands Special Protection Area (SPA) is located to the immediate west and north of the Development Site. This 586km^2 designated site encompasses both upland and lowland areas of mainly heather moorland and rough grassland and occupies most of the northern half of the Isle of Lewis. The SPA comprises an extensive area of deep blanket bog, interspersed with bog pool complexes and freshwater lochs. The peatlands are of importance for a range of characteristic peatland breeding birds, especially waders, divers and raptors.

Development Proposals

4.2.14 The redesign of the Consented Development was primarily driven by the emergence of larger wind turbines that offer opportunities for increased generation, ensuring that the project optimises yield and productivity, making the best use of a high resource site and thereby maximising the amount of renewable energy generated in order to contribute to the UKs renewable energy targets.

4.2.15 The layout of the Proposed Development incorporating maximum tip heights of 180m (for 25 of the turbines) has been chosen because it balances sustainably high productivity with the environmental sensitivities present at the Development Site. Each chapter takes an appropriate and topic specific approach to assessment of the Proposed Development within identified parameters that are set out in **Table 4.1**.

Table 4.1 Application Turbine Parameters

Turbine ID	Easting	Northing	Max Tip Height	Max Rotor Diameter
1	134518	931471	180m	150m
2	135057	931501	180m	150m
3	135334	930964	180m	150m
4	135974	931083	180m	150m
5	136504	931093	180m	150m

Turbine ID	Easting	Northing	Max Tip Height	Max Rotor Diameter
6	137085	931096	180m	150m
7	137745	931334	156m	136m
8	137459	931647	180m	150m
9	137054	931906	180m	150m
10	136256	931758	180m	150m
11	135678	931644	180m	150m
12	135509	932128	180m	150m
13	136047	932198	180m	150m
14	136837	932330	180m	150m
15	137962	932171	156m	136m
16	138185	932705	156m	136m
17	137539	932809	180m	150m
18	137197	932997	180m	150m
19	138130	933104	156m	136m
20	138511	933652	156m	136m
21	138265	934003	156m	136m
22	137306	934087	180m	150m
23	137124	934521	180m	150m
24	136467	934645	180m	150m
25	136497	935172	180m	150m
26	137065	935045	180m	150m
27	137656	935217	180m	150m
28	137716	934787	180m	150m
29	138091	934590	156m	136m
30	138558	934796	156m	136m
31	138323	935192	180m	150m
32	138066	935798	180m	150m
33	138600	935760	156m	136m
34	138915	935506	156m	136m
35	137800	934040	180m	150m

4.3 Delivery Route

4.3.1 The route to the Development Site for abnormal vehicles and general site traffic is illustrated in **EIA Appendix 13.A**. Route Analysis has been conducted for the turbine delivery route to the Development Site (see **EIA Appendix 13.A Swept Path Analysis)** and turbines are expected to be shipped to the port of Arnish approximately 4km to the south east (**AI Figure 13.1**). This deepwater port has facilitated wind turbine deliveries for both on and offshore developments in recent years and is capable of handling the turbine deliveries for the Proposed Development. The turbines would be transported along the existing port access road running north-west from it to the A859.

4.3.2 Depending on delivery requirements, upgrades to the Arnish port road may be required. Details of the full extent of required works are not available for this assessment. Any alterations to the Arnish port road would be the subject of a separate planning application and do not form part of this application.

4.4 Pre-Construction

4.4.1 This section describes those aspects that have become standard practice for developing a consented wind farm proposal into a buildable project. In the technical chapters of this EIA , additional environmental management and mitigation proposals are set out and, for the avoidance of doubt, they are additional to the inherent mitigation that is embedded into the development proposals as described in this Chapter.

Environmental Management Plans

4.4.2 A Construction Environmental Management Plan (CEMP) would be produced prior to construction. Further details on the CEMP is set out below in **Section 4.7**. The construction works would require an overall Construction Method Statement (CMS) to set out overriding construction principles, programme and health and safety requirements etc. The overall CMS would be agreed with Comhairle nan Eilean Siar (CnES) in advance of commencement of development. Further details on the CMS is set out below in **Section 4.7**. Additional CMSs corresponding to individual construction activities would also be provided. They would identify reference documentation for that activity; principally the CEMP and also any relevant individual management plans (e.g. waste, habitat, water management plans), legislation and construction drawings and documents. For each construction activity, the CMS would detail all environmental sensitivities pertaining to the activity alongside the controls/mitigation measures to be put in place. Approvals or consents required to complete the activity would also be described.

4.4.3 Detailed mitigation plans are frequently requested as pre-commencement documents for agreement with the Planning Authority and relevant environmental regulators. Once these are agreed, the provisions and requirements set out therein would be incorporated into the CEMP. It is envisaged that the following would be required:

- A detailed Peat Management Plan (PMP) (**AI Appendix 9H Peat management plan**);
- A detailed Transport Management Plan (TMP);
- A Water Management Plan (WMP);
- An Outline Habitat Management Plan (HMP) (**AI Appendix 9I Outline Habitat Management plan**;
- A forestry compensatory Planting Plan; and

- A Site Waste Management Plan (SWMP).

Geotechnical Investigations

4.4.4 Some preliminary Geotechnical Investigation (GI) work has been undertaken to date on the Development Site at turbine locations to allow for the design of foundations and locating of turbines.

4.4.5 Further GI would be carried out at the pre-construction stage to determine detailed ground conditions along tracks, and at construction compound and wind farm substation locations. This would provide support to the project team to develop further phases of detailed design work. The geotechnical fieldwork undertaken may include (but not be limited to): visual inspections; machine and hand excavated trial pits; windowless sample boreholes; rotary core boreholes; and sampling and laboratory based geotechnical and geochemical testing. This information would inform the detailed track design, the turbine foundation design and identify any micro-siting requirements.

4.4.6 The following considerations will feed into the GI strategy:

- All fieldworks to be conducted in accordance with BS5930, BS EN 1997 (Eurocode 7) and Site Investigation Steering Group (SISG) recommendations published in the "Specification of Ground Investigations" published by the ICE (1993);
- Competent and suitably qualified contractors would be used;
- Ground condition impacts on available access to GI locations (i.e. consideration of suitable vehicle and rig);
- Site specific induction to be given to all on site personnel prior to works commencing;
- Site work to be conducted in accordance with the construction Health & Safety Plan, Site Rules and Site Induction;
- Use tracked / low bearing excavators/drilling rigs;
- Use bog mats or trackway to traverse areas of softer ground if required;
- Qualified engineer in attendance throughout fieldworks;
- Areas of sensitivity/high risk to be marked out prior to fieldworks starting, including works around watercourses and areas of peat; and
- Monitor weather conditions prior to and during fieldworks.

Environmental Clerk of Works (ECoW)

4.4.7 An ECoW would be appointed prior to construction and employed for the duration of construction related works (including post construction restoration). The role of the ECoW would be to manage the effects of construction works on the environment, make sure that the mitigation measures required as part of the EIA are implemented in accordance with the documents. The ECoW may change depending on technical requirement (i.e. a hydrologist would be used to confirm compliance with the PPP, an ecologist would be used to give tool box talks regarding otter mitigation, or an archaeologist used to define the areas to be fenced off to protect heritage features.

4.5 Construction Activities

4.5.1 It is expected that construction of the Proposed Development would be completed over an approximate period of 30 months. Due to commitments to undertake certain construction works during months when certain birds are not breeding and the unpredictability of weather (especially) during the non-breeding months, there may be downtime and delays in the construction programme. The anticipated construction activities are described below.

Enabling Works

4.5.2 Prior to the main construction phase commencing, a number of enabling works may be necessary, including:

- Geotechnical investigations: excavation of trial pits or boreholes;
- Any required upgrades to public roads, including road widening to allow the abnormal loads to negotiate corners, protection of any below ground services and the temporary removal or resiting of infrastructure (ie signage);
- Site Entrances: establishment of site offices and compound; and
- Borrow pits: establishment of borrow pit aggregate source on the Development Site and initial processing of stone.

Borrow Pits

4.5.3 Five borrow pits are proposed as the source of aggregate for construction of wind farm tracks, turbine bases, crane hard-standings, the main construction compound and auxiliary compounds, the substation compounds, and site office. The location of the proposed borrow pits is indicated on **AI Figure 4.1**.

4.5.4 Typically, aggregate extraction from borrow pits involves the following activities:

- Installation of perimeter drains to prevent surface water flows entering the excavated area;
- Creation of sumps and silt traps to capture subsurface flows and rainwater from the excavated area prior to discharge into the perimeter drains. These would allow suspended materials in the water to drop out before entering the drainage system;
- Upper layer of heather or grass (top 300mm minimum) would be turfed, rolled and located suitably near to the point of removal. Turves would be watered and maintained until reinstatement;
- Extracted material would be separated and graded/crushed within the borrow pit (or adjacent to it) and separated into stockpiles for use as general fill, structural fill or topping material.

4.5.5 Extraction of the material may involve blasting of rock, the methodology for this would be contained in a Quarry Management Plan if required.

4.5.6 Following completion of construction, borrow pits would be restored to ensure that the ground is stable, safe and improve their visual appearance. The restoration plan for each borrow pit would draw on the advice of a landscape architect, hydrologist and an ecologist and would be designed in line with the proposed reinstatement materials and techniques available. It is anticipated that steep faces would be graded out to fit with the surrounding topography and disturbed surfaces covered with peat (details of this are set out in **AI Appendix 9H: PMP**). The reinstatement works would include habitat improvement within the borrow pit area where practicable. **AI Figures 4.12-**

16 are detailed drawings of the borrow pits with indicative restoration profiles and an associated drainage plan.

4.5.7 **Table 4.2** below and **AI Figures 4.12-16,** provide further information about borrow pits.

Table 4.2 Indicative Borrow Pit Volumes

Borrow Pit	Approx. Length (m)	Approx. Breadth (m)	Area (m^2)	Estimated Area Excavated (m^2)	Depth BP Floor (m)	Recovery %	Volume (m^3)
A	260	150	36,250	9,000	12.5	0.8	90,000
B	100	100	10,000	3,000	12.5	0.8	30,000
C	205	90	19,340	6,000	12.5	0.8	60,000
D	200	120	23,900	7,000	12.5	0.8	70,000
E	175	85	14,660	6,000	10.5	0.8	50,000

Alternative Lewis Quarries

4.5.8 It is anticipated that a limited amount of stone would need to be imported from existing on-island quarries for initial site set up works and to construct the section of track up to the first of the borrow pits. It is expected that the rock required would be sourced from one or more of the local established sources identified below;

Marybank – Bardon Hebrides

- Location: 2km west of the centre of Stornoway on A589 near turning to the fabrication yard at Arnish Point.

Creed Business Park – IA & C Maciver

- Location: 3km south west of the centre of Stornoway on A589 at turning to the Creed Enterprise Park.

Bennadrove – Bardon Hebrides

- Location: 3km west of the centre of Stornoway.

Loch Airigh na Lic – Bardon Hebrides

- Location: next to Bennadrove, 3km west of the centre of Stornoway.

Site Infrastructure

4.5.9 The following components would be required for the Proposed Development and typical design detail for these is shown on the accompanying figures listed:

- Wind turbines (**EIA Figure 4.2a-b**);

- Wind turbine gravity base foundation (**EIA Figure 4.3**);
- Wind turbine rock anchor foundation (**EIA Figure 4.4**);
- Wind turbine crane hard standing (**AI Figure 4.5**).
- Floating roads detail (**AI Figure 4.6 (option A and option B)**);
- Excavated roads detail (**AI Figure 4.7**);
- Water crossings – bridges (**EIA Figure 4.8**).
- Water crossings – culverts (**EIA Figure 4.9**).
- Electrical connection, including substation building (**EIA Figure 4.10a**);
- Temporary construction and storage compound (**EIA Figure 4.11a**)**;**
- Borrow Pits (as described above and shown in **AI Figures 4.12 -16**);
- Proposed Grid Connection Route (**EIA Figure 4.13**); and
- Construction Programme (**EIA Figure 4.14**).

Micrositing

4.5.10 In carrying out the various surveys that are necessary in advance of construction activities, environmental, geotechnical and health and safety sensitivities might be identified that could be avoided if the locations of turbines or tracks are re-sited to a relatively small degree (i.e. 'micro-sited'). It is therefore proposed that some flexibility for infrastructure micro-siting be retained and that appropriate limits of deviation would be up to 50m for turbines and 100m for internal wind farm tracks and other infrastructure such as substations and compounds. This mitigation may be restricted further in terms of specific locational hard constraints such as not mircositing closer to a water course if within 50m of a water course or not encroaching beyond the agreed Fresnel zone of microwave links.

Wind Turbines

4.5.11 The turbines of the Proposed Development would be three bladed variable speed pitch regulated, with the rotor and nacelle mounted on a cylindrical tower. This is a typical modern, horizontal axis design comprising four main components: a rotor (consisting of a hub and three blades); a nacelle (containing the generator and also often a gearbox) to which the rotor is mounted; a tower; and a foundation. The specific choice of wind turbine to be installed (henceforth called the 'reference turbine') is dependent on the final commercial and technical choice by the wind farm developer but would not exceed the physical parameters specified in the consent. The chosen turbines would have a height to blade tip of up to 156m or 180m, as per **Table 4.1** and an example of a typical turbine is shown on **EIA Figure 4.2**.

4.5.12 Wind turbines convert the kinetic energy of the wind into electrical energy, the air passing over the blades causing them to rotate. This low speed rotational motion of the blades is converted into electrical energy by a generator located inside the nacelle at a nominal voltage of 690V.

4.5.13 A transformer located immediately adjacent to the turbine tower in a small kiosk (typically 3m x 2m x 3m) steps up the voltage which is then fed to the control building via underground electrical cabling linking all of the turbine unit transformers. Some turbine options may allow transformers to be incorporated into the nacelle, or into the base of the tower itself. An external kiosk is more likely and therefore has been considered by this assessment as a worst-case assessment. The electricity

generated by the Proposed Development would be metered and fed into the electricity transmission network to which it is connected.

4.5.14 The hub height and rotor diameter may vary depending on the final turbine type selected following competitive tender. For the reference turbine used to inform this assessment, an indicative 5.6MW machine has been considered. The blades would rotate at approximately 5 to 13 revolutions per minute, generating power for all wind speeds between a cut in speed of approximately 4m/s (9mph) and 25m/s (56mph), though these parameters may vary slightly depending on final turbine selection. Based on current technology, at wind speeds greater than 35m/s (126kph or 78mph), the turbines would shut down for self-protection. Wind data to inform final turbine design and selection is being gathered using temporary anemometry masts.

4.5.15 The design process has considered an appropriate colour for the wind turbines. They would be painted in a neutral colour (colour specification, light grey RAL 7035) with a semi-matt finish so as to minimise the visual intrusion. Note however that the montages supporting **EIA Chapter 6 Landscape and Visual Impact** are shown in white to ensure adequate contrast in the imagery. The components for each turbine would be brought to the Development Site separately, with the towers being delivered in three or four sections. The overall assembly process for each turbine takes approximately two to four days, depending on weather conditions.

4.5.16 The construction typically involves the use of a small auxiliary 200 tonne crane for vehicle off-loading components from delivery vehicles before preliminary assembly. A larger crane, approximately 500 tonnes lifting capacity, possibly with a 100-tonne trailing crane would be used to erect the base and mid towers. Once preliminary assembly has been completed, a larger main-lift crane, approximately 1,750 tonnes lifting capacity and a 100-tonne trailing crane would be used to erect the top tower section, nacelle including generator, hub and blades.

4.5.17 Once the turbines are in operation, they would be monitored remotely and would not be permanently staffed. Maintenance personnel would make routine visits by car or van approximately once a month, with intermediate visits as and when necessary.

4.5.18 Major planned maintenance would be carried out periodically throughout the year.

Wind Turbine Foundations

4.5.19 Detailed geotechnical investigations would be undertaken during the enabling works to establish the nature of the formation condition at each turbine location. If the geological conditions are suitable than the foundations at the Development Site may be a rock anchor foundation system. If the geology is not suitable, the traditional, gravity foundation design would be implemented. This approach would be implemented to minimise peat removal and significantly reduce the amount of concrete required, thereby minimising environmental impacts as much as possible.

4.5.20 The construction methodology for wind turbine foundations would depend on the strength of subgrade material and depth of peat specific to each proposed location. Based on current knowledge, it is anticipated that 8 gravity base foundations and 27 rock anchor /cage foundations could be required for the Proposed Development, and the following assessment has therefore been based on this design envelope.

Rock Anchor/Cage Foundation

4.5.21 Rock Anchors were developed for sites where bedrock is close to the surface, allowing the loads from the turbines to be directly transferred into the bedrock utilising the strength of the rock, rather than using the foundation to take the load. Further development of Rock Anchor technology has resulted in rock anchor cages allowing the bedrock at slightly lower lying bedrock to be accessed. Both forms of rock anchor are the same diameter as the tower and therefore any

excavation required for digging down to expose the rock head is minimised. For the Rock Anchor, once the rock is exposed and levelled off, a steel adapter plate is installed on top of the rock, with post-tensioned anchors drilled through the plate down up to 15m into the rock. For the Rock Cage, once the rock is exposed and levelled off, the steel cage is installed on top of the rock, with post-tensioned anchors drilled through the base of the cage down into the rock. An example of a rock anchor design is shown in **EIA Figure 4.4**. The area surrounding the rock anchor foundation would be finished in the same way as described for the gravity foundation base set out below.

4.5.22 Different types of rock anchor foundation may be required depending on the depth of the excavation. It is anticipated that around 50m^3 of concrete would be required for the shallower rock anchor foundation, and around 200m^3 for the deeper rock anchor cage foundation.

Gravity Foundation

4.5.23 Foundations would need to be taken down to competent bearing strata, which means excavating through the peat and founding on either bedrock or glacial till. In general, standard excavation techniques would be adopted if peat is shallow and/or stable. However, if peat is unstable or not able to form a stable face, a rock cofferdam would be installed around the perimeter of the foundation to retain the peat and prevent it from flowing back into the excavation.

4.5.24 Whilst the foundation excavation is open it would need to be kept free of water to allow construction of the reinforced concrete base. Water ingress would potentially be from ground (from exposed faces, via peat), surface and rain water. The foundation excavation would be designed to be gravity draining where local topographical conditions allow. If this is not possible, the excavation would be dewatered by pumping. The discharges from dewatering operations would be subject to a method statement agreed with the ECoW and SEPA. Where necessary, settling ponds, filter treatment facilities and buffer strips would be installed to remove sediment from pumped water. No water from foundation dewatering operations would be discharged directly into a watercourse.

4.5.25 The use of a gravity type foundation would involve the excavation and removal of material down to a suitable load bearing strata. Should suitable formation not be present, ground replacement via back filling with compacted stone would be carried out to build up the formation level. A circular reinforced concrete foundation would then be constructed, extending out to approximately 11.5m radius (23m diameter) from the turbine base (as illustrated in **AI Figure 4.3**). It is expected that approximately 575m^3 of concrete would be required for each of the gravity base foundations.

4.5.26 The foundation construction would involve the placing of shuttering and steel reinforcement followed by the pouring concrete within the shuttering to form the base *in situ*. The upper surface of each base would finish approximately 1m below ground level, with the central pedestal extending above existing ground level to receive the bottom tower section. Selected suitable excavated material would be compacted in layers on top of the concrete foundation to leave approximately 150mm above ground level. Around the base of the tower a 2m wide stone footpath would be constructed to allow access.

4.5.27 Removed topsoil and vegetation would be stored adjacent to the foundation and later used to cover areas which have been backfilled. Material needed for backfill would be compacted and stored temporarily in bunds adjacent to the excavations until required.

Crane Hardstandings

4.5.28 Areas of hardstanding would be constructed adjacent to the turbines to create a stable base for assembly cranes. Each area would consist of an excavated crushed stone hardstanding with approximate dimensions of 50m by 25m. A typical arrangement is illustrated on **AI Figure 4.5**. Each

hardstanding would be approximately 1250m^{2}in area, with the exact arrangement being modified to suit the specific requirements of the turbine, the crane and local topography.

4.5.29 Vegetation surrounding turbines would be managed if it has potential to interfere with lifting equipment.

Internal Wind Farm Tracks

4.5.30 Approximately 28.7km of new internal wind farm tracks would be required for the Proposed Development. These tracks would form the link between the public road and the individual turbines, and would be 5m wide on the running surface. Temporary passing places (58 no. up to 33m x 4m) would also be provided every 500m (or as required) to facilitate traffic movements. Potentially the main routes could have been 10m wide to facilitate two-way traffic for stone wagons, however this would require an increased use of materials and peat excavation, therefore strategic passing places were considered to be more appropriate.

4.5.31 Turning heads would be provided at the termination of each turbine string. Abnormal vehicles and cranes would use these turning heads to perform an about turn during the turbine delivery and assembly processes. Where a single turbine is located on a spur track close to the main central track and the topography is suitable, the abnormal vehicles would reverse to the junction with the main track to complete an about turn.

4.5.32 Four site entrances are proposed; two main entry points from the A859, and two on the unclassified road (Pentland Road) where the site tracks meet the road and cross it.

4.5.33 The tracks would be floated normally where the peat depth is greater than 1m, otherwise the tracks would be excavated and backfilled as shown in AI Figure 3.1 within **AI Appendix 9H**. Submerged drainage pipes would be installed across excavated tracks where hydrological sensitivities are present. A section drawing of two typical floating road/track construction methodologies (option A and option B) is given in **AI Figure 4.6** and, for a standard excavated road, in **AI Figure 4.7**.

4.5.34 Where a floating track (**AI Figure 4.6** option A) is to be constructed, geogrid and geotextiles would be laid, and crushed stone would be layered on this to the required depth by excavator machinery. Where any floating road meets an excavated section (such as a compound or crane hardstanding), long lap lengths of geogrid would be installed at the interface. The average stone depth of the tracks would be approximately 0.7m. The main spine road would require the greatest depth of stone (about 1m, dependent on bearing) and spur tracks to individual turbines would be shallower at approximately 0.6m, although this would be determined by the strength of the underlying peat. The stone would be compacted by mechanical excavator as the use of vibratory compaction is not recommended on floating roads. In areas of sensitivity, such as groundwater dependent terestrial ecosystems (GWDTE's), cross drainage under the tracks may be required to maintain water flow.

4.5.35 A second floating road construction methodology is also considered, whereby it is proposed to excavate up to two thirds of catotelmic peat where present (see **AI Figure 4.6** option B). A suitable volume of oversize clean rock would then be placed into the remaining catotelmic peat allowing this peat to fill the interstitial voids between the rocks before the access track is laid. Further details will be provided in the CEMP that would be produced for approval by the Scottish Environment Protection Agency (SEPA) prior to construction.

4.5.36 The floating tracks would be constructed in line with the good practice guidance and would include the use of geogrids.

4.5.37 A desk study, site walkover, peat landslide risk assessment and peat and geotechnical risk assessment have been undertaken for the Development Site. Peat depth (probing) works and auger works (to identify peat classification) have contributed to these studies. A range of design measures

have been undertaken to minimise the extent of works on areas of deep peat, principally involving the alignment of tracks and wind farm components to avoid such areas (alongside other site constraints) where possible. Consideration is given to the techniques recommended in the guidance document 'Floating Roads on Peat'[1]. Consideration of the impacts upon soils and suitable mitigation measures is presented in **EIA Chapter 11 Geology, Hydrology and Hydrogeology**.

4.5.38 It is possible to transition from one track type to another over short sections (30m to 70m), whilst still adhering to the 'Floating roads on Peat' guidance document. In some circumstances, track design can transition from cut and fill, to punched, to floating over very short distances, and engineers react to the ground conditions on the site on a meter by meter basis. Notwithstanding this, the detailed peat probing gives a clear indication of the type of track that would be suitable on the Development Site, and the Proposed Development has been designed on this basis.

4.5.39 The track design would be developed further by the successful civil works contractor, following detailed design and ground investigation, in consultation with the ECoW, with priority given to ecological, drainage and peat considerations.

Water Crossings

4.5.40 There are a large number of small streams, larger watercourses and drainage channels present throughout the Development Site and a small river, Abhainn Ghrioda, over which a new crossing is proposed. The detailed assessment of impacts upon the water environment is presented in **AI Chapter 9 Ecology** and **EIA Chapter 11**. The following sections briefly describe the types of water crossings that would be employed.

4.5.41 Access tracks have avoided crossing watercourses where possible, but due to the number of watercourses on the Development Site, and limitations regarding access locations, it is not possible for the development to take place without some being crossed. In addition, there are some preferential flow pathways that do not have clear surface water channels (e.g. where subsurface flow occurs or flow is ephemeral) where the method of crossing has also been considered to ensure that flow paths are not disrupted. The appropriate method of watercourse crossing has been selected based on the topography, hydrology and ecology of each watercourse individually.

4.5.42 Two main types of watercourse crossing are proposed for the development: bridges and culverts. However the use of each of these types of structures would be determined individually to minimise potential effects based on a site-specific assessment, which would account for topographic, hydrological and ecological attributes at each proposed crossing point. All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings and, where culverts are required, they will be designed in accordance with the CIRIA Culvert Design and Operation Guide.

4.5.43 Based on the proposed road layout and knowledge of the site and watercourses, it is anticipated that four single span bridge crossings would be required, and the remaining 12 crossings would be culverts.

4.5.44 All river crossings would be designed to convey a 1 in 200-year return period flood event, and individually sized and designed to suit the specific requirements and constraints of its location. As noted above it is probable that additional crossings would be identified on site during construction, or the proposed crossing may change. All crossing points and methodologies would be agreed with all relevant stakeholders, prior to construction.

[1] FLOATING ROADS ON PEAT, A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland, Forestry Civil Engineering and Scottish Natural Heritage, August 2010.

Bridges

4.5.45 Bridges in general are the preferred solution for the larger required watercourse crossings due to their lesser hydrological and ecological effects and are particularly suited to larger spans and to higher flow watercourses. Bridge construction is unlikely to interfere with the watercourse to the same extent as culvert construction and can be built over the existing alignment of the river without the need for diversion. The bridge would carry ducts that would accommodate site electrical cables. Foundations will be required on both banks (down to a competent bearing stratum) in order to support the bridge deck. A typical bridge section is shown in **EIA Figure 4.8.**

4.5.46 A local widening of the track would be required on one side of the bridge; if necessary the track will need to be strengthened to allow a hardstanding area for the crane when the bridge deck beams are lifted into place. The size of this area would be determined by factors governing the size of the crane, for instance the bridge span.

Culverts

4.5.47 Culverts are proposed where there are small but distinct channels with no clear topographic variability. The small size and channel capacity limit the hydrological and ecological benefits that a bridge would bring, while the lack of topographic variation would make bridge design unfeasible.

4.5.48 Culverts would be designed to meet minimum requirements as set out in CIRIA Culvert Design and Operation Guide (C689). The size of the culvert would be determined by the design flow of the watercourse and its gradient at the point of crossing. Small circular culverts would be used where a small watercourse or stream needs to be crossed, and the river crossing is deemed to have low environmental sensitivity. A typical section is shown in **EIA Figure 4.9,** the construction technique would be site specific, either the watercourse would be temporarily diverted, whilst the culvert is constructed on line, or the watercourse would be diverted to a new alignment through the structure. When installing culverts in streams, culverts would be full pipes where the base would be covered with a natural bed. The riverbed would be recreated through the length of the culvert to keep the watercourse flowing as naturally as possible. A mammal tunnel, if judged necessary by the ECoW following further pre-construction surveys, would be provided so that no restriction is created to established movement routes.

Electrical Connection and Battery Storage

4.5.49 Following turbine foundation construction, some of the required electrical infrastructure would be installed such as the small transformers to be located either internally within the turbine towers or adjacent to each turbine in a small kiosk (3 x 2m x 3m) according to the selected turbine specification.

4.5.50 The onsite power cable network would be installed adjacent to wind farm tracks in a trench around 0.5m wide and at a depth of approximately 1m. Where depths less than 1m are to be adopted, possibly as a result of rock head or groundwater, or where the cables go underneath the site roads at crossing points then the cables would be installed in cable ducts.

4.5.51 The power cables will be XLPE (cross linked polyethylene) insulated with copper or aluminium conductors. A separate fibre optic cable would be laid alongside the power cables within the same trench for communications. A bare copper earth cable would also be laid at the bottom of the same cable trench.

4.5.52 The turbines would be connected through suitable switchgear to be installed in a control building on-site. The substation compound would comprise a hardstanding with maximum dimensions of approximately 150m x 80m and a single storey building approximately 37m x 10m which will house switchgear, metering, protection and control equipment, battery storage facilities (for up to 20MW

of storage) as well as welfare facilities. **EIA Figure 4.10** provides an illustration of a typical control building and compound. Final details including external finishes and bunding and drainage of the battery storage area would be submitted pursuant to a condition of the deemed planning permission should consent be granted. The envisaged location of the control building and the main site compound are shown in **AI Figure 4.1** and would be sited in a borrow pit location (Borrow Pit A), which would therefore be previously disturbed ground. The Proposed Development would be connected into the national grid transmission system at 132kV. This connection from the on-site substation is expected to be achieved using a buried cable to the Scottish Hydro-Electric Transmission Ltd (SHETL) transmission network. The electricity would be exported to the grid via the proposed Western Isles Interconnector, which SHETL are progressing as a separate project. The HVDC Converter and AC substation is expected to be located at Arnish Point, approximately 5km to the south of the Development Site substation.

4.5.53 The anticipated grid connection route is illustrated on **EIA Figure 4.13**.

Construction Compounds

4.5.54 A temporary site office comprising a portacabin, a single parking space and a vehicle layby would be located approximately 150m east of the Development Site entrance. This office would be manned during construction hours and provide a sign-in/out function for the Development Site. This would prevent unauthorised vehicular access to the Development Site and allow supervision of anyone remaining on-site beyond agreed working hours.

4.5.55 The location of the main construction compound is illustrated on **AI Figure 4.1**. This would be a maximum of 150m by 80m in area but this may be reduced depending on site requirements at the start of the construction phase. The plans and elevations of the compound is illustrated on **EIA Figure 4.11a**.

4.5.56 The construction compound would be of an excavated construction. The peat would be removed to an average depth of approximately 800mm (depending on the ground conditions encountered during the geotechnical investigations), and then replaced with a geogrid membrane layer, on which layers of crushed rock would be compacted and finished with a final layer of finely graded material to act as a top dressing. On average 800mm depth of stone would be used as fill.

4.5.57 Once the erection and commissioning of the wind turbines is complete, the main construction compound would be removed and the land reinstated.

Site Security and Lighting

4.5.58 The construction compounds would be lit with security lighting, which would face inwards to minimise light pollution. The construction compound may be enclosed within a security fence around the perimeter of the substations and the access to electrical compounds would be via a locked access gate.

4.5.59 It is also anticipated that a small security area would be established at the junction to the public highway during the construction period. These would be manned to monitor the flow of traffic into and out of the Development Site with a small manned security kiosk installed.

Proposed Working Hours

Development Timescales and Programme

4.5.60 It is anticipated that the construction period for the Proposed Development would be approximately 30 months in duration (month numbers relate to the construction programme and not calendar months) and would comprise the following activities broadly listed in sequence:

- Improvement works to the public highway to accommodate turbine deliveries (e.g. widening at junctions);
- Construction of four site access points;
- Formation of site compound(s) including hardstanding and temporary site office facilities;
- Construction of new access tracks and passing places (as required), inter-linking the turbine locations and substation compound(s);
- Construction of bridges where required;
- Construction and upgrade of culverts under roads to facilitate drainage and maintain existing hydrology;
- Construction of crane hardstanding areas;
- Construction of turbine foundations;
- Construction of site control building and associated substation(s);
- Excavation of trenches and cable laying adjacent to site tracks;
- Connection of on-site distribution and signal cables;
- Delivery and erection of wind turbines;
- Commissioning of site equipment; and
- Site restoration.

4.5.61 Where possible, operations would be carried out concurrently (thus minimising the overall length of the construction programme). In addition, development would be phased such that, at different parts of the Development Site, the civil engineering works would be continuing whilst wind turbines are being erected. Site restoration would be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

4.5.62 Floating road construction for access tracks would be scheduled to take account of predicted settlement rates, with monitoring undertaken to ensure their stability.

4.5.63 An indicative programme for construction activities is shown in **EIA Figure 4.14.** The start date for construction activities is largely dependent upon the date that consent might be granted and grid transmission availability; subsequently the programme would be influenced by constraints on the timing and duration of any mitigation measures confirmed in the individual technical chapters or by the application decision.

4.5.64 The final length of the programme would be dependent on seasonal working and weather conditions. Summer months are favoured for construction due to longer periods of daylight allowing longer (and safer) working days. Summer months are generally also drier which aids construction progress and reduces the impact of site debris (mud etc) reaching the public highway, although wheel wash facilities would be installed at the main site entrance / exit points. Wet

weather has the potential to complicate construction activities in peat, although these complications can be minimised through the use of 'stop rules' included in the CMS (see **Section 4.7**).

4.5.65 For the purposes of this EIA, subject to the caveats noted below, construction activities have been assumed to take place between 07:00 to 19:00 hours on week days and 07:00 to 13:00 on Saturdays. Quiet on-site working activities such as electrical commissioning have been assumed to extend outside the core working times, noted above, where required. No working will be undertaken on Sundays. Working hours may be reduced at times due to seasonal or weather restrictions or in certain locations where required as mitigation (for example during the breeding bird season should a stand-off from an active nest be required).

4.5.66 Weather, in particular wind, has a strong influence on the timing of construction activities. Crane activities are generally limited during strong winds (>9 m/s) and erection during these weather conditions may be avoided for safety reasons, with the actual limiting conditions being reviewed as part of the crane lifting plan. As a result of this, it may be necessary to carry out turbine erection activities outwith the standard working times and during periods of calm weather. During periods of cold weather, concrete pouring of the turbine bases may be prohibited (temperatures <4°C) or subject to specific cold weather working practices.

Development Phasing

4.5.67 Construction of the Proposed Development would consist of two main elements. Firstly, civil and electrical construction of the infrastructure and secondly, erection and commissioning of turbines. Construction of the control building and the grid connection are lengthy processes which will commence early in the construction programme to allow a live grid connection to coincide with the commissioning of the turbines. As noted, many individual construction processes will run partly or fully concurrently whilst others would progress in a sequence with or without some overlap in time.

Site Quantities

Rock Requirements

4.5.68 It is estimated that the construction of access tracks, hardstandings, foundations, and compounds of the Proposed Development would require an estimate of 225,400 m^3 of rock[2]. **Table 4.3** below provides a breakdown of the required rock volumes for each construction element. It is anticipated that all of the rock required would be sourced from the on-site borrow pit(s)[3].

Table 4.3 Rock Volumes

Infrastructure	Total Rock Volume (m^3)
Turbine Hardstandings and foundations	62,000
Access tracks	145,000
Temporary compounds	9,600

[2] This includes a 20% contingency for stone requirements.
[3] It should be noted that for completeness, the traffic and transport assessment consider this scenario and a scenario whereby no borrow pits being possible on the Development Site.

Infrastructure	Total Rock Volume (m^3)
Substation compounds	8,800
Total Rock Volume	225,400

Concrete Batching Plants

4.5.69 For the purpose of this application and EIA it has been considered that all concrete would be sourced off-site and there will be no on-site batching required.

4.5.70 For the purposes of the assessment concrete batching plant has been assumed to be from the Marybank Quarry location, although could be from one of the other on-island suppliers with no additional adverse effects.

4.5.71 The majority of the concrete used on the Development Site is required for turbine foundations with additional material for substation and transformers. **Table 4.4** provides an estimate for each.

4.5.72 As set out in **Section 4.5**, the assessment has been based on a design envelope of 11 gravity base foundations, 16 rock anchor foundations and 8 rock cage foundations.

Table 4.4 Concrete Volumes

Infrastructure	Total Concrete Volume (m^3)
35 Wind Turbine Foundations	8,725*
Substation Foundations	222
Wind Turbine Transformer Foundations	189
HV Equipment Plinths	90
Total Concrete Volume	9,226

*Based on 11 gravity (575m3), 8 rock anchor (200m3) and 16 rock anchor (50m3)

4.5.73 Other materials associated with the construction, operation and decommissioning will be sourced locally where possible.

Employment Proposals

4.5.74 Potential job creation levels are discussed in detail in **EIA Chapter 14: Socio Economics.**

Transport Movements

4.5.75 As mentioned in **Section 4.6**, it is anticipated that construction of the Development Site would take up to 30 months to complete. The schedule shown in **EIA Figure 4.14** illustrates works in line with a 30-month construction period (month numbers relate to the construction programme and not calendar months).

4.5.76 The vehicles likely to be involved in construction activities include:

- Articulated trailer lorries – to bring initial establishment equipment (port-a-cabins etc.);
- Low loaders – to transport the civil construction equipment to and from the site;
- Tipper trucks – to import any aggregates required during construction (e.g. engineering fill for turbine foundations) and to move stone for track construction and remove spoil (these would be retained on site during construction);
- Concrete mixers wagons –to transport concrete from the offsite batching source to location of turbine bases and substations;
- Cranes – typically this involves one 100 tonne trailing crane, one 200 tonne crane for assembling the turbines on the ground and one 1000 tonne maximum lifting capacity crane plus three support vehicles for the period of turbine erection. The final turbine choice may have specific requirements for alternative crane types;
- Specialist delivery vehicles for delivery of turbine blades, tower sections and nacelles; and
- Miscellaneous vehicles and handling equipment, including cars belonging to the construction workforce.

4.5.77 Anticipated vehicle movements on the public road network are detailed in **AI Appendix 13.B** and assessed in **AI Chapter 13 Traffic and Transport**. **Table 13.10** sets out the worst case scenario for the predicted traffic generation during the construction phase (i.e. not using borrow pits).

4.5.78 **AI Appendix 13.B** summarises the predicted traffic movements associated with each type of vehicle during the construction phase. Month numbers relate to the construction programme and not calendar months.

4.5.79 Turbine deliveries are anticipated in phases, based on the construction programme schedule and are likely to be subject to movement orders as agreed with the local authority and other relevant statutory bodies.

4.5.80 During the delivery periods when the turbine components would be entering the Development Site, long and slow loads would use the local road network. Traffic management measures incorporated into a TMP would be employed to mitigate potential adverse effects on road users. Typically turbine components are delivered in convoys of up to 6 vehicles and travel during off-peak periods of traffic flow.

4.5.81 The largest component of vehicle numbers during main construction works is due to non-HGV movements, in particular concrete delivery and stone (if imported).

4.5.82 A TMP would be produced and submitted pursuant to a condition of the deemed planning permission.

4.5.83 Once the turbines are in operation, minimal vehicle traffic would be required to access the Development Site. The turbines would be monitored remotely and require only routine maintenance visits.

4.5.84 An assessment of the impacts arising from traffic on ornithology and ecology is presented in **AI Chapter 8 Ornithology** and **AI Chapter 9 Ecology** and consideration of the impacts arising from project traffic increases upon the local road network and users is presented in **AI Chapter 13.**

Offsite Development

4.5.85 As discussed in **Section 4.3**, some modifications to the Arnish Port road might be required to allow for the delivery of the turbine components, however they would be the subject of a separate planning application and therefore not considered further in this Application.

4.6 Decommissioning

Wind Farm Decommissioning Requirements

4.6.1 There are two options available at the end of the operational lifetime of the Proposed Development. As wind energy is a renewable resource and thus a sustainable method of generation, the first is to re-power the site with new machines, which would require a new application and a further EIA Report. The second option is to remove the wind turbines and re-instate the Development Site.

4.6.2 In any event, a decommissioning plan is required for the removal of the Proposed Development.

4.6.3 If consent is granted, LWP believe that there is likely to be a planning condition that the wind turbines are removed after a period of operation of 25 years. Wind turbines can easily be removed and the hardstanding areas re-instated. Prior to wind turbine removal, due consideration would be given to any potential impacts arising from these operations. Some of the potential issues could include:

- Potential disturbance by the presence of a crane, HGVs and engineers on-site;
- On-site temporary compound would need to be located appropriately;
- Time of year and time-scale (to be outside sensitive periods); and
- Access tracks may remain in use for the benefit of the landowner, crofters and other stakeholders.

4.6.4 A comprehensive plan for the decommissioning (including environmental management practices) of the Proposed Development and restoration plan of the Development Site on completion of decommissioning works would be prepared for agreement with CnES. The decommissioning plan would be prepared near the end of the operational life of the Proposed Development to decommissioning the Development Site and restore the landform after removal of the above ground infrastructure.

Wind Turbine Decommissioning

4.6.5 Wind turbines (towers, nacelle, hub, blades and electrical kiosk) can be dismantled using a crane and removed from site. Most parts can be readily recycled with the only parts which are currently difficult to recycle being the glass fibre blades. Most items would be broken down so that specialist lorries are not required unless there is a potential follow on use for the components in one piece.

4.6.6 The wind turbine foundations would be cut off to a depth of approximately 1m and the remainder left in situ and covered by 1m of soil / peat, which would be reinstated and re-vegetated, this being more environmentally sensitive than removing foundations.

Substation and Distribution System Decommissioning

4.6.7 The control building, substation and associated equipment would be removed and the components reused or recycled. It is likely that the plant would be re-used as it has a life well in excess of the Proposed Development itself. The buried distribution cables would be de-energised and would be cut off below ground level at the ends. Any disturbed areas would be reinstated and re-vegetated.

Access Track Decommissioning

4.6.8 Following decommissioning of the Proposed Development, some wind farm tracks may remain in perpetuity for future use by landowners, crofters, other stakeholders and for recreational purposes. It is also considered that the disturbance associated with their removal and disposal of the material would have a much greater environmental effect than leaving them in situ.

Transmission System Decommissioning

4.6.9 There may well be other users of the wider transmission system at the end of the project. It may be integrated with the transmission network on Lewis and other electricity generators may be connected to it. In this case, the relevant circuits would not be removed when the Proposed Development is decommissioned.

4.7 Embedded Environmental Measures

Introduction

4.7.1 A key benefit of the EIA process is the opportunity it gives to integrate environmental considerations into the careful, iterative design of a project. Embedded mitigation proposals are those mitigation measures which are inherent to the Proposed Development and are integral to and should be included in consideration of the application. Embedded mitigation includes all mitigation assumed to be in place during construction, operation and decommissioning. Embedded mitigation is generally regarded as industry standard or best practice.

4.7.2 Embedding mitigation has been a feature of the process that has led to the final design of the Proposed Development; and this embedded mitigation therefore forms part of the Proposed Development which is assessed.

4.7.3 In addition to the plans and management plans described in **Section 4.4**, the following provides an overview of some of the general (currently not project specific) environmental management considerations for the construction of the Proposed Development. This is supplemented by specific environmental management practices set out in relevant guidance, described in greater detail in the relevant **EIA** and **AI** Chapters. These provisions do not replace or affect the implementation of specific mitigation measures detailed in the specialist assessment chapters which follow.

Construction Environmental Management Plan (CEMP)

4.7.4 The CEMP would be the master document for consolidating all environmental requirements and undertakings that relate to the Development Site. The CEMP would include the schedule of mitigation set out in this EIA Report and the undertakings that emerge from any individual management plans which may be produced for the project, such as a Habitat Management Plan, Waste Management Plan, Peat Management Plan, Surface Water and Silt Management etc, and would be the central document for environmental provisions and protections when producing detailed designs for construction method statements. It would be the main document used by the Environmental Clerk of Works (ECoW) when carrying out audits of planning and environmental compliance.

4.7.5 The CEMP would remain a live document throughout the pre-construction and construction processes and some provisions are likely to extend into the operational phase. The CEMP would consolidate all appropriate mitigation and enhancement strategies, and would clearly outline what should be implemented, where, and by whom.

4.7.6 The CEMP would be produced prior to the commencement of works and made available to the appointed civil engineers and construction company, and its objectives would be to:

- Provide a mechanism for delivering many of the embedded environmental measures described in the EIA Report;
- Ensure compliance with legislation through setting out the need for consultation with 'consultation bodies' (as defined in Regulation 2 in the EIA Regulations), and by obtaining necessary consents and licences from relevant bodies;
- Provide a framework for monitoring and compliance auditing and inspection to ensure the environmental measures included in the scheme are being implemented;
- Ensure environmental good practices are adopted throughout the construction stage;
- Provide a framework for dealing with adverse effects as they occur;
- Ensure a prompt response should unacceptable adverse effects be identified during the works.

Construction Method Statement (CMS)

4.7.7 The CMS would be prepared following the grant of consent and be subject to approval with individual elements and the supporting CEMP, Pollution Prevention Plan (PPP), Pollution Incident Response Plan (PIRP) and SWMP expected to require approval by relevant consultees. The proposed content of the CMS is as follows:

- GI methods including appropriate reference to CEMP, PPP, PIRP and SWMP;
- Turbine and infrastructure locations (including borrow pits) following post GI micro-siting involving a number of technical specialists - see **Section 4.5**;
- Good practice guidance relevant to H&S, design details etc (e.g. CIRIA "Culvert Design and Operation guide) - see **Section 4.5**;
- Design detail for infrastructure (e.g. foundation specification, foundation and crane hardstanding configuration, confirmation of road sections to be excavated and roads sections to be floated, borrow pit locations and dimensions, watercourse crossing type and dimensions, bell mouth junction design, external finish to buildings, security fencing form and location, etc) - see **Section 4.5**;
- Design detail for pollution control measures (location specific arrangements and design for management of dewatering activities) - see **Section 4.5**;
- Material import requirements and confirmation of stone and concrete source - see **Section 4.5**;
- Programme of works and working hours controls -see **Section 4.5**;
- PPP and PIRP - see below;
- SWMP - see below; and
- Site restoration plan to be implemented to restore areas affected by construction activity.

Peat Management Plan

4.7.8 A detailed Peat Management Plan (PMP) would be produced and agreed with CnES in consultation with SEPA in advance of the commencement of development. The PMP would address how peat

would be removed from working areas, stored and reinstated. Further details on the outline PMP is set out in **AI Appendix 9H**.

Transport Management Plan

4.7.9 A detailed Transport Management Plan (TMP) would be produced and agreed with CnES in advance of commencement of development. The TMP would address traffic related planning conditions and would include, but not be limited to:

- Communication – The TMP would include a strategy for communication with local residents and businesses. The strategy would include procedures to keep affected parties aware of when works would be carried out, if / when roads would be closed (and diversionary routes to be used if there are closures) and how to contact the construction team with a query or complaint;
- Traffic Management – Detailed traffic management strategies would be provided for each stage of the construction works alongside finalised road traffic signage arrangements and a proposed programme of safety inspections on the public highway. This would include details of proposed timings of deliveries and transportation during the construction period;
- Road Condition Survey pre and post construction;
- Remedial Works – Details of procedure for conducting emergency road maintenance, on-going remedial work and final remedial work along with an agreed maintenance period for any repairs carried out on the public road; and
- Contact and Liaison – Details would be outlined with respect to road safety and condition monitoring, including a named individual who would be responsible for liaising and coordinating with CnES.

Water Management Plan

4.7.10 A Water Management Plan (WMP) would be produced and agreed prior to the commencement of development. The WMP would provide specific information in relation to the management of water on the construction site. Practices set out in the WMP would be incorporated into the project CEMP once agreed. This would draw on the specific mitigation measures set out in **EIA Chapter 11**.

Habitat Management Plan

4.7.11 A Habitat Management Plan (HMP) (**AI Appendix 9I**) would be produced and would include the location and approach to implementing ecological and other enhancements and mitigation where applicable.

Pollution Prevention Plan and Pollution Incident Response Plan.

4.7.12 A PPP and PIRP would be prepared and subject to consultation with SEPA and SNH in advance of any construction activities and implemented as part of the overall CEMP. This would set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs). Construction methods and storage of materials at borrow pits will strictly adhere to the Plan.

4.7.13 Aspects of pollution prevention are inherent in the design process and form of infrastructure as described under the CMS above as well as being addressed in general terms through general environmental management as described under the CEMP above.

4.7.14 Good practice guidance would be adhered to (e.g. SEPA guidance "Pollution Prevention and Control Guidelines").

Dust and Air Quality

4.7.15 Particular care would be required to maintain dust emissions at a practicable minimum when working in the vicinity of residential properties and environmentally sensitive areas. Good practice mitigation would be required during dry conditions. The use of Best Practicable Means (as defined in Part III of the Environmental Protection Act 1990) would be employed.

4.7.16 The environmental measures to be implemented to control dust emissions during construction and decommissioning are:

- The use of dust suppression facilities on-site. This would include the provision of water bowsers with sufficient capacity and range to dampen down all areas which may lead to dust escape on-site;
- Any storage on-site of aggregate or fine material would be properly enclosed and screened so that dust escape is avoided. Adequate sheeting would also be provided for the finer materials which are prone to 'wind whipping';
- Wheel wash facilities would be installed for vehicles entering and exiting the Development Site where required. This facility would be able to automatically clean the lower parts of the HGVs by removing mud, clay etc from the wheels and chassis in one drive through operation;
- HGVs entering and exiting the Development Site would be fitted with adequate sheeting to totally cover any load carried which has the potential to be 'wind whipped' from the vehicle;
- Good housekeeping or 'clean up' arrangements would be employed so that the Development Site is kept as clean as reasonably practicable. There will be daily inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation or spillages are removed/cleaned up as soon as reasonably practicable;
- The appointment of a contact to whom complaints/ queries about construction dust can be directed. Any complaints to be investigated and action taken where appropriate.

4.7.17 Dust and air quality are not considered any further within this EIA Report because no likely significant effects are anticipated in this regard and have been scoped out of the assessment (**EIA Appendix 2A Scoping Request**).

Site Waste Management

4.7.18 Prior to commencement of works, a detailed SWMP would be submitted pursuant to a condition of the deemed planning permission. It would set out procedures for handling all waste arising from the Proposed Development. Typically this would involve a three stage process:

- A description of each waste type expected to be produced over the course of the Proposed Development;
- Estimations of the quantity of each different waste type expected to be produced; and
- Identification of the waste management action proposed for each waste type including re-use, re-cycling, recovery and disposal.

Re-Use and Recycling of Decommissioned Materials

4.7.19 All decommissioned materials would be stored on site in segregated areas. The principal contractor would provide method statements for the collection, storage and transportation of materials/waste.

Where appropriate, materials/waste would be segregated on the Development Site in skips or bunded tanks and transported to appropriate sites or recycling facilities.

4.7.20 No materials would be burned on the Development Site. Hazardous waste would be held in a separate skip (or suitable bunded facility) and disposed of at a suitably licensed site.

4.7.21 No waste would leave the Development Site until the appropriate waste carriers' license and management certificates for the disposal site or transfer station have been inspected and authenticated by the relevant parties.

Control of Hazardous Materials

4.7.22 All hazardous materials and substances stored on the Development Site would be stored in a 'Haz-bin' or similar secure lockable container located within the temporary decommissioning compound.

4.7.23 Control of Substances Hazardous to Health (CoSHH) assessments would be completed by all contractors for activities using hazardous substances.

4.7.24 Any on site facilities for the storage, transportation or refuelling of chemicals, oils or fuels shall be sited on suitable impervious bunds. No discharge to any watercourse, land or underground strata would be permitted.

4.8 Implementation of Embedded Environmental Measures

4.8.1 **Table 16.1** in **AI Chapter 16: Summary of mitigation measures** summarises the environmental measures that form part of the Proposed Development, as well as the mechanisms which would be used to ensure that these are implemented. Greater detail on these measures can be found in each of the technical assessment chapters.

Monitoring

4.8.2 Monitoring, where it is required, is explained further within the relevant technical chapters.

4.9 References

Constructed Tracks in the Scottish Uplands (SNH, 2013).

Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition, SEPA, 2010.

Floating Roads on Peat, A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland, Prepared by: Forestry Civil Engineering & Scottish Natural Heritage, August 2010.

General Guide to the Prevention of Pollution: PPG1, Pollution Prevention Guidelines, Scottish Environment Protection Agency.

General Guide to the Prevention of Pollution: PPG 2, Pollution Prevention Guideline Above Ground Oil Storage Tanks.

Good practice during wind farm construction – A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, October 2010.

Pollution Prevention Guidelines: PPG 3, Use and design of oil separators in surface water drainage systems.

Pollution Prevention Guidelines: PPG 4, Treatment and disposal of sewage where no foul sewer is available.

Pollution Prevention Guidelines: PPG5, Works and Maintenance in or Near Water, Scottish Environment Protection Agency.

Pollution Prevention Guidelines: PPG 6, Working at Construction and Demolition Sites, Scottish Environment Protection Agency.

The Pollution Prevention and Control (Scotland) Regulations 2012, Scottish Environment Protection Agency.

8. Ornithology

Non-Technical Summary

The layout of the turbines, road network and associated infrastructure has evolved through the design process, taking environmental constraints to avoid potentially adverse effects on ornithological features into account. Specifically, the layout was designed to avoid possible sensitive lochans used by breeding divers and areas of moorland planted with trees that are preferentially used by hen harrier. The ornithological baseline consisted of a desk study and two years of field surveys from October 2017 – September 2019; surveys carried out over 2015 - 2016 in the north-western area of the Development Site and field surveys conducted in 2010/11 as part of the Stornoway Wind Farm 2012 application.

The desk study identified two European sites and their qualifying features that were taken forward for assessment, Lewis Peatlands SPA and Lewis Peatlands Ramsar. Surveys recorded 33 key species of conservation concern over the two-year period. Of these, 25 were considered to have held breeding territories. All seven species listed as qualifying features of the Lewis and Peatlands SPA were recorded breeding, as were eight species listed on Schedule 1 of the Wildlife and Countryside Act (as amended) (W.C.A.). Nine species were taken forward for full assessment.

The assessment has been based on the results of the desk study and field surveys, relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the ornithological features scoped in to the assessment, where this information is available), and professional knowledge of ecological processes and functions.

For each scoped-in ornithological feature, effects were assessed against the current baseline conditions for that feature during construction, operation and decommissioning.

The initial results of the assessment regarding potentially significant effects were used to inform whether additional baseline data collection was required, together with the identification of environmental measures that should be embedded into the Proposed Development to avoid or reduce adverse effects or to deliver enhancements. This was an iterative process with the results of desk study and surveys informing the requirement for additional scope of works/embedded mitigation. The results of the assessment therefore reflect the final scheme design (i.e. incorporating the environmental measures).

A full assessment, including where appropriate collision risk modelling and population viability assessment, of the screened in ornithological features was undertaken following CIEEM (2018) guidance. No significant effects were concluded for any species or site. A further cumulative assessment was undertaken for golden eagle, white-tailed eagle and red-throated diver, no cumulative significant effects were concluded for any of these species.

A range of environmental measures have been embedded into the Proposed Development to minimise any potential impacts on breeding and roosting birds. Working practices to minimise effects on ornithological features during construction are to be set out in a Bird Protection Plan. This would form part of an overarching Construction Environmental Management Plan and would be implemented under the direction/supervision of an Environmental Clerk of Works. Taking this and other mitigation measures into account, such as those included in the Outline Habitat Management Plan, it was concluded that the Proposed Development would not have a significant effect on birds.

8.1 Introduction

8.1.1 This Chapter of the Additional Information (**AI**) Report assesses the likely significant effects[1] of the Proposed Development with respect to ornithology based on the data collected from two years continuous survey (October 2017 – September 2019). It should be read in conjunction with the baseline information set out in **EIA Chapter 8** of the Environmental Impact Assessment ("**EIA"**) that was previously submitted, and which was based on the results of a single year's data collection. This chapter is supported by a number of appendices, as follows:

- **AI Appendix 8A Bird Surveys October 2018 – March 2019**: This appendix presents the methods and results of bird surveys carried out over the second non-breeding period (October 2018 – March 2019). Methods and results for the first non-breeding period (October 2017 – March 2018) are presented within **EIA Appendix 8B**;
- **AI Appendix 8B Bird Surveys April – September 2019**: This appendix presents the methods and results of bird surveys carried out over the second breeding period (April – September 2019). Methods and results for the first breeding period (April – September 2018) are presented within **EIA Appendix 8C**;
- **AI Appendix 8C Confidential Report October 2018 – September 2019**: This appendix presents confidential data relating to sensitive bird species over the period October 2018 – September 2019). Confidential data for the first year (October 2017 – September 2018) is presented within **EIA Appendix 8D**;
- **AI Appendix 8D Scoping of the Assessment October 2018 – September 2019**: This appendix provides the rationale for the scope of the assessment for the period October 2018 – September 2019. Scoping of the results for the first year (October 2017 – September 2018) are presented within **EIA Appendix 8E**;
- **AI Appendix 8E Collision Risk Modelling Report**: This appendix documents the methodology of collision risk modelling (CRM) and presents results based on flight data collected from Vantage Point (VP) surveys covering two non-breeding and two breeding seasons (2017-2019). By way of comparison it also provides CRM results using the turbine parameters of the consented Stornoway Wind Farm Variation (2016) based on the same set of flight data. It supersedes that presented within **EIA Appendix 8F**;
- **AI Appendix 8F Population Viability Analysis**: In this Appendix population viability analysis (PVA) is used to compare expected bird population sizes with and without additional mortality (attributable to the Proposed Development) to the end of the expected life of the project, either alone, or in combination with other projects. It considers the results from CRM collected from two years of survey effort and supersedes that presented within **EIA Appendix 8G**;
- **AI Appendix 8G Habitat Regulations Appraisal:** This appendix contains a Habitat Regulations Appraisal (HRA) Report, considering potential effects on European sites[2] with regard to the Conservation of Habitats and Species Regulations 2017. It considers the data

[1] In this Ornithology Chapter, the term "potentially significant effects" is used in the sections prior to the "scope of the assessment" (**EIA Section 8.8**) being determined, as it accords with CIEEM guidance. The term "likely significant effects" is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of the Habitats Regulations Appraisal.

[2] European sites include Special Protection Areas (SPA), Special Areas of Conservation (SAC), candidate SACs (cSAC) and Sites of Community Importance (SCI); these sites are collectively referred to as Natura 2000 sites. Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites and proposed Ramsar sites are also considered in the same manner in accordance with national planning policy.

collected from two years of survey effort and thus it supersedes the appraisal presented within **EIA Appendix 8H**;

8.1.2 This Chapter should be read in conjunction with the development description provided in the **AI Chapter 4** and with respect to relevant parts of other Chapters within the original **EIA** and the **AI**, including **AI Chapter 9: Ecology**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects.

8.1.3 The Chartered Institute of Ecology and Environmental Management (CIEEM 2018) "*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*" refer to receptors being 'ecological features', defined as pertaining to habitats, species and ecosystems. However, for the purposes of this SEI Report, for which a separate ecology and ornithology Chapter has been produced, the term 'ornithological feature' is adopted to differentiate terminology and avoid any confusion between the two Chapters.

8.2 Limitations of this Assessment

8.2.1 The baseline context of the Study Area has been determined on the basis of the following:

- A desk study and field surveys from October 2017 – September 2019, representing two years continuous data collection as requested by SNH and the RSPB;
- Surveys carried out over 2015 - 2016 in the north-western area of the Development Site. Field data collected during this period (pertinent to this assessment) included breeding and non-breeding bird surveys (see **EIA Appendix 8A**);
- Field surveys conducted in 2010/11 as part of the Stornoway Wind Farm 2012 application (providing background survey information).

8.3 Relevant Legislation, Planning Policy, Technical Guidance

8.3.1 Refer to **EIA Chapter 8, Section 8.3**. There has not been a change in policy or guidance in the submission of the EIA Report in 2019.

8.4 Data Gathering Methodology

8.4.1 Refer to **EIA Chapter 8, Section 8.4**.

Survey Work

8.4.2 A list of the field surveys carried out from October 2018 to September 2019 to inform the preparation of this Chapter is provided in **Table 8.1**. The detailed methodologies for, and results of, these surveys can be found in **AI Appendices 8A** and **8B.** Following SNH guidance (SNH 2016d), **AI Appendix 8C** presents data and figures of flight activity, roosting locations and breeding locations associated with sensitive species from October 2018 - September 2019 and should be read in conjunction with **AI Appendices 8A and 8B.**

8.4.3 A summary of the surveys undertaken from October 2017 – September 2018 are presented in **EIA Chapter 8** and **EIA Appendices 8B, 8C and 8D**.

Table 8.1 Summary of Ornithological Surveys: October 2018 – September 2019

Survey	Relevant Guidance	Field Survey Area	Survey Period	Ref.
Vantage Point (VP) surveys	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Proposed Development and 500m buffer	22/10/2018 – 15/09/2019	**AI Appendices 8A, 8B and 8C**.
Hen harrier Roost Monitoring	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms; *Hardey et al (2009)*.	Specific roost location within Proposed Development	24/10/2018 – 28/03/2019	**AI Appendices 8A and 8C.**
Moorland Bird Survey	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Proposed Development and 500m buffer	17/04/2019 – 13/07/2019	**AI Appendices 8B** and **8C**.
Breeding raptor surveys	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Proposed Development and 2km buffer (6km for golden eagle and white-tailed eagle)	09/04/2019 – 16/07/2019	**AI Appendices 8B** and **8C**.
Breeding diver surveys	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Proposed Development and 1km buffer	23/05/2019 – 02/08/2019	**AI Appendices 8B** and **8C**.
Breeding hen harrier focal watches	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Specific nest locations within 2km buffer	19/05/2019 – 05/07/2019	**AI Appendices 8B** and **8C**.
Breeding diver focal watches	SNH (2017 V.2) Recommended bird survey methods to inform impact assessment of onshore wind farms.	Specific nest locations within 1km buffer	17/06/2019 – 25/08/2019	**AI Appendices 8B** and **8C**.

8.5 Baseline

8.5.1 A summary of the ornithological baseline as determined through desk study and field survey is provided below and re-presents data collected from October 2017 to September 2018 as well as data collected from October 2018 to September 2019.

8.5.2 Further baseline details are provided in **Sections 8.10 – 8.24**, and detailed descriptions are provided in **EIA Appendices 8A, 8B, 8C** and **8D** and **AI Appendices 8A, 8B** and **8C**.

Current Baseline

Site Context and Surrounding Habitats

8.5.3 Refer to **EIA Chapter 8, Section 8.5**.

Statutory Nature Conservation Sites (International/European)

8.5.4 Refer to **EIA Chapter 8, Section 8.5**.

Statutory Nature Conservation Sites (National)

8.5.5 Refer to **EIA Chapter 8, Section 8.5**.

Non-Statutory Nature Conservation Sites

8.5.6 Refer to **EIA Chapter 8, Section 8.5**.

Species

8.5.7 **Table 8.2** provides a brief summary of all species recorded during bird surveys from October 2017 – September 2019. A detailed summary of the species recorded across the Development Site is presented in **EIA Appendices 8A, 8B, 8C** and **8D** and **AI Appendices 8A, 8B** and **8C**. Corncrake, the qualifying feature for Ness and Barvas SPA was not recorded during any surveys therefore Ness and Barvas SPA was not considered further in this assessment and is scoped out.

8.5.8 **Table 8.2** indicates whether the bird is a qualifying feature of the Lewis and Peatlands SPA, is listed on Annex 1 of the Birds Directive, Schedule 1 of the Wildlife and Countryside Act (as amended) (W.C.A.) or is a species of principal importance on the Scottish Biodiversity list (SBL). The species status on the Birds of Conservation Concern List (BoCC) is displayed as green, amber or red (*Eaton et al. 2015*). Species have been arranged alphabetically as opposed to taxonomically for convenience.

Table 8.2 Summary of Ornithological Survey Results: October 2017 – September 2019

Species	Status	Period	Number Territories in the Development Site	Summary
Arctic skua	SBL BoCC Red List	Oct 17-Sep 18	0	A single flight was recorded from Vantage Point (VP) surveys and consisted of a single bird in June 2018.
		Oct 18-Sep 19	0	A single flight was recorded during a Diver Focal Watch survey in June 2019.
Black-throated diver	Lewis Peatlands SPA / Ramsar W.C.A. Schedule 1[3] SBL BoCC Amber List	Oct 17-Sep 18	1	24 flights were recorded during VP surveys. Two breeding attempts were recorded within the field survey area, one of which appeared to fail at the egg laying stage whilst the second failed at the chick rearing stage. A third pair located outside of the field survey area possibly fledged two chicks. No breeding attempts were located within the part of the Lewis Peatlands SPA that the survey area covered, although the one which appeared to fail at the egg laying stage was immediately adjacent. An additional 9 flights were recorded from focal watch surveys of the pair within the field survey area that failed at the chick rearing stage.
		Oct 18-Sep 19	1	28 flights were recorded during VP surveys. Five breeding attempts were recorded during 2019, three of which were monitored. One was within the 1km field survey area, whilst four were located approximately 1 – 3km from the Development site. Records indicate that two of the three breeding attempts (including the one located within the Proposed Development) that were monitored failed whilst the third may have fledged a single chick. A total of 36 flights were recorded from focal watch surveys covering three breeding locations.
Black-tailed godwit	W.C.A. Schedule 1 SBL BoCC Red List	Oct 17-Sep 18	0	A single flight was recorded during VP surveys, consisting of a flock of five birds in May 2018.
		Oct 18-Sep 19	0	Not recorded.
Barnacle goose	Annex 1 Birds Directive (SBL) BoCC Amber List	Oct 17-Sep 18	0	A single flight was recorded during VP surveys, consisting of a flock of 15 birds in October 2017.

[3] Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) makes it an offence to recklessly or intentionally disturb any Schedule 1 species while they are nest building, or at a nest containing eggs or young, or to disturb the dependant young of such birds. Further protection is given to birds listed on Schedule 1A (it is an offence **at any time** to harass a white-tailed eagle, golden eagle, hen harrier or red kite) and Schedule A1 (it is an offence to damage a nest of a white-tailed eagle or golden eagle).

Species	Status	Period	Number Territories in the Development Site	Summary
		Oct 18-Sep 19	0	A single flight was recorded during VP surveys, consisting of a flock of 13 birds in October 2018.
Common sandpiper	BoCC Amber List	Oct 17-Sep 18	1	An estimated 10 territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	7	An estimated 11 territories were recorded within the field survey area in 2019.
Common tern	Annex 1 Bird Directive SBL BoCC Amber List	Oct 17-Sep 18	c 50	60 flights were recorded during VP surveys. A colony of approximately 50 pairs were recorded within the field survey area, nesting within the Development Site on an island on Loch a Chlachain.
		Oct 18-Sep 19	C 50	75 flights were recorded during VP surveys. A colony of approximately 50 pairs were recorded within the field survey area, nesting within the Development Site on an island on Loch a Chlachain.
Dipper	BoCC Amber List	Oct 17-Sep 18	0	No records.
		Oct 18-Sep 19	1	A single breeding attempt was recorded
Dunlin	Lewis Peatlands SPA / Ramsar SBL BoCC Amber List	Oct 17-Sep 18	5	Six flights were recorded during VP surveys. An estimated seven territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	2	Eight flights were recorded during VP surveys. An estimated three territories were recorded within the field survey area in 2019.
Golden eagle	Lewis Peatlands SPA / Ramsar W.C.A Schedule 1,1A and A1 SBL BoCC Green List	Oct 17-Sep 18	0	86 flights were recorded during VP surveys. Three active breeding territories were recorded within the field survey area, two of which failed to breed in 2018. The breeding status of the third pair in 2018 is unknown.
		Oct 18-Sep 19	0	95 flights were recorded during VP surveys. Three breeding territories fall within the field survey area, two of which attempted to breed in 2019. One of these successfully fledged a single chick, whilst the second failed at the incubation stage.
Golden plover	Lewis Peatlands SPA / Ramsar SBL BoCC Green List	Oct 17-Sep 18	4	40 flights were recorded during VP surveys. An estimated 10 territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	1	39 flights were recorded during VP surveys. An estimated nine territories were recorded within the field survey area in 2019.
Goosander	BoCC Green List	Oct 17-Sep 18	0	No records.
		Oct 18-Sep 19	0	Three flights were recorded from VP surveys.

Species	Status	Period	Number Territories in the Development Site	Summary
Great black-backed gull	BoCC Amber List	Oct 17-Sep 18	32	An estimated 32 AON (Apparently Occupied Nests) were recorded within the field survey area in 2018.
		Oct 18-Sep 19	73	An estimated 78 AON were recorded within the field survey area in 2019.
Great skua	BoCC Amber List	Oct 17-Sep 18	8	280 flights were recorded during VP surveys. An estimated 9 AOT (Apparently Occupied Territories) were recorded within the field survey area in 2018.
		Oct 18-Sep 19	12	269 flights were recorded during VP surveys. An estimated 13 AOT were recorded within the field survey area in 2019.
Greenland white-fronted goose	Annex 1 Birds Directive SBL BoCC Red List	Oct 17-Sep 18	0	Not recorded.
		Oct 18-Sep 19	0	A single flight consisting of 16 birds was recorded in October 2018.
Greenshank	Lewis Peatlands SPA / Ramsar W.C.A. Schedule 1 BoCC Amber List	Oct 17-Sep 18	0-2	17 flights were recorded during VP surveys. An estimated three to six territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	2-4	Five flights were recorded during VP surveys. An estimated three to six territories were recorded within the field survey area in 2019.
Greylag goose	BoCC Amber List	Oct 17-Sep 18	5	96 flights were recorded during VP surveys. An estimated 10 territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	4	58 flights were recorded during VP surveys. An estimated eight territories were recorded within the field survey area in 2019.
Hen harrier	Annex 1 Birds Directive Schedule 1, 1A BoCC Red List SBL	Oct 17-Sep 18	3	186 flights were recorded during VP surveys. Five active territories were recorded within the field survey area in 2018, three of which successfully fledged young. Focal watch surveys recorded a total of 189 flights whilst monitoring the nest locations. Roost monitoring flights recorded 17 flights in over the winter of 2017-2018.
		Oct 18-Sep 19	5	87 flights were recorded during VP surveys. Seven breeding attempts were recorded within the field survey area in 2019, one of which successfully fledged young. Evidence indicated an additional un-confirmed breeding attempt within the field survey area, with an additional two breeding attempts recorded outside the survey area.

Species	Status	Period	Number Territories in the Development Site	Summary
				Focal watch surveys recorded a total of 81 flights whilst monitoring seven nest locations. Roost monitoring flights recorded 82 flights over the winter of 2018-2019.
Herring gull	SBL BoCC Red List	Oct 17-Sep 18	c. 170	Six colonies, totalling an estimated 210 AON, were recorded within the field survey area in 2018.
		Oct 18-Sep 19	c. 415	Six colonies, totalling an estimated 615 AON, were recorded within the field survey area in 2019.
Lesser black-backed gull	BoCC Amber List	Oct 17-Sep 18	61	An estimated 63 AON were recorded within the field survey area in 2018.
		Oct 18-Sep 19	2	An estimated 2 AON were recorded within the field survey area in 2019.
Mallard	BoCC Amber List	Oct 17-Sep 18	1	A single breeding attempt was recorded within the field survey area.
		Oct 18-Sep 19	2	Four breeding attempts were recorded within the field survey area in 2019.
Merlin	Lewis Peatlands SPA W.C.A. Schedule 1 SBL BoCC Red List	Oct 17-Sep 18	0	29 flights were recorded during VP surveys. A single active territory was recorded within the field survey area in 2018.
		Oct 18-Sep 19	0	21 flights were recorded during VP surveys. Two active territories were recorded within the field survey area in 2019.
Peregrine	Annex 1 Birds Directive W.C.A. Schedule 1 SBL BoCC Green List	Oct 17-Sep 18	0	Two flights were recorded during VP surveys. No territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	0	One flight was recorded during VP surveys. No territories were recorded within the field survey area in 2019.
Pink-footed goose	BoCC Amber List	Oct 17-Sep 18	0	Ten flights were recorded during VP surveys.
		Oct 18-Sep 19	0	Six flights were recorded during VP surveys.
Red-breasted merganser	BoCC Green List	Oct 17-Sep 18	0	No records.
		Oct 18-Sep 19	0	A single flight was recorded in April 2019.
Red grouse	SBL BoCC Amber List	Oct 17-Sep 18	0	No records.

Species	Status	Period	Number Territories in the Development Site	Summary
		Oct 18-Sep 19	2	An estimated ten territories were recorded in 2019.
Redshank	BoCC Amber List	Oct 17-Sep 18	0	No records.
		Oct 18-Sep 19	2	An estimated two territories were recorded in the survey area in 2019.
Red-throated diver	Lewis Peatlands SPA / Ramsar W.C.A. Schedule 1 SBL BoCC Green List	Oct 17-Sep 18	1	125 flights were recorded during VP surveys. Four breeding attempts were recorded within the field survey area in 2018, three of which were within the Lewis Peatlands SPA. An additional breeding attempt, also within the SPA, was located approximately 2.3km from the Development Site. All breeding attempts appeared to be successful. Focal watch surveys recorded a total of 165 flights whilst monitoring the nest locations.
		Oct 18-Sep 19	1	101 flights were recorded during VP surveys. In 2019 there was one breeding attempt on site and a further four attempts within 1km of the site boundary. A sixth pair were recorded outside the 1km site boundary. Two further attempts were recorded outside of the 2km buffer. Records indicate that 3 out of five monitored nests were successful. Focal watch surveys recorded a total of 192 flights whilst monitoring five nest locations.
Short-eared owl	Annex 1 Birds Directive BoCC Amber List	Oct 17-Sep 18	1 possible	Six flights were recorded during VP surveys. No territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	1 possible	Five flights were recorded during VP surveys. No confirmed territories were recorded within the field survey area in 2019.
Snipe	BoCC Amber List	Oct 17-Sep 18	7	An estimated seven territories were recorded within the field survey area in 2018.
		Oct 18-Sep 19	6	An estimated 18 territories were recorded within the field survey area in 2019.
Teal	BoCC Amber List	Oct 17-Sep 18	0	Two flights were recorded during VP surveys.
		Oct 18-Sep 19	4	Two flights were recorded during VP surveys. An estimated eight territories were recorded in 2019.
Whimbrel	W.C.A. Schedule 1 BoCC Red List	Oct 17-Sep 18	0	No records.
		Oct 18-Sep 19	1	A single territory was recorded in 2019.
White-tailed eagle	Annex 1 Birds Directive W.C.A. Schedule 1, 1A and A1, SBL, BoCC Red List	Oct 17-Sep 18	0	44 flights were recorded during VP surveys. A single breeding territory falls within the field survey area, although the breeding attempt failed in 2018.

Species	Status	Period	Number Territories in the Development Site	Summary
		Oct 18-Sep 19	0	36 flights were recorded during VP surveys. A single breeding attempt was recorded within the field survey area, three chicks being recorded.
Whooper swan	Annex 1 Birds Directive W.C.A. Schedule 1 SBL BoCC Amber List	Oct 17-Sep 18	1	10 flights were recorded during VP surveys. A single breeding attempt was recorded in 2018.
		Oct 18-Sep 19	0	Six flights were recorded from VP surveys. No evidence of breeding was recorded in 2019.

AON = apparently occupied nest / AOT = apparently occupied territory

Future Baseline

8.5.9 Refer to **EIA Section 8.5.**

8.6 Consultation

8.6.1 **EIA Table 8.7** provides a summary of consultee comments about the Proposed Development during scoping and the responses given. Following submission of the **EIA** which included one year of bird survey data, additional comments were received, and these are summarised below in **Table 8.3**.

Table 8.3 Summary of Consultee Comments Regarding Biodiversity

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
SNH	This proposal is likely to have a significant effect on the qualifying interests of the Lewis Peatlands SPA. In our view, based on the information provided, the proposal will not adversely affect the integrity of the site. In this we agree with the conclusions provided in Appendix H of the EIA.	The results of an additional second year of survey work have identified that the baseline has remained the same or similar for all Lewis Peatland SPA qualifying species.	**AI Appendix 8A, 8B, 8C, 8E** AL **8F**
	There is insufficient information to determine whether the proposal is likely to have an adversely negative impact on the hen harrier population in the Outer Hebrides. In order for this to be determined, the following additional information should be provided: • An assessment of the impact on hen harrier, based on two years of data from the development site. • This should include a re-calculated collision risk model and population modelling of the long-term effect on the NHZ 3 hen harrier population. We consider that displacement during the operational phase of this development is not a significant issue to hen harriers.	The results of an additional second year of survey work have been combined with the first year's data so that an assessment based on two years of continuous data can be carried out. Collision risk modelling was revised based on the results from year 1 and year 2 survey data. As a precautionary measure, population modelling has been undertaken on the Isle of Lewis hen harrier population rather than the larger NHZ 3 population. Any predicted impacts that the Proposed Development may have on hen harrier will be greater on the smaller Isle of Lewis population.	**AI Appendix 8A, 8B, 8C** **AI Appendix 8E** **AI Appendix 8F**
	We further recommend that the developer prepares a more informed Habitat Management Plan to consider how impacts on hen harrier might be mitigated and/or compensated.	An Outline Habitat Management Plan is presented in **AI Appendix 9I**.	
	We expect all measures in Table 8.25 to be implemented.	These measures are presented again in **Table 8.21** and will be implemented, should consent be granted.	**AI Section 8.33**
RSPB	RSPB objects to this application on the basis that the ornithological survey work and vantage point work presented in the EIA and informing the Habitat Regulations Appraisal is incomplete. The EIA only includes up to date ornithological survey data covering one year rather than two full years of survey which is recommended by SNH and was requested in our Scoping Response.	A second consecutive year of survey data has been undertaken and included in the assessment process.	**AI Appendix 8A, 8B, 8C, 8E** and **8F**

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
	A comparison of ornithological impacts for the consented 36 turbine Stornoway Wind Farm and the current proposal should be presented.	A comparison of impacts on key sensitive breeding and non-breeding birds has been undertaken, including CRM, based on the results from year 1 and year 2 survey data.	**AI Section 8.34** **SEI Appendix 8E**
	Based on the current information in the EIA (from one year of ornithological survey) 10.1 hen harriers are predicted to be killed through collisions over the 25-year life span of the wind farm.	To clarify, the EIA presented results from precautionary CRM that predicted that up to 4 hen harriers could be killed through collisions over the 25-year life span of the wind farm. Based on data from year 1 and year 2, the revised CRM presented in this SEI predicts that the number of hen harriers that could potentially be killed through collisions over the 25-year life span of the wind farm is 3.6.	**A Appendix 8F** **AI Appendix 8E**
	The risk of collision is greatest when hen harriers nest in the proximity of wind turbines, during display, and other flights associated with breeding. The data presented in the EIA are consistent with this, with the greatest proportion of flight activity occurring at rotor swept height in April during peak display and again in June during chick rearing. Such complex, risky flights are not properly accounted for in the CRM because of its assumption of a horizontal flight at fixed speed. Because of the high level of uncertainty inherent in the assessment of collision risk for harriers, it is crucial that both an adequate survey effort and a suitable degree of precaution are included in the EIA.	The flight speed used for the hen harrier collision risk model has been selected in accordance with SNH guidance (2014), it being taken from one of the two key sources (Alerstam, 2007) that SNH recommend.	**AI Appendix 8F**
	As part of the full EIA that will be submitted after two years of survey, we request that a population viability model is run at the scale of the Lewis hen harrier population to assess the impacts from the wind farm on this population.	A population viability model that included the Counterfactual of Population Size metric was run at the scale of the Isle of Lewis hen harrier population.	**AI Appendix 8F**
	The cumulative collision risk estimate for white-tailed eagle is out of date as the survey work for most of the consented wind farm assessments on the Western Isles was undertaken several years ago (more than 10 years ago in some cases) when there were far fewer white-tailed eagles on the Western Isles and therefore flight activity rates would have been much lower than they are now. The assessment should include a PVA to determine the potential impacts on white-tailed eagle. Outputs of this PVA need to include the Counterfactual of Population Size metric so that we can understand the potential scale of effect on this population from Western Isles wind farm proposals.	In recognition of the age of some secondary data sets, a sensitivity analysis was carried out whereby a range of unlikely worst case scenario theoretical cumulative collision risk models were applied to the PVA to illustrate impacts on the Western Isles population.	**AI Section 8.30**

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
	Turbines 24 and 17 are within ca. 300m of red-throated diver breeding lochs, and this is within the advised 750m disturbance free distance for red-throated diver. Turbines and infrastructure placed within this distance of breeding lochs could result in permanent displacement or loss of these territories in addition to disturbance associated with construction and maintenance. It is recommended that these turbines are re-located to 750m from red-throated diver breeding sites.	Disturbance minimisation measures will be addressed within the Construction Environment Management Plan (CEMP) and Bird Protection Plan with specific reference to breeding divers.	**EIA Table 8.10, AI Section 8.23**
	Whilst hen harriers can breed close to operational wind turbines, there is evidence that foraging harriers can be displaced from an area of a few hundred meters around turbine bases as some studies show reduced foraging activity in this zone (Pearce-Higgens et al., 2009). The Habitat Management Plan proposes managing an area to compensate for direct loss of conifer plantation habitat to road infrastructure and turbine bases. This plan needs to be more ambitious to manage or create habitat to compensate for areas around turbines that foraging harriers are likely to be displaced from as well as areas of direct habitat loss.	See OHMP (**AI Appendix 9I**)	**AI Chapter 9, AI Appendix 9I**
	Habitats Regulations Appraisal for golden eagle: Cumulative collision risk and population viability analysis modelling for golden eagle at the scale of the Western Isles should be considered as part of the 'In Combination Assessment of the HRA'. The Western Isles golden eagle population has been found to be genetically isolated from the mainland population. This means that if the cumulative collisions from all wind farm developments on the Western Isles lead to a decline in the golden eagle population, this would also put the North Harris and Lewis Peatlands SPA populations at risk.	A population viability model that included the Counterfactual of Population Size metric was run at the scale of the Western Isles golden eagle population, taking into account cumulative collision risk.	**AI Appendix 8F**
	We recommend that the habitat management plan needs to be much more ambitious than that currently proposed to further mitigate impacts on hen harrier in particular. RSPB Scotland is keen to be involved in the development of the Habitat Management Plan as two of the three objectives in the plan relate to hen harrier. In order to go some way to mitigating the impacts of the development on hen harrier, the plan needs to be more ambitious, creating or managing compensatory habitat over a larger area and ensuring that the habitat on the site remains suitable for breeding and foraging hen harrier.	Following such consultation with RSPB, an updated Habitat Management Plan is presented in **AI Appendix 9I**.	**AI Chapter 9, AI Appendix 9I**

8.7 Scope of the Assessment

8.7.1 Refer to **EIA Section 8.7** for a full description of the approach taken for determining the spatial and temporal scope of the assessment.

8.7.2 An explanation of all determinations of importance of scoped in ornithological features recorded from both October 2017 – September 2018 and October 2018 – September 2019 is provided in **Table 8.4**. **AI Appendix 8E** (Tables 8D.1 and 8D.2). This provides a summary of assessed importance for all ornithological features recorded from October 2017 – September 2019, i.e. those scoped in and out, to ensure transparency.

Table 8.4 Likely Effects, ZoIs and Justification for Scoped in Ornithological Features

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
Lewis Peatlands SPA / Ramsar: black-throated diver	International	International	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds potentially associated with the SPA qualifying population fall within disturbance distance of proposed works.
			Operational displacement leading to barrier effects.	Within 750m of the Proposed Development footprint (based on guidance in SNH 2017).	Breeding black-throated diver normally forage within large fresh-water lochs, and do not make regular commuting flights to and from the sea. However, flight activity recorded during surveys indicates that the possibility that the Proposed Development may cause a barrier effect between breeding locations and feeding lochs requires consideration.
Lewis Peatlands SPA: golden eagle	International	International	Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity indicates that there is potential for effects to eagles from the SPA population.
Lewis Peatlands SPA / Ramsar: greenshank	International	International	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement.	Within 500m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds potentially associated with the SPA qualifying population fall within disturbance distance of proposed works.

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
Lewis Peatlands SPA / Ramsar: red-throated diver	International	International	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in temporary disturbance or displacement.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds potentially associated with the SPA qualifying population fall within disturbance distance of proposed works.
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 750m of Proposed Development footprint.	Although effects during the operational phase will be less than that experienced during the construction phase, red-throated diver may still be disturbed during this phase.
			Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Breeding red-throated diver normally forage at sea, making regular commuting flights to and from breeding lochs inland. Flight activity recorded during surveys indicates that the possibility that the Proposed Development may cause a barrier effect between breeding locations and the sea requires consideration.
Black-throated diver: breeding	International	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works.
			Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Breeding black-throated diver normally forage within large fresh-water lochs, and do not make regular commuting flights to and from the sea. However, flight activity recorded during surveys indicates that the possibility that the Proposed Development may cause a barrier effect between breeding locations and feeding lochs requires consideration.

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
Common tern: breeding	International	Regional	Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity recorded during surveys indicates that the possibility that the Proposed Development may potentially cause a barrier effect to breeding common tern requires consideration.
			Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity indicates that there is potential for significant effects to occur on the regional population.
Golden eagle: breeding	International	Regional	Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	When combined with the non-breeding CRM calculations and flight activity there is potential for effects to occur on the Western Isles population.
Golden eagle: non-breeding	International	Regional	Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	When combined with the breeding CRM calculations and flight activity there is potential for effects to occur on the Western Isles population.
Greenshank	International	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement of breeding birds.	Within 500m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works.
Hen harrier: breeding	International	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement of breeding birds.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works.

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 750m of Proposed Development footprint.	Although effects during the operational phase will be less than that experienced during the construction phase, hen harrier may still be disturbed during this phase.
			Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary.	Flight activity recorded during surveys indicates that there is a possibility that the Proposed Development may potentially cause a barrier effect .
			Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity indicates that there is potential for effects to occur on the Isle of Lewis population.
Hen harrier: non-breeding	International	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of non-breeding birds fall within disturbance distance of proposed works.
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 500m of Proposed Development footprint.	Although effects during the operational phase will be less than that experienced during the construction phase hen harrier may still be disturbed during this operational phase.
			Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary.	Flight activity recorded during surveys indicate that the possibility that the Proposed Development may cause a barrier effect requires consideration.
			Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	When combined with the breeding CRM calculations and flight activity there is potential for effects to occur on the Isle of Lewis population.

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
Red-throated diver: breeding	International	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement of breeding birds.	Within 750m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works.
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 750m of Proposed Development footprint.	Although disturbance effects during the operational phase will be less than that experienced during the construction phase Red-throated diver may still be disturbed during this operational phase.
			Operational displacement leading to barrier effects.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Breeding red-throated diver normally forage at sea, making regular commuting flights to and from breeding lochs inland. Flight activity recorded during surveys indicates that the possibility that the Proposed Development may potentially cause a barrier effect to breeding red-throated diver requires consideration.
Whimbrel	National	Regional	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement of breeding birds.	Within 500m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works, and there may be potentially effects on the NHZ population.
White-tailed eagle: breeding	International	Regional	Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity indicates that there is potential for effects to the Natural Heritage Zone (NHZ population.

Ornithological Feature	Importance – Legislation and Policy	Importance – Development Site	Environmental Changes and Potential Significant Effects	Zone of Influence	Relevant Assessment Criteria and Scoped in Justification
White-tailed eagle: non-breeding	International	Regional	Potential collision with operational turbines.	Within 500m of the Proposed Development boundary (based on guidance in SNH 2017).	Flight activity indicates that there is potential for effects to the NHZ population.
Whooper swan: breeding	International	National	Construction activity including use of plant and the presence of workforce resulting in an increase in aural and visual stimuli due to noise and vibration, and movement of construction vehicles resulting in disturbance or displacement of breeding birds.	Within 500m of Proposed Development footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Locations of breeding birds fall within disturbance distance of proposed works.
			Potential disturbance and displacement to birds due to the operation of turbines and associated human activities for maintenance purposes.	Within 500m of Proposed Development footprint.	Although effects during the operational phase will be less than that experienced during the construction phase, disturbance may still occur.

8.8 Environmental Measures Embedded into the Development Proposals

8.8.1 A range of environmental measures have been embedded into the Proposed Development as outlined in **AI Chapter 3** and **EIA Table 8.10**.

8.9 Assessment Methodology

8.9.1 The assessment methodology is presented in **EIA Section 8.9.**

8.10 Assessment of Effects: Lewis Peatlands Special Protection Area – Black-throated Diver

Baseline Conditions

Desk Study

8.10.1 Black-throated diver is a qualifying feature of the Lewis Peatlands SPA and Ramsar sites, is listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended) and the Scottish Biodiversity List. This species is amber listed on Birds of Conservation Concern 4 (Eaton *et al. 2015*) due to being a rare breeding bird.

8.10.2 The black-throated diver population in Scotland is estimated at 176 (range 123 to 245) breeding pairs (Wilson *et al. 2015*). The UK breeding population is entirely confined to western and northern Scotland, with the main concentrations in Sutherland, Wester Ross and the Outer Hebrides (Gibbons *et al. 1993*). The breeding population increased c. 16% between 1994 and 2006 (Eaton *et al. 2007*), and on the Western Isles the rise in population between 1994 and 2006 was c. 52% which is a greater rise than in other areas of the UK. This population rise may still be occurring as the number of apparently suitable waterbodies (albeit with unknown prey levels) is large.

8.10.3 The Lewis Peatlands SPA citation notes that it supports 12 pairs, c. 7% of the Scottish breeding population, and the population was considered as favourable maintained in the most recent site condition assessment (2004).

8.10.4 During surveys carried out in 2009 to inform the 2012 Stornoway Wind Farm application, two black-throated diver nests were located within the survey area, one of which was within the SPA. No nests were located during breeding surveys in 2016, with just a single record of an adult within the survey area obtained.

8.10.5 Flight activity of black-throated diver in 2009 recorded during VP watches and focal watches overlooking active breeding sites showed that the greatest level of flight activity was focussed on the central and southern areas of the Development Site, with further areas of high activity to the north east. These areas have a high density of lochs and lochans, with birds showing signs of prospecting for nesting locations, socialising and undertaking foraging trips. No flights were recorded during surveys in 2016.

Field Surveys

8.10.6 Field surveys were carried out from April – September 2018 (see **EIA Appendix 8D**) and April – September 2019 (**AI Appendix 8C**), and results are summarised below.

Breeding Diver Surveys

8.10.7 **Table 8.5** summarises the results of the breeding diver surveys undertaken in 2018 and 2019 (**EIA Appendix 8D** and **AI Appendix 8C**). A total of six territories were recorded over the two years, fledging at least three chicks. One territory, BV1 was located within the ZoI. Two territories were adjacent to the Lewis Peatlands SPA boundary, with both being more than 1km from the nearest proposed track or turbine.

Table 8.5 Black-throated Diver: Breeding Records

Territory*	Distance to Lewis Peatlands SPA (m)	Distance to Proposed Track (m)	Distance to Nearest Proposed Turbine (m)	Season	Outcome
BV1	2,539	112	527	2018	Failed
				2019	Failed
BV2	Adjacent	1.017	1,004	2018	Failed
BV3	2,555	2,462	2,733	2018	Fledged two chicks
				2019	Outcome unknown
BV4	Adjacent	1,831	1,831	2019	Fledged one chick
BV5	3,819	2,722	3,573	2019	Outcome unknown
BV6	2,973	1,426	2,150	2019	Failed

* SEI Appendix 8C provides locations for these territory codes

Flight Activity Surveys

8.10.8 Black-throated diver flight activity from VP and focal watch surveys shows that the majority of flights occurred around and between breeding and non-breeding lochs that were being used as feeding lochs in the southern areas of the Development Site. **Table 8.6** presents a summary of all flight activity recorded during VP and focal watch surveys between April – September 2018 and 2019, including the amount of time at and above/below potential collision height (PCH)[4].

Table 8.6 Black-throated Diver: VP and Focal Watch Flight Activity Data April-September

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2018	24	915	1,560	495
	2019	26	1,035	2,490	30
Focal watch	2018	15	495	315	0
	2019	36	1,020	2,625	120

[4] PCH was taken as a precautionary 20-200m, covering height bands B and C.

Future Baseline

8.10.9 In the absence of development, the black-throated diver population is likely to be maintained at similar levels within the area. Reduced predation pressure due to the eradication of American mink (in 2018) may potentially lead to an increase in productivity, with any subsequent increase in the breeding population numbers being supported by the abundance of alternative large fresh-water bodies in the area.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.10.10 A single breeding location and lochs used by breeding birds from an two other known breeding attempts for loafing or feeding fall within the ZoI (**EIA Appendix D** and **AI Appendix C**), and so in theory three pairs could potentially be affected by construction activities. However, construction and decommissioning related disturbance/displacement effects to black-throated diver that may be connected to the SPA would be minimised via the embedded measures outlined in **EIA Table 8.10** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans) with disturbance to nesting birds being unlikely.

8.10.11 Due to the extent of available habitat within the SPA (58,959 hectares) that would remain undisturbed during construction and decommissioning, availability of foraging and breeding habitat is not considered to be a limiting factor. Given the temporary nature of the construction/decommissioning works the magnitude of change to the Lewis Peatlands SPA black-throated diver population is considered to be very low, the effects would be not significant, and there would be no adverse significant effect on the Lewis Peatlands SPA site integrity.

Operation: Barrier to Flights Leading to Displacement

8.10.12 In terms of operational displacement associated with the Proposed Development acting as a barrier to flights, the low levels and distribution of flight activity shown in **EIA Table 8.6** and **EIA Appendix 8D** and **AI Appendix 8C**, indicates that there is little potential for barrier effects to occur in relation to flight activity from SPA birds. Even if the Proposed Development does act as a barrier and birds fly around or over it, the additional energy expenditure required to do so for the relatively few flights recorded would not be expected to have a discernible effect given the relatively small additional flight distances involved. On this basis, the Proposed Development would result in a low magnitude of change. The effects would be not significant and there is no adverse significant effect on the Lewis Peatlands SPA site's integrity.

8.10.13 With the exception of barrier related effects during operation leading to displacement, no other effects, whether construction/decommissioning or operation related, were scoped in for assessment as no breeding attempts associated with the SPA population were found within the 750m ZoI (**AI Appendix 8D**).

8.10.14 No other construction or operational effects were scoped in for further assessment (**AI Appendix 8D**).

8.11 Assessment of Effects: Lewis Peatlands Special Protection Area – Golden Eagle

Baseline Conditions

Desk Study

8.11.1 Golden eagle is a qualifying feature of the Lewis Peatlands SPA, is listed on Annex I of the Birds Directive, Schedule 1, 1A and A1 of the Wildlife & Countryside Act 1981 (as amended), and the Scottish Biodiversity List. This species was amber listed (a species of European Conservation Concern) on Birds of Conservation Concern 3 (Eaton *et al, 2009*), but has since moved onto the green list (regularly occurring species) in the recently published Birds of Conservation Concern 4 (Eaton *et al. 2015*).

8.11.2 Within Scotland, there are an estimated 508 occupied home ranges, based on a national survey carried out in 2015 (Challis *et al, 2016*). The Lewis Peatlands SPA citation is for 5 pairs, c. 1% of the Scottish breeding population (Wilson *et al, 2015;* Challis *et al 2016*), and the population was considered as favourable maintained in the most recent site condition assessment (2015).

8.11.3 There are two pairs within the SPA that hold breeding territories within 6km of the Development Site. These are known as Pair EA1 and Pair EA2 (see **AI Appendix 8C** for further information). Pair EA1 is known to have made breeding attempts in three distinct locations; two of these locations have been used historically, whilst the third was the site of a new nest built in 2015, approximately 1.2km from the nearest turbine. A single chick was fledged successfully from this new nest location in 2016, whilst in 2017 the pair reverted to one of the original areas. There was no evidence of breeding from this pair in 2018, whilst in 2019, a single chick was reared at one of the historic locations, approximately 1.7km from the nearest turbine. This chick had a satellite tag fitted as part of a wider study across Lewis and Harris looking at juvenile dispersal (Lewis and Harris Raptor Study Group LHRSG).

8.11.4 Pair EA2 is known to have made nesting attempts in two locations, although they are thought to have failed to produce fledged young for a considerable period (over 20 years). This pair has shown signs of breeding regularly, building up existing nest locations with fresh material although reaching the egg laying phase has been unsuccessful for over 20 years. One of these nesting locations is historic and has not been built up in many years (over 10 years); nothing now remains of the nest previously constructed at this location. The nearest nest location is approximately 3.9km from the closest proposed turbine and access track.

8.11.5 During the 2009-2010 flight activity surveys for the 2012 Stornoway Wind Farm application, golden eagle were recorded throughout the Development Site but with a concentration in the north-west part of the survey area (the Development Site and 500m beyond). Of the 187 flights, at least 59 were of sub-adult, 42 by adult birds with the remainder not being aged due to visibility issues (e.g. identified in silhouette). The total number of individuals using the Development Site was unknown, but from plumage characteristics and observing more than one bird simultaneously it was thought that at least six individuals were recorded (comprising two adults, three sub-adults and one juvenile).

8.11.6 Surveys undertaken in 2015-2016 indicated that the levels of activity were considerably less than that recorded from the same location in 2009 – 2010, with the main areas of activity being north of the Pentland Road Wind Farm, with the majority of the 13 recorded flights noted approximately 2km from the Development Site.

Field Surveys

8.11.7 Field surveys were carried out from October 2017 – September 2019, and are summarised below whilst full details are provided in **EIA Appendix 8B, 8C,** and **8D** and **AI Appendix 8A, 8B** and **8C.**

Breeding Raptor Surveys

8.11.8 See **paragraphs 8.11.3-8.11.4** for a summary.

Flight Activity Surveys

8.11.9 Golden eagle flight activity from VP surveys shows that there were two main areas of activity. One of these fell outside of the survey area, whilst the second fell to the east and south of Pentland Road Wind Farm within the survey area. There were also occasional flights across the Development Site itself. **Table 8.7** presents a summary of all flight activity recorded during VP and focal watch surveys between October 2017 – September 2019.

Table 8.7 Golden Eagle: VP Flight Activity Data

Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
October 2017 – March 2018	29	204	4,174	45
April 2018 – September 2018	57	1,410	6,270	1,435
October 2018 – March 2019	57	1,745	13,585	135
April 2019 – September 2019	38	690	7,965	1,680

Future Baseline

8.11.10 In the absence of development, golden eagle are likely to continue to maintain their present population levels within the area. Given the age of Pair EA2, it is possible that the natural death of either mate may lead to a new pair bond being established within this territory, potentially leading to an increase in productivity for this territory.

Predicted Effects and their Significance

Potential Collision with Operational Turbines

8.11.11 No other construction or operational effects were scoped in for further assessment as explained in **AI Appendix 8D**.

8.11.12 CRM predicted a mean theoretical risk of 0.235 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.073), resulted in a combined theoretical collision risk of 0.308 fatalities per year (**AI Appendix 8E**). This worst case scenario is equivalent to 3.08% of the SPA population. However, population modelling of the Western Isles population predicts that the Western Isles population could be c.129 pairs after 25 years, whilst with potential cumulative mortality from all wind farm developments in the Western Isles, it is predicted to reach c. 104 pairs (**AI Appendix 8F**), representing an increase of nine pairs from the 2015 population estimate.

8.11.13 The Western Isles golden eagle population has been found to be genetically isolated from the mainland population and as the cumulative collisions from all wind farm developments on the

Western Isles will not lead to a decline in the Western Isles golden eagle population (see Section 8.30), this also indicates that the North Harris and Lewis Peatlands SPA populations would not be at risk.

8.11.14 Furthermore, evidence suggests that golden eagle actively avoid wind turbines (Walker et al, 2005) and so it is probable that actual collision risks will be lower than predicted here. Hotker et al (2006) found only 1 reported casualty of a golden eagle due to a collision with a wind turbine in Spain.

8.11.15 On this basis, the Proposed Development would result in a low magnitude of change. Effects would therefore be not significant and there would be no adverse significant effect on the Lewis Peatlands SPA site's integrity.

8.12 Assessment of Effects: Lewis Peatlands Special Protection Area – Greenshank

Baseline Conditions

Desk Study

8.12.1 Greenshank is a qualifying feature of the Lewis Peatlands SPA and Ramsar sites and is listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended). This species was green listed on Birds of Conservation Concern 3 (*Eaton et al 2009*) but has been moved onto the amber list in the recently published Birds of Conservation Concern 4 (*Eaton et al. 2015*) due to its localised breeding population.

8.12.2 The Scottish population of greenshank is estimated to be 1,297 breeding pairs, and the Lewis Peatlands SPA supports c. 140 pairs, c 11% of the Scottish breeding population (*Wilson et al 2015*). The SPA population was considered as favourable maintained in the most recent site condition assessment (2015).

8.12.3 Five greenshank territories were noted within the survey area in 2009, three of which were associated with the Lewis Peatlands SPA. The other two territories were located in the south-east corner of the survey area. All territory centres recorded were greater than 200m from a turbine location. Of the 42 greenshank flights noted the majority were outside of the turbine envelope; no flights at collision risk height were noted within 250m of any of the proposed turbine locations.

8.12.4 A single pair of greenshank were recorded in 2016 within the north western corner of the site (see **EIA Appendix 8A,** Section 2.2).

Field Surveys

8.12.5 Field surveys were carried out from April to July in 2018 and 2019, and full details are provided in **EIA Appendix 8C and 8D** and **AI Appendix 8B** and **8C**.

Breeding Wader Surveys

8.12.6 Based on the method of Hancock (1997) for deriving population estimates from survey data, an estimated maximum of six pairs were present within the moorland bird survey (MBS) area (**EIA Appendix 8D** and **AI Appendix 8C**) during the 2018 and 2019 breeding seasons (March – July 2018 as specified by SNH (2017)). Most activity was distributed within the 500m buffer outside of the Development Site boundary, overlapping the SPA boundary.

Flight Activity Surveys 2018

8.12.7 Greenshank were recorded intermittently across the survey area during breeding season VP surveys, though flights did not follow any real pattern in distribution (**EIA Appendix 8C** and **AI Appendix 8D**).

8.12.8 **Table 8.8** presents a summary of all flight activity recorded during VP and focal watch surveys between April – September 2018 and 2019.

Table 8.8 Greenshank: VP Flight Activity Data

Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
2018	16	345	555	-
2019	5	120	150	-

Future Baseline

8.12.9 In the absence of development, greenshank are likely to continue to maintain their present population levels within the area. However, reduced predation pressure due to the eradication of American mink may lead to an increase in productivity, with any subsequent increase in the breeding population numbers being supported by the abundance of suitable breeding habitat within the SPA.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.12.10 Four (2018) and six pairs (2019) were recorded within the ZoI, equivalent to up to 4.2% of the SPA population.

8.12.11 Construction and decommissioning related disturbance/displacement effects to greenshank that may be connected to the SPA would be minimised via the embedded measures outlined in **EIA Table 8.10** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans) **.** with disturbance to nesting birds being unlikely.

8.12.12 Due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, availability of foraging and breeding habitat is not considered to be a limiting factor. Given the temporary nature of the construction/decommissioning works and that the magnitude of change to the Lewis Peatlands SPA greenshank population is considered to be very low, the effects would be not significant, and there would be no adverse significant effect on the Lewis Peatlands SPA site integrity.

8.12.13 No other construction or operational effects were scoped in for further assessment (**AI Appendix 8D**).

8.13 Assessment of Effects: Lewis Peatlands Special Protection Area – Red-throated Diver

Baseline Conditions

Desk Study

8.13.1 Red-throated diver is a qualifying feature of the Lewis Peatlands SPA and Ramsar sites, is listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended) and the Scottish Biodiversity List. This species was amber listed on Birds of Conservation Concern 3 (Eaton *et al 2009*), but has been moved onto the green list in the most recently published Birds of Conservation Concern 4 (Eaton *et al. 2015*).

8.13.2 Scotland supports approximately 1,268 breeding pairs of red-throated diver and the Lewis Peatlands SPA citation is for 80 pairs, c 6.3% of the Scottish breeding population (Wilson *et al 2015*). The population was considered as unfavourable declining in the most recent site condition assessment (2004).

8.13.3 Red-throated diver breed widely across the Isle of Lewis, with a number of known nest locations/breeding areas (recorded at various scales) being located within and around the Development Site. The species is known to change between favoured breeding locations between years. There are seven known historical breeding locations (based on kilometre squares) that are either within the study area or are due west of it (within the SPA). In years for which data are available no more than three of these sites were occupied simultaneously.

8.13.4 Breeding surveys for the Stornoway Wind Farm in 2009 recorded divers or diver signs (nest scrapes) at seven locations, one of which was located within the Development Site boundary with a further five located within the SPA to the north and west. Breeding was confirmed at three of these five locations (all within the SPA, two locations to the north of the site and one to the south west). None of these sites supported a successful breeding attempt.

8.13.5 In 2016, divers or diver signs were recorded at four locations, all within the SPA, with a juvenile recorded at one site. Activity was recorded at two of the same locations in 2009 and 2016. One 2016 location was located within the boundary, whilst the remaining three were all within 500m.

8.13.6 Red-throated diver flight activity recorded in 2009 during VP watches and focal watches overlooking active breeding sites showed that the greatest level of flight activity was focussed on the central and southern areas of the study area, with further areas of high activity to the north east. These areas have a high density of lochs and lochans, with birds showing signs of prospecting for nesting locations, socialising and undertaking foraging trips to the coast. During surveys in 2016, flight activity was focussed on the single confirmed breeding location.

Field Surveys

8.13.7 Results from field surveys, carried out from April – September 2018 (see) and April – September 2019 are summarised below (see **EIA Appendix 8D and** (**AI Appendix 8C** for more detail).

Breeding Diver Surveys

8.13.8 **Table 8.9** summarises the results of the breeding diver surveys (**EIA Appendix 8D** and **AI Appendix 8C**). A total of nine territories were recorded across the two years survey. Two territories (territories RH3 and RH6) fell within the ZoI of the Proposed Development. RH3 also lies within the SPA boundary whilst RH6 falls within the Proposed Development.

Table 8.9 Red-throated Diver: Breeding records

Territory*	Distance to Lewis Peatlands SPA (m)	Distance to Nearest Proposed Track (m)	Distance to Nearest Proposed Turbine (m)	Season	Outcome
RH1	Within SPA	935	942	2018	Fledged 1 chick
RH2	Within SPA	980	988	2019	Fledged 1 chick
RH3	Within SPA	270	277	2018	Fledged 2 chicks
				2019	Fledged 1 chick
RH4	Within SPA	1,370	1,378	2019	Late breeding attempt failed
RH5	Within SPA	815	821	2018	Fledged 1 chick
				2019	Fledged 2 chicks
RH6	1,565	231	222	2018	Fledged 2 chicks
				2019	Failed - predated
RH7	Within SPA	3,307	3,307	2018	Fledged 1 chick
				2019	Fledged 1 chick
RH8	2,434	1,787	1,961	2019	Failed
RH9	5,447	2,438	4,032	2018	Outcome unknown

* SEI Appendix 8C provides locations for these territory codes

Flight Activity Surveys

8.13.9 Red-throated diver flight activity recorded from VP and focal watch surveys shows that the majority of flights occurred around and between breeding and non-breeding lochs as well as movements of birds off-site towards coastal feeding areas (**EIA Appendix 8D, AI Appendix 8C**).

8.13.10 **Table 8.10** presents a summary of all flight activity recorded during VP and focal watch surveys between April – September 2018 and 2019.

Table 8.10 Red-throated Diver: VP and Focal Watch Flight Activity Data

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2018	123	2,145	14,310	15
	2019	101	2,145	19,725	735
Focal watch	2018	168	3,665	10,437	3,945
	2019	192	3,620	17,865	330

Future Baseline

8.13.11 In the absence of development, red-throated diver are likely to continue to maintain their present population levels within the area. However, reduced predation pressure due to the eradication of American mink may lead to an increase in productivity, with any subsequent increase in the breeding population numbers being supported by the abundance of alternative suitable water bodies in the area.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.13.12 One pair of SPA red-throated diver falls within the ZoI, being equivalent to 1.2% of the SPA population. Construction and decommissioning related disturbance/displacement effects on red-throated diver within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10** impact magnitude would be very low.

8.13.13 Due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, the availability of foraging and breeding habitat is not considered to be a limiting factor. Given the temporary nature of the construction works, the magnitude of change to the Lewis Peatlands SPA red-throated diver population is considered to be very low. On this basis, effects would be not significant and there would be no adverse significant effect on the Lewis Peatlands SPA site's integrity.

Operation: Barrier to Flights Leading to Displacement

8.13.14 The Proposed Development has the potential to act as a barrier to red-throated divers undertaking foraging flights between breeding lochs within the SPA and coastal feeding areas. Flight activity surveys highlighted that birds from the two breeding locations within the SPA to the west of the Development Site were taking a direct route to coastal feeding areas and crossed the proposed turbine envelope (see **AI Appendix 8C**).

8.13.15 The wind turbines blade tips within the Development Site are more widely spaced than in wind farms incorporating smaller turbines, and there are two corridors (one situated north of the Beinn Grideag Wind Farm, running east to Loch a Leadharain, and a second to the south heading south east towards Loch Briodag) that birds could utilise to fly through the Proposed Development. Designing wind farm layouts to provide such diver flight corridors is a recognised approach (SNH, 2018a) that has been designed into a number of existing consented on-shore wind farms (Strathy North, Caithness; Strathy South, Caithness)

8.13.16 Evidence from offshore and onshore wind farms show that divers strongly avoid complex turbine arrays (Furness, 2015; Halley and Hopshaug, 2007)), and if this same behaviour is assumed to apply here, birds will adjust their flight paths and/or flight height accordingly, potentially adding to the energy expenditure required. Calculations of energy expenditure indicate that the increased energy cost of avoiding a wind farm during flight is typically negligible: for example, increased energy costs of 0.2 – 0.7% have been calculated for migrating eider ducks passing offshore wind farms in Denmark (Petersen *et al.* 2006) and Sweden (Pettersson 2005). Low costs have been calculated for other migrating seabirds as well (Desholm & Kahlert 2005, Christensen *et al.* 2006, Masden *et al.* 2012), including red-throated divers.

8.13.17 Red-throated divers fly from their inland breeding lochs to foraging grounds at sea an average of 11 times per day to feed a single chick during the pre-fledging period (Reimchen and Douglas 1984), and so wind farms located between breeding and foraging sites may potentially increase the

energy cost of reproduction for breeding red-throated divers (Masden et al. 2010, Schuster et al. 2015).

8.13.18 However, a range of evidence shows that barrier effects do not have a significant negative effect. Divers may often have circuitous commuting routes in order to reach feeding sites, without any reduction in productivity. Commuting distances up to 13km from breeding loch to the sea were recorded during surveys in 2009 (Stornoway Wind Farm ES 2012). The one nest located within the proposed development (RH6) is located 6km from the coast. Gomersal (1987) found no significant effects on distance between the nest and the sea on breeding success in Shetland. Given the distribution of confirmed breeding lochs and the flights paths present at Stornoway, the additional flight length required to fly around the Proposed Development is limited.

8.13.19 Should barrier effects stop red-throated divers utilising the flight corridors that have been incorporated into the design of the Proposed Development, any additional energy expenditure required to fly around the Proposed Development is not considered significant, and the magnitude of change in respect of potential barrier effects on the SPA population of red-throated diver would be no more than low. On this basis, effects would be not significant and there would be no adverse significant effect on the Lewis Peatlands SPA site's integrity.

Potential Collision with Operational Turbines

8.13.20 CRM based on flights recorded during Focal Watch surveys predicted a mean theoretical 0.46 collisions per breeding season (**AI Appendix 8F**), equivalent to 0.287% of the SPA population. However, population modelling of the Lewis Peatlands SPA population predicts that the SPA population would be 93 pairs after 25 years, whilst with additional mortality from the Proposed Development, it is predicted to reach 87 pairs (**AI Appendix 8F**), representing an increase of seven pairs.

8.13.21 On this basis, the Proposed Development would result in a low magnitude of change. The effects would be not significant and there would be no adverse significant effect on the Lewis Peatlands Ramsar site's integrity.

8.14 Assessment of Effects: Lewis Peatlands Ramsar – Black-throated Diver

8.14.1 The assessment for the Ramsar black-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same.

8.14.2 The effects would be not significant, there is no adverse significant effect on the Lewis Peatlands Ramsar site's integrity.

8.15 Assessment of Effects: Lewis Peatlands Ramsar – Greenshank

8.15.1 The assessment for the Ramsar greenshank population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same.

8.15.2 The effects would be not significant, there is no adverse significant effect on the Lewis Peatlands Ramsar site's integrity.

8.16 Assessment of Effects: Lewis Peatlands Ramsar – Red-throated Diver

8.16.1 The assessment for the Ramsar red-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same.

8.16.2 The effects would be not significant, there is no adverse significant effect on the Lewis Peatlands Ramsar site's integrity.

8.17 Black-throated Diver: Breeding

Baseline Conditions

Desk Study

8.17.1 NHZ 3 supports approximately 35 pairs (range 19-55) of black-throated diver (Wilson *et al. 2015*), approximately 20% of the national population.

8.17.2 Please refer to **Section 8.10** for further information on status and data from the desk study.

Field Surveys

8.17.3 Please refer to **Section 8.10** for further information on status and data from the field surveys.

Future Baseline

8.17.4 Please refer to **Section 8.10** for further information.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.17.5 One breeding pair of black-throated diver falls within the ZoI (112m from the nearest track, 119m from the nearest construction compound, 170m from the nearest borrow pit and 527m from the nearest turbine). This is equivalent to 2.9% of the NHZ population.

8.17.6 Construction and decommissioning related disturbance/displacement effects for black-throated diver within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), impact magnitude would be very low.

8.17.7 Due to the extent of available habitat within NHZ 3 that would remain undisturbed during construction and decommissioning, availability of foraging and breeding habitat is not considered to be a limiting factor.

8.17.8 Given the temporary nature of the construction works, the magnitude of change to the NHZ 3 black-throated diver population is considered to be very low, and the resultant effect on the species' conservation status is not significant.

Operation: Barrier to Flights Leading to Displacement and Collision Risk

8.17.9 In terms of operational displacement associated with the Proposed Development acting as a barrier to flights, the low levels and distribution of flight activity shown in **Table 8.6** and **EIA Appendix 8D** and **SEI Appendix 8C**, indicates that there is little potential for barrier effects to occur in relation to flight activity from NHZ birds. Even if the Proposed Development does act as a barrier and birds fly around or over it, the additional energy expenditure required to do so for the relatively few flights recorded would not be expected to have a discernible effect given the relatively small additional flight distances involved. On this basis, the Proposed Development would result in a low magnitude of change. Therefore the effects would be not significant and there would be no adverse significant effect on the favourable conservation status of black-throated diver.

8.18 Common Tern: Breeding

Baseline Conditions

Desk Study

8.18.1 Common tern is listed on Annex 1 of the Birds Directive, the Scottish Biodiversity List and is an Amber listed BoCC due to at least 50% of the UK breeding population being located within 10 or fewer sites (Eaton *et al 2015*).

8.18.2 There is no figure available for the NHZ population but an estimated 502 pairs were considered to be breeding on the Western Isles in 2000, representing approximately 10% of the Scottish population of 4,784 pairs (Mitchell *et al, 2004*).

Field Surveys

Breeding Bird Surveys 2018

8.18.3 A breeding colony of approximately 50 pairs was recorded on an island located on Loch a Chlachain within the Development Site in both 2018 and 2019 (**EIA Appendix 8C** and **AI Appendix 8B**).

Flight Activity Surveys 2018

8.18.4 Common tern flight activity was focussed along a regular flight corridor that followed the River Creed from the breeding colony at Loch a Chlachain down to coastal foraging areas (**EIA Appendix 8C** and **AI Appendix 8B**) (**Table 8.11**).

Table 8.11 Common Tern: VP Flight Activity Data

Season	Total Number Flights	Total Number Birds	Total Number Birds at PCH
2018	60	145	66
2019	75	265	127

Future Baseline

8.18.5 In the absence of development, common tern are likely to continue to maintain their present population levels within the area. However, reduced predation pressure due to the eradication of

American mink may lead to an increase in productivity with any subsequent increase in the breeding population numbers being supported by the abundance of alternative islands within large fresh-water bodies in the area.

Predicted Effects and their Significance

Operation: Barrier to Flights Leading to Displacement

8.18.6 The Proposed Development has the potential to act as a barrier to common tern undertaking foraging flights between the breeding colony and coastal feeding areas, utilising a regular flight corridor that follows the River Creed. This could potentially affect up to 50 pairs, which represents c 10% of the Western Isles population in 2000.

8.18.7 The wind turbines within the Proposed Development are widely spaced and a corridor has been built into the design along the River Creed, with the nearest turbine being c 200m away, suggesting that any impediment to use of this flight corridor would be unlikely.

8.18.8 As there is a flight corridor within the final design, and the turbines are widely spaced the magnitude of change due to the barrier effect on the Western Isles population of common tern would no more than low. Furthermore, it is likely that the Western Isles population may have increased since 2000 due to the eradication of American mink, and therefore any effect would be reduced due to the greater productivity that has followed eradication of mink.

8.18.9 The Proposed Development would result in a low magnitude of change. Therefore, the effects would be not significant and there would be no adverse significant effect on the favourable conservation status of common tern.

Potential Collision with Operational Turbines

8.18.10 The flight activity recorded from VP surveys was subject to CRM which resulted in a theoretical annual collision risk of 0.326 (**AI Appendix 8E**), equating to 0.03% of the Western Isles population.

8.18.11 The Proposed Development would result in a very low magnitude of change in respect of collision risk. Therefore the effects would be not significant and there is no adverse significant effect on the favourable conservation status of common tern.

8.19 Golden eagle: Breeding

Baseline Conditions

Desk Study

8.19.1 NHZ3 was considered to contain 81 breeding pairs based on the 2003 national survey data (Wilson *et al*. 2015), although surveys from 2015 indicate that numbers on the Western Isles increased to 95 occupied home ranges (Hayhow *et al,* 2017). Please refer to **Section 8.11** for further information on status and data from the desk study.

Field Surveys

8.19.2 Please refer to **Section 8.11** for further information on status and data from the field surveys.

Future Baseline

8.19.3 Please refer to **Section 8.11** for further information.

Predicted Effects and their Significance

Potential Collision with Operational Turbines

8.19.4 CRM predicted a mean theoretical risk of 0.235 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.073), resulted in a combined theoretical collision risk of 0.308 fatalities per year (**AI Appendix 8E**). This is equivalent to 0.16% of the Western Isles population. Population modelling of the Western Isles population predicts that the Western Isles population would be 129 pairs after 25 years, whilst with additional cumulative mortality from all wind farm developments in the Western Isles, it is predicted to reach 104 pairs (**AI Appendix 8F**). The Western Isles golden eagle population has been found to be genetically isolated from the mainland population, and as the cumulative collisions from all wind farm developments on the Western Isles will not lead to a decline in the golden eagle population, this also indicates that the NHZ population would not be at risk from the Proposed Development in isolation.

8.19.5 Furthermore, evidence suggests that golden eagle actively avoid wind turbines (Walker *et al*, 2005) and so it is probable that actual collision risks will be lower than predicted here. Hotker *et al* (2006) found only 1 reported casualty of a golden eagle due to a collision with a wind turbine in Spain.

8.19.6 On this basis, the Proposed Development would result in a low magnitude of change. Effects would therefore be not significant and there would be no adverse significant effect on the conservation status of the Western Isles population.

8.20 Golden eagle: Non-breeding

Baseline Conditions

Desk Study

8.20.1 Please refer to **Section 8.19** for further information on status and data from the desk study.

Field Surveys

8.20.2 Please refer to **Section 8.11** for further information on status and data from the field surveys.

Future Baseline

8.20.3 Please refer to **Section 8.11** for further information.

Predicted Effects and their Significance

Potential Collision with Operational Turbines

8.20.4 CRM predicted a mean theoretical risk of 0.073 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.235), resulted in a combined theoretical collision risk of 0.308 fatalities per year (**AI Appendix 8E**). This is equivalent to 0.16% of the Western Isles population.

8.20.5 The assessment detailed within Section 8.19 for the breeding population also applies to the non-breeding populations and on that basis, the Proposed Development would result in a low magnitude of change. Effects would therefore be not significant and there would be no adverse significant effect on the conservation status of the Western Isles population.

8.21 Greenshank: Breeding

Baseline Conditions

Desk Study

8.21.1 NHZ 3 supports approximately 256 pairs (*Wilson et al. 2015*).

8.21.2 Please refer to **Section 8.12** for further information on status and data from the desk study.

Field Surveys

8.21.3 Please refer to **Section 8.12** for further information on status and data from the field surveys.

Future Baseline

8.21.4 Please refer to **Section 8.12** for further information.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.21.5 Four (2018) and six pairs (2019) were recorded within the ZoI, equivalent to up to 2.34% of the NHZ 3 population.

8.21.6 Construction and decommissioning related disturbance/displacement effects to greenshank would be minimised via the embedded measures outlined in **EIA Table 8.10.** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), with disturbance to nesting birds being unlikely.

8.21.7 Due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, availability of foraging and breeding habitat is not considered to be a limiting factor. Given the temporary nature of the construction/decommissioning works and that the magnitude of change to the NHZ greenshank population is considered to be very low, the effects would be not significant, and there would be no adverse significant effect on the conservation status of the Western Isles NHZ3 population.

8.21.8 No other construction or operational effects were scoped in for further assessment (**AI Appendix 8D**).

8.22 Hen Harrier: Breeding

Baseline Conditions

Desk Study

8.22.1 Breeding hen harrier is listed on Annex I of the Birds Directive, Schedule 1 and 1A of the Wildlife & Countryside Act 1981 (as amended) the SBL and is a Red listed BoCC due to a historical decline in the breeding population.

8.22.2 The Scottish population of hen harrier was estimated to be 501 breeding pairs, with 48 in NHZ3 (Wilson *et al.* 2015), based on data collected during a national survey in 2010.

8.22.3 A more recent national survey was carried out in 2016, and this put the Scottish population at an estimated 460 pairs of hen harrier (Challis *et al.* 2018). The 2016 data indicated that there were 43 territories in the Western Isles, four of which were on the Isle of Lewis (figures were not provided at the NHZ level).

8.22.4 Although there is a population of hen harrier on the Uists, further south on the Outer Hebrides, there are no records of this species nesting on the Isle of Lewis before 2015, when a single breeding attempt was recorded. All breeding activity on Lewis has been recorded within a 2km buffer of the Development Site and all within OS 10km grid square NB 33.

Field Surveys

Breeding Bird Surveys

8.22.5 Based on the data provided from breeding surveys and flight activity surveys (**EIA Appendix 8C** and **8D, AI Appendix 8B** and **8C**), the survey area supported five pairs of breeding hen harrier in 2018 and seven confirmed territories and a probable territory in 2019 (**Table 8.12**).

8.22.6 Furthermore, in 2019 evidence was collected that indicated the core breeding population had begun to expand from its original breeding area, with one confirmed and one probable breeding attempt being recorded within 10km of the Proposed Development boundary.

8.22.7 The 10 confirmed/probable territories recorded in 2019 represents approximately 2.1% of the Scottish breeding population, 20% of the NHZ regional breeding population (2010 national survey data), and approximately 23% of the Western Isles population (2016 national survey data).

Table 8.12 Hen harrier: Breeding Records

Year	Nest ID	Distance to Nearest Proposed Track (m)	Distance to Nearest Proposed Turbine (m)	Habitat	Outcome
2018	HH2	120	249	Nest located in failed plantation forestry / wet modified bog.	Nest failed.
	HH4	764	766	Nest located in area consisting of mosaic of failed forestry and modified bog.	At least 3 chicks fledged.
	HH5	375	375	Failed forestry.	Nest failed.
	HH6	990	1,481	Nest located in area of blanket bog / wet modified heath.	At least 2 chicks fledged.

Year	Nest ID	Distance to Nearest Proposed Track (m)	Distance to Nearest Proposed Turbine (m)	Habitat	Outcome
	HH7	51	220	Nest located in mosaic of failed forestry and modified bog.	Four chicks fledged.
2019	HH1	730	730	Nest located in area consisting of mosaic of failed forestry and modified bog. Same approximate area as nest location from 2018 (Nest ID HH4).	Four chicks fledged.
	HH2	431	759	Nest located in blanket bog / wet heathland adjacent to failed plantation forestry.	Nest failed – cause unknown.
	HH3	857	1,022	Nest located in blanket bog / wet heathland.	Nest failed – cause unknown.
	HH4	510	529	Nest located in area consisting of modified bog.	Nest failed – cause unknown.
	HH5	1,563	3,153	Nest located in in blanket bog / wet heathland.	Nest failed – probable avian predation.
	HH6	79	81	Nest located in area of blanket bog / wet modified heath.	Nest failed – probable avian predation.
	HH7	30	172	Nest located in area consisting of mosaic of failed forestry and modified bog.	Nest failed – cause unknown.
	HH8	9	130	Food pass observed 24th May 2019 but further searches and monitoring failed to locate a breeding territory in the area.	Probable breeding attempt.
	HH9	5,500	5,500	Located within 10km of Proposed Development in mosaic of forestry and bog.	Probable breeding attempt.
	HH10	10,200	10,200	Located within 10km of Proposed Development in mosaic of forestry and bog.	Outcome unknown.

8.22.8 Out of the 12 breeding attempts monitored in 2018 and 2019, four attempts successfully fledged 13 chicks. Combined with the fledging data for 2015 – 2017 (**AI Appendix 8F**), the average productivity rate for the Isle of Lewis population is 0.94 per monitored breeding attempt.

8.22.9 Broad scale habitats associations for nest site selection indicate a 50/50 preference for either open moorland habitats or a mosaic of failed forestry / open moorland habitats. These forestry areas were originally planted over 30 years ago and have failed to become fully established, leading to slow growth, dead standing and fallen trees and an open / gappy habitat creating a mixed mosaic within the surrounding habitats.

Flight Activity Surveys

8.22.10 **Table 8.13** presents a summary of all flight activity recorded during VP and focal watch surveys between April – September 2018 and 2019.

Table 8.13 Hen Harrier: VP and Focal Watch Flight Activity Data

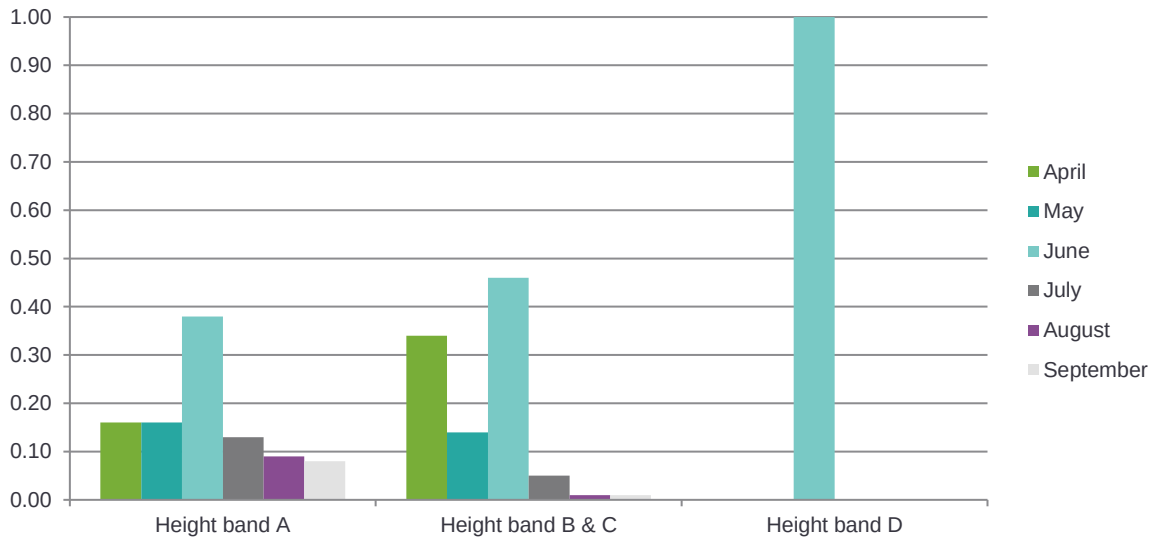
	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2018	132	12,845	4,010	120
	2019	53	5,040	2,355	-
Focal watch	2018	189	15,420	5,900	90
	2019	81	3,165	990	-

Habitat Associations of flight activity

Temporal Distribution

8.22.11 Vantage Point and focal watch flight activity surveys have shown that 27% of recorded breeding season flight time was at PCH (Height bands A up to 20m, Height band B and C covering 20m – 200m, height band D 200m+). The greatest proportion of flight activity occurring at PCH peaked in April coinciding with territorial display flights and again in June during the chick rearing period (**Figure 8.1**).

Figure 8.1 Hen Harrier: Proportion of Flight Activity 2018 Breeding Season



Spatial Distribution of Flight Activity

8.22.12 The distribution of hen harrier activity in relation to different Phase 1 habitat types was calculated by first clipping each separate hen harrier flight line recorded between April to August in both 2018 and 2019 to the Phase 1 survey area polygon using QGIS. Next, the Chainage tool in QGIS (QGIS

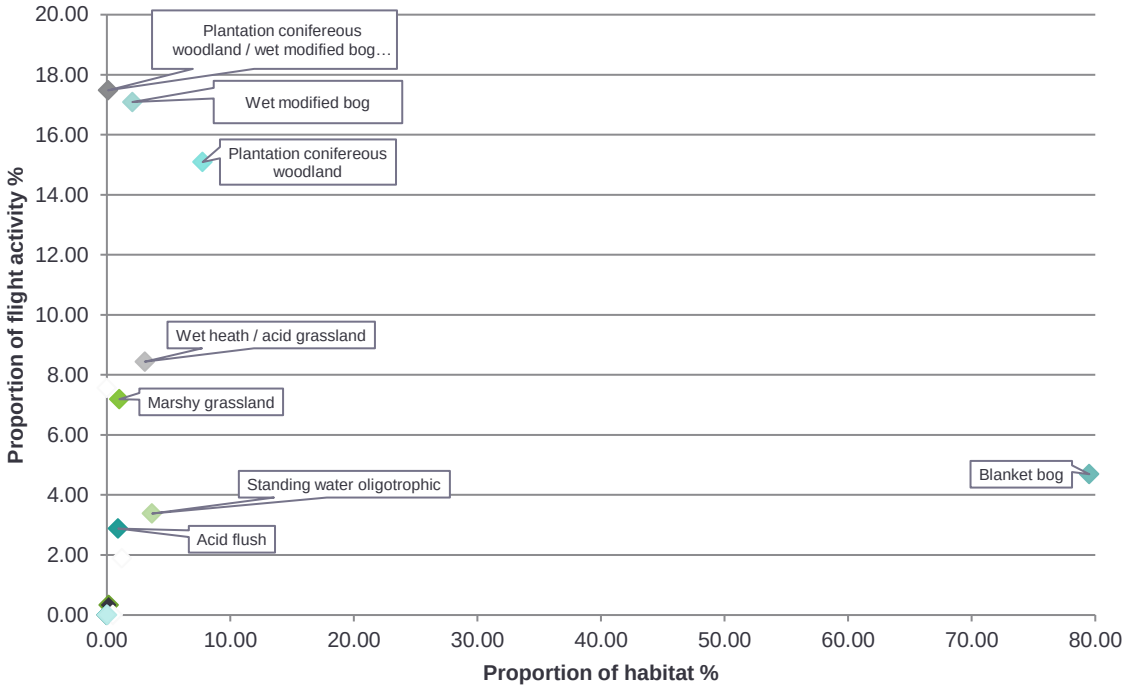
Development Team, 2009. QGIS Geographic Information System. Open Source Geospatial Foundation. URL http://qgis.org) was used to create individual points at 1m intervals along each clipped flight line.

8.22.13 The total number of each individual 1m points falling within each Phase 1 habitat type was then calculated. A mean measure of flight activity/ha for each habitat type was then calculated by dividing the total habitat area by the number of 1m points. The total flight activity/ha was calculated and the proportion for each habitat type was calculated. The proportion of each habitat type as a percentage of the overall Phase 1 survey area was also calculated. **Figure 8.2** shows the relationship between the proportion of flight activity/ha for each habitat type in relation to proportion of Phase 1 habitat type available.

8.22.14 Although blanket bog was clearly the predominant habitat type recorded on site (accounting for almost 80% of all available habitat types), it accounted for just over 5% of flight activity/ha during the breeding seasons of 2018 and 2019.

8.22.15 Peak flight activity levels were recorded above wet modified bog (17.48%), a mosaic of wet modified bog and plantation coniferous woodland (17.09%) and plantation coniferous woodland (15.09%), despite these habitat types accounting for a relatively small proportion of the overall habitat types available (2.06, 0.09 and 7.75% respectively).

Figure 8.2 Proportion of Hen Harrier Flight Activity by Habitat Type: 2018 and 2019 Breeding Season Combined



Future Baseline

8.22.16 In the absence of development, the newly established hen harrier breeding population is likely, in the short term, to continue to maintain or increase their present population levels within the area. However, reduced predation pressures due to the eradication of American mink may lead to a longer-term increase in productivity, allowing the population to expand to other areas on Lewis.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.22.17 In 2019, five confirmed breeding attempts fell within the ZoI, representing 10.5% of the NHZ population based on the 2010 population estimate, 11.6% of the Western Isles population estimate from 2016 and 50% of the Isle of Lewis population in 2019.

8.22.18 Construction and decommissioning related disturbance/displacement effects to hen harrier within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10**, (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), the magnitude of change to the NHZ 3 (and Lewis) hen harrier population is considered to be low, and the resultant effect on the species conservation status is not significant.

Operational Disturbance

8.22.19 In light of the embedded measures outlined in **EIA Table 8.10,** operational related disturbance and displacement effects to hen harrier within the ZoI would be of low magnitude of change. There is an increasing body of evidence that hen harriers can successfully breed within close proximity to wind farms, and there are examples from different Scottish wind farms where young have fledged at nests within 30m from operational turbines. From a study of a number of wind farm sites, Haworth and Fielding (2014) found little evidence that turbines restrict hen harrier nesting attempts except, perhaps, at a distance of 0m - 200/250m. Furthermore, one of the successful territories monitored in 2018 and 2019 was located less than 350m from a currently operational turbine, indicating that hen harrier can successfully habituate to the presence of operational turbines.

8.22.20 Thus, the magnitude of change to the NHZ 3 and Lewis hen harrier breeding population is considered to be very low. Therefore, the effects would be not significant and there would be no adverse significant effect on the favourable conservation status of hen harrier.

Operational Displacement Leading to Barrier Effects

8.22.21 The data reviewed by Haworth and Fielding (2014) does not provide any evidence of a barrier effect. Any displacement was considered to be small scale. The evidence indicated that foraging was reduced close to turbines, but this may be due to the presence of large areas of hard standings that significantly reduces foraging opportunities rather than any turbine avoidance behaviour. Measures proposed in **AI Chapter 9** and **AI Appendix 9I** are designed to address loss of suitable foraging habitats on and off site and therefore barrier effects are considered to be low magnitude.

8.22.22 Thus, the magnitude of change associated with operational displacement leading to barrier effects to the NHZ 3 and Lewis hen harrier breeding population is considered to be very low. Therefore, the effects would be not significant and there would be no adverse significant effect on the favourable conservation status of breeding hen harrier.

Potential Collision with Operational Turbines

8.22.23 CRM predicted a mean theoretical risk of 0.123 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.023), resulted in a combined theoretical collision risk of 0.146 fatalities per year (**AI Appendix 8E**). This is equivalent to 0.15% of the NHZ population, 0.16% of the Western Isles population and 0.7% of the Isle of Lewis population. However, population modelling of the Isle of Lewis population predicts that the population would be 21 pairs after 25 years, whilst with an additional annual mortality rate of 0.145

(breeding and non-breeding combined), it is predicted to reach 17 pairs after 25 years, an increase of 7 pairs compared to 2019 population levels (**AI Appendix 8F**).

8.22.24 The main limiting factor to the growth of the Isle of Lewis population would appear to be the low level of productivity within the population. Measures proposed in **AI Chapter 9** and **AI Appendix 9I** are designed to address identifying and reducing the causes contributing to the low levels of productivity.

8.22.25 Therefore, the magnitude of change to the NHZ 3/Lewis hen harrier breeding population associated with potential collision with operational turbines is considered to be very low and the effects would be not significant with no adverse significant effect on the conservation status of breeding hen harrier.

8.23 Hen Harrier: Non-breeding

Baseline Conditions

Desk Study

8.23.1 There is little information on numbers of hen harriers in the UK outside the breeding season, although Forrester estimated that Scotland held between 1,050-1540 individuals (Forrester *et al. 2007*).

8.23.2 At the time of the 2009-2010 surveys, hen harrier was a common winter visitor to Lewis, and flight activity surveys at the time recorded 58 flights, only one of which was observed during the breeding season. Flight activity surveys during the 2015-2016 winter period recorded three flights.

8.23.3 Please refer to **Section 8.22** for further information on hen harrier status and data from the desk study.

Field Surveys

Non-breeding Bird Surveys

8.23.4 In November 2017, activity recorded during VP surveys and incidental observations whilst accessing the Site indicated that there appeared to be a number of hen harriers utilising parts of the site characterised with stands of *Juncus* species as nocturnal roosts. Roost monitoring watches were established and two adjacent areas in the central part of the Development Site were identified as being utilised for roosting by up to six individual hen harriers; comprising an adult female, two adult males and at least three ringtails[5] (**EIA Appendix 8B, 8D)**. In the winter of 2018-2019, an additional second roost location was identified just outside the survey area (**AI Appendix 8A, 8C**). Observations between October 2018 and March 2019 indicated that the roosts within the site were used by at least three different birds, comprising an adult male and at least two ringtails, whilst that offsite appeared to be utilised by at least two ringtails plus an adult male. Simultaneous observations indicated that both roosts were in use at the same time on two occasions. The maximum numbers of bird recorded utilising the roosts (six) is the equivalent to approximately 0.6% of the Scottish non-breeding population.

[5] Collective term for females and immature birds (male and female).

Flight Activity Surveys

8.23.5 **Table 8.14** presents a summary of all flight activity recorded during VP and focal watch surveys between October 2017 – March 2018 and October 2018 – March 2019.

Table 8.14 Hen Harrier: VP Flight Activity Data Non-breeding

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2017-2018	54	3,190	1,026	0
	2018-2019	34	3,479	555	0
Roost monitoring	2017-2018	14	1,350	60	0
	2018-2019	82	6,910	990	0

Future Baseline

8.23.6 In the absence of development, the hen harrier non-breeding population is likely to continue to maintain or increase their present population levels within the area. However, reduced predation pressures due to the eradication of American mink may lead to a longer-term increase in breeding productivity, which in turn may lead to an increase in the numbers of non-breeding hen harriers on Lewis.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.23.7 In terms of construction and decommissioning disturbance, one of the roosting locations fall within the ZoI (approximately 150m to 350m to proposed infrastructure at their nearest points). Based on a maximum occupancy of 6 birds, this is equivalent to 0.57% of the Scottish population.

8.23.8 Construction and decommissioning related disturbance/displacement effects to hen harrier within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), impact magnitude would be very low. The magnitude of change to the NHZ 3/Lewis hen harrier population is therefore considered to be very low and there would be no adverse significant effect on the conservation status of hen harrier.

Operational Disturbance

8.23.9 In light of the embedded measures outlined in **EIA Table 8.10**, operational related disturbance and displacement effects to roosting hen harrier within the ZoI would be similar to those experienced by breeding hen harrier, they being as sensitive roosting during the non-breeding season as when nesting during the breeding season. (As detailed previously one of the successful hen harrier breeding territories monitored in 2018 and 2019 was located less than 350m from a currently operational turbine, indicating that hen harrier can successfully habituate to the presence of operational turbines.)

8.23.10 Therefore, the magnitude of change to the NHZ 3/Lewis hen harrier non-breeding population is considered to be very low and the effects would be not significant with no adverse significant effect on the conservation status of non-breeding hen harrier.

Potential Collision with Operational Turbines

8.23.11 CRM predicted a mean theoretical risk of 0.023 collisions per non- breeding season and combined with the predicted mean collision risk from the breeding season, resulted in a combined theoretical collision risk of 0.146 fatalities per year (**AI Appendix 8E**). This is equivalent to 0.15% of the NHZ population, 0.16% of the Western Isles population and 0.7% of the Isle of Lewis population. However, population modelling of the Isle of Lewis population predicts that the population would be 21 pairs after 25 years, an increase of 15 pairs compared to 2019 population levels, whilst with an additional annual mortality rate of 0.145 (breeding and non-breeding combined), it is predicted to reach 17 pairs after 25 years (**AI Appendix 8F**).

8.23.12 The main limiting factor to the growth of the Isle of Lewis population would appear to be the low level of productivity within the population. Measures proposed in **AI Chapter 9** and **AI Appendix 9I** are designed to address identifying and reducing the causes contributing to the low levels of productivity.

8.23.13 Therefore, the magnitude of change to the NHZ 3/Lewis hen harrier non-breeding population associated with potential collision with operational turbines is considered to be very low and the effects would be not significant with no adverse significant effect on the conservation status of non-breeding hen harrier.

Operational Displacement Leading to Barrier Effects

8.23.14 It is anticipated that operational displacement effects to roosting hen harrier within the ZoI would be similar to those experienced by breeding hen harrier. Measures proposed in **AI Chapter 9** and **Appendix 9I** are designed to address loss of suitable foraging and roosting habitats on and off site and therefore barrier effects are considered to be low magnitude.

8.23.15 Thus, the magnitude of change associated with operational displacement leading to barrier effects to the NHZ 3 and Lewis hen harrier non-breeding population is considered to be very low. Therefore, the effects would be not significant and there would be no adverse significant effect on the conservation status of hen harrier.

8.24 Red-throated Diver: Breeding

Baseline Conditions

Desk Study

8.24.1 NHZ 3 supports approximately 317 pairs (*Wilson et al. 2015*), approximately 25% of the national population.

8.24.2 Please refer to **Section 8.13** for further information on status and data from the desk study.

Field Surveys

8.24.3 Please refer to **Section 8.13** for further information on status and data from the field surveys.

Future baseline

8.24.4 Please refer to **Section 8.13** for further information.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.24.5 In terms of construction and decommissioning disturbance, two breeding pairs of red-throated diver were within the ZoI. This is equivalent to 0.63% of the NHZ population.

8.24.6 Construction and decommissioning related disturbance/displacement effects to red-throated diver within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10,** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), impact magnitude would be low.

8.24.7 Red throated diver foraging and breeding habitat is not considered to be a limiting factor within Lewis and there is extensive availability of similar habitat within NHZ 3 that will remain undisturbed during construction and decommissioning. Given the temporary nature of the construction works, the magnitude of change to the NHZ 3 red-throated diver population is considered to be very low. Therefore, the effects would be not significant and there is no adverse significant effect on the conservation status of breeding red-throated diver.

Operational Disturbance

8.24.8 Disturbance effects during the operational phase are generally considered to be less than that experienced during the construction phase. In light of the embedded measures outlined in **EIA Table 8.10**, operational related disturbance/displacement effects to breeding red-throated diver within the ZoI are considered to be of very low magnitude. Therefore the effects would be not significant and there is no adverse significant effect on the conservation status of breeding red-throated diver.

Operational Displacement Leading to Barrier Effects

8.24.9 It is anticipated that operational displacement effects to the NHZ population of red-throated diver within the ZoI would be similar to those experienced by the SPA population, albeit at a lower magnitude given the population is much larger (317 pairs as opposed to 80 pairs associated with the SPA).

8.24.10 The wind turbines within the Development Site are widely spaced and two flight corridors have been incorporated into the design of the Proposed Development as noted previously (see Section 8.13.14 – 8.13.19) suggesting that any impediment would be minor. In addition, red-throated divers have been noted flying through the Arnish Wind Farm (observed during the surveys reported on for the Stornoway Wind Farm 2012 application) and the Burgar Hill wind farm, Orkney (Viking Wind Farm ES 2009).

8.24.11 As there are corridors within the final layout, and the turbines are widely spaced, the magnitude of change in respect of potential barrier effects on the NHZ population of red-throated diver will be of very low magnitude and effects would be not significant. There would therefore be no adverse significant effect on the conservation status of breeding red-throated diver.

8.25 Whimbrel

Baseline Conditions

Desk Study

8.25.1 Breeding whimbrel is listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended). This species is a Red BoCC due to its severe population and range decline as a breeding bird over the last 25 years.

8.25.2 The Scottish population was estimated to be 307 pairs with an estimated 14 pairs in NHZ3 (Wilson et al. 2015).

Field Surveys

8.25.3 A single breeding record was recorded in 2019 (**AI Appendix 8C**).

Future Baseline

8.25.4 In the absence of development, whimbrel are likely to continue to maintain their present population levels within the area. However, reduced predation pressure due to the eradication of American mink may lead to an increase in productivity, with any subsequent increase in the breeding population numbers being supported by the abundance of suitable breeding habitat in the wider environment.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.25.5 A single breeding record was observed within the ZoI in 2019, equivalent to up to 7% of the NHZ 3 population.

8.25.6 Construction and decommissioning related disturbance/displacement effects to whimbrel that may be connected to the SPA would be minimised via the embedded measures outlined in **EIA Table 8.10.** (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), with disturbance to nesting birds being unlikely.

8.25.7 Due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, availability of foraging and breeding habitat is not considered to be a limiting factor. Given the temporary nature of the construction/decommissioning works and that the magnitude of change to the NHZ 3 breeding whimbrel population is considered to be very low, the effects would be not significant, and there would be no adverse significant effect on the conservation status of breeding whimbrel.

8.25.8 No other construction or operational effects were scoped in for further assessment (**AI Appendix 8D**).

8.26 White-tailed Eagle: Breeding

Baseline Conditions

Desk Study

8.26.1 Breeding white-tailed eagle is listed on Annex I of the Birds Directive, Schedules 1, 1A and A1 of the Wildlife & Countryside Act 1981 (as amended) and the SBL. This species is a Red BoCC due to its rarity as a breeding bird and a historical decline in its breeding population (*Eaton et al. 2015*).

8.26.2 Following the successful re-introduction of white-tailed eagle to Scotland, this species has re-colonised much of the Western Isles and is now regularly seen on the Isle of Lewis. The results of a recently published study commissioned by SNH looking at population and future range modelling suggests that the Scottish population will continue to expand in range and numbers for the foreseeable future (*Sansom et al. 2016*).

8.26.3 The Scottish population was estimated to be 82 pairs (Wilson *et al.* 2015), with an estimated 23 in NHZ3. In 2018, at least 120 home ranges were occupied, with the Western Isles supporting 32 pairs, 22 of which were on the Isle of Lewis and Harris (Challis *et al* 2019).

Field Surveys

Breeding Bird surveys

8.26.4 A pair of white-tailed eagle nest within approximately 5km from the closest proposed infrastructure. The territory was established in 2013 by a sub-adult female and an adult male, utilising an old golden eagle nest. The first breeding attempt was made in 2014, at which two young were fledged. In 2015 the breeding attempt failed at the egg or early chick stage. The outcome was unknown in 2016, whilst two chicks fledged in 2017. This nest failed in 2018, whilst in 2019 three chicks were present.

Flight Activity Surveys

8.26.5 White-tailed eagle flight activity followed no obvious pattern, although flights were predominantly recorded in the central and southern survey areas[6]. **Table 8.15** presents a summary of all flight activity recorded during VP surveys from April – September 2018 and 2019.

Table 8.15 White-tailed Eagle: VP Flight Activity Data

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2018	20	555	2,310	1,600
	2019	12	180	2,070	750

[6] Study Areas identified in EIA Table 8.5 of the EIA Report 2019

Future Baseline

8.26.6 Studies (Sansom, 2016; Natural Research,2019) have shown that white-tailed eagle are likely to continue to expand from their present population levels on Lewis in the absence of the Proposed Development.

Predicted Effects and their Significance

Potential Collision with Operational Turbines

8.26.7 CRM predicted a mean theoretical risk of 0.391 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.243), resulted in a combined theoretical collision risk of 0.634 fatalities per year (**AI Appendix 8E**). This is equivalent to 1% of the increasing NHZ population. Population modelling of the Western isles population predicts that the Western Isles population would be 318 pairs after 25 years, whilst with additional cumulative annual mortality rate of from all wind farm developments in the Western Isles (1.184), it is predicted to reach 233 pairs (**AI Appendix 8F**).

8.26.8 It should be noted that these models isolated the Western Isles population from the rest of Scotland. There would be migrants into this population which could offset the effects of the collisions. Furthermore, Sansom et al *(2016*) found that in none of their modelling scenarios did the estimated number of breeding pairs decline, and that any mortality as a result of collisions would only reduce the rate at which population growth occurs. From their paragraph 3.6 (p26): the bold emphasis has been added.

8.26.9 "*…. Perhaps a more realistic modelling approach is to assume that the annual mortality is related to the overall population size. Three scenarios were modelled using this approach, assuming that 0.5%, 1% and 2% of the total population size were killed annually, with mortality equally spread between the different age classes and between the two sexes. In none of these scenarios did the estimated number of breeding pairs decline. …….Thus, despite potentially limiting the overall population size, the modelled additive mortality levels would not cause a population decline or extinction (across the whole population) and would only reduce the rate at which population growth occurs*."

8.26.10 Impact magnitude is therefore considered to be low and the effects would be not significant. Therefore, there is no adverse significant effect on the conservation status of breeding white-tailed eagle.

8.27 White-tailed Eagle: Non-breeding

Baseline Conditions

Desk Study

8.27.1 As white-tailed eagle occupy their territories throughout the year their breeding status described in **Section 8.26** can also be applied to territorial pairs during the non-breeding season.

Field Surveys

Flight Activity Surveys

8.27.2 White-tailed eagle flight activity followed no obvious pattern. **Table 8.16** presents a summary of all flight activity recorded between October 2017-March 2018 and October 2018-March 2019.

Table 8.16 White-tailed Eagle: VP Flight Activity Data

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2017-2018	22	348	1,629	180
	2018-2019	23	485	2,280	120

Future baseline

8.27.3 Please refer to **Section 8.26** for further information.

Predicted Effects and their Significance

Potential Collision with Operational Turbines

8.27.4 CRM predicted a mean theoretical 0.243 collisions per non-breeding season and combined with the predicted mean collision risk from the breeding season (0.391), resulted in a combined theoretical collision risk of 0.634 fatalities per year (**AI Appendix 8E**). This is equivalent to 0.96% of the increasing NHZ population.

8.27.5 As detailed within **Section 8.26**, the impact magnitude associated with potential collision with operational turbines is considered to be low and the effects would be not significant. Therefore, there is no adverse significant effect on the conservation status of non-breeding white-tailed eagle.

8.28 Whooper Swan: Breeding

Baseline Conditions

Desk Study

8.28.1 Whooper swan is listed on Annex I of the Birds Directive, Schedule 1 of the Wildlife & Countryside Act 1981 (as amended) and appears on the Scottish Biodiversity List. It is an Amber listed BoCC due to its rarity as a breeding species (Eaton *et al 2015*).

8.28.2 Whooper swan is a regular winter visitor to the UK from its breeding rounds in the Arctic Circle, with only a small number of sporadic breeding records in the UK recorded each year. The Scottish breeding population was estimated to be between 3-7 pairs (Forester *et al. 2007*).

Field Surveys

Breeding Bird Surveys

8.28.3 A single confirmed breeding attempt was confirmed within the Development Site in 2018 only (**EIA Appendix 8D**).

Flight Activity Surveys

8.28.4 Whooper swan flight activity followed no obvious pattern. **Table 8.17** presents a summary of all flight activity recorded between April – September in 2018 and 2019.

Table 8.17 Whooper swan: VP Flight Activity Data

	Season	Total Number Flights	Total Seconds Below PCH	Total Seconds at PCH	Total Seconds Above PCH
VP	2018	1	30	0	0
	2019	2	120	180	0

Future Baseline

8.28.5 The whooper swan is long-lived, monogamous and shows delayed maturity. Only a small proportion of the population breed in any year (Haapanen et al 1973 b). During a 12-13 year study of breeding whooper swan in their traditional nesting grounds in northern Iceland, Einersson and Rees (2002) identified that there was wide scale variation in inter-year occupancy of territories, and that 35% of pairs were only present for one year over a 12-13 year period. Given the rare and sporadic nature of breeding attempts recorded in the UK, whooper swan are not likely to maintain their present breeding population levels within the study area.

Predicted Effects and their Significance

Construction and Decommissioning Disturbance

8.28.6 One breeding pair of whooper swan fell within the ZoI in 2018 only (55m from the nearest point of construction activity). This is equivalent to between 14 - 33% of the National population.

8.28.7 Construction and decommissioning related disturbance/displacement effects to whooper swan within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **EIA Table 8.10**, (such as the CEMP, the deployment of an ECoW, checking surveys, construction buffers the OHMP, and pollution prevention plans), impact magnitude would be low.

8.28.8 The sporadic nature of breeding attempts (no previous breeding records from the 2010/11 and 2015/16 surveys) indicates that there may be no pairs present during the construction phase. Additionally, the extent of the available habitat within the Isle of Lewis that will remain undisturbed during construction and decommissioning would offer any potential prospective breeding pairs alternative habitats.

8.28.9 Therefore the magnitude of change to the national whooper swan breeding population is considered to be low, and the effects would be not significant, with no adverse significant effect on the conservation status of whooper swan.

Operational Disturbance

8.28.10 Disturbance effects during the operational phase are generally considered to be less than that experienced during the construction phase. In light of the embedded measures outlined in **EIA Table 8.10**, operational related disturbance/displacement effects to breeding whooper swan within the ZoI are considered to be low magnitude.

8.28.11 Therefore, the magnitude of change to the national whooper swan breeding population is considered to be very low, and effects would be not significant, with no adverse significant effect on the conservation status of whooper swan.

8.29 Assessment Summary

8.29.1 A summary of the assessment is provided in **Table 8.18.** This deals in an integrated way, with the effects of all phases of the Proposed Development. Potential effects are considered together as the assessment focuses on the favourable conservation status of each feature and as such, is assessed throughout the lifespan of the Proposed Development. Often, changes to a feature would occur during several stages of the Proposed Development and the resultant effect may reverse during different phases. For example, during construction a local population may decline as a result of disturbance, however, this effect may be reversed during operation.

Table 8.18 Summary of Significance of Adverse Effects

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
Lewis Peatlands SPA – black-throated diver	*Operation: Barrier to flights leading to displacement*	International	Low	Not significant	Limited levels of flight activity recorded were recorded. Sensitive design layout and the implementation of a Bird Protection Plan and other embedded measures during operation would ensure that the magnitude of any disturbance/displacement effects was low and the resultant effect on SPA site's integrity would be not significant.
Lewis Peatlands SPA – golden eagle	*Potential collision with operational turbines*	International	Low	Not significant	The low levels of flight activity resulted in a combined theoretical annual collision risk of 0.308, which equates to 3.1% of the SPA population. However, population modelling of the Western Isles population predicts that the population would be 129 pairs after 25 years, whilst with additional cumulative mortality from all wind farm developments in the Western Isles, it is predicted to reach 104 pairs, representing an increase of nine pairs from the 2015 population. The Western Isles golden eagle population has been found to be genetically isolated from the mainland population, and as the cumulative collisions from all wind farm developments on the Western Isles will not lead to a decline in the golden eagle population, this also indicates that the North Harris and Lewis Peatlands SPA populations would not be at risk. On this basis, there is no adverse significant effect on the site's integrity.

[7] The importance of the feature is defined as per **EIA Table 8.9, Section 8.8**, using the criteria set out in **EIA Table 8.8** and method in **EIA Section 8.8**.
[8] The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **EIA Section 8.10, and Table 8.11** and is defined as neutral, very low, low, medium, and high.
[9] The significance of the environmental effects are either significant or not significant subject to the evaluation methodology outlined in **EIA Section 8.10**.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
Lewis Peatlands SPA - greenshank	*Construction and decommissioning disturbance*	International	Very low	Not significant	A maximum of six pairs of breeding greenshank within the SPA fall within the ZoI, equivalent to 4.2% of the SPA population. However, due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the Lewis Peatlands SPA greenshank population is considered to be very low, and the resultant effect on the site's integrity is not significant.
Lewis Peatlands SPA – red-throated diver	*Construction and decommissioning disturbance*	International	Very low	Not significant	One pair of red-throated diver within the SPA falls within the ZoI, being equivalent to 1.2% of the SPA population. However, due to the extent of available habitat within the SPA that would remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the Lewis Peatlands SPA red-throated diver population is considered to be very low, and the resultant effect on the site's integrity is not significant.
	Operation: Barrier to flights leading to displacement	International	Low	not significant	The wind turbines within the Development Site are widely spaced and there are two corridors built into the design suggesting that any impediment will be minor. In addition, red-throated divers have been noted flying through the Arnish Wind Farm (observed during the surveys reported on for Consented Development) and the Burgar Hill Wind Farm, Orkney (Viking Wind Farm ES 2009). As there are flight corridors within the final design, and the turbines are widely spaced, the magnitude of change in respect of potential barrier effects would be no more than low and therefore not significant. On this basis, the resultant effect on the site's integrity is not significant.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
	Potential collision with operational turbines	International	Low	not significant	The levels of flight activity recorded resulted in a theoretical annual collision rate of 0.46, which equates to 0.287% of the SPA population. However, population modelling of the Lewis Peatlands SPA population predicts that the SPA population would be 93 pairs after 25 years, whilst with additional mortality from the Proposed Development, it is predicted to reach 87 pairs, representing an increase of seven pairs. On this basis, the resultant effect on the site's integrity is not significant.
Lewis Peatlands Ramsar – black-throated diver	*Operation: Barrier to flights leading to displacement*	International	Low	not significant	The assessment for the Ramsar black-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same. On this basis, the resultant effect on the site's integrity is not significant.
Lewis Peatlands Ramsar – greenshank	*Construction and decommissioning disturbance*	International	Low	not significant	The assessment for the Ramsar greenshank population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same. Therefore, the resultant effect on the site's integrity is not significant
Lewis Peatlands Ramsar – red-throated diver	*Construction and decommissioning disturbance*	International	Very low	not significant	The assessment for the Ramsar red-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same. Therefore, the resultant effect on the Ramsar site's integrity is not significant
	Operational displacement leading to barrier effects	International	Low	not significant	The assessment for the Ramsar red-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same. Therefore, the resultant effect on the Ramsar site's integrity is not significant
	Potential collision with operational turbines	International	Low	not significant	The assessment for the Ramsar red-throated diver population is considered to be consistent with that carried out for the SPA population, given that the site boundaries are the same. Therefore, the resultant effect on the Ramsar site's integrity is not significant

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
Black-throated diver: breeding	*Construction and decommissioning disturbance*	Regional	Very low	not significant	One breeding pair of black-throated diver falls within the ZoI and this is equivalent to 2.9% of the NHZ population. However, due to the extent of available habitat within the NHZ that will remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ black-throated diver population is considered to be very low, and the resultant effect on the species favourable conservation status is not significant.
	Operation: Barrier to flights leading to displacement	Regional	Very Low	not significant	The wind turbines within the Development Site are widely spaced and there are two corridors built into the design suggesting that any impediment will be minor. This would ensure that the magnitude of any displacement effects is very low and the resultant effect on the species' favourable conservation status in the NHZ would be not significant.
Common tern: breeding	*Operation: Barrier to flights leading to displacement*	Regional	Low	not significant	The wind turbines within the Development Site are widely spaced and there is a corridor along the River Creed that the breeding tern colony uses as a commuting route to the coastal feeding areas. The resultant effect on common tern conservation status would be not significant.
	Potential collision with operational turbines	Regional	Very Low	not significant	The levels of flight activity recorded from VP surveys resulted in a theoretical annual collision rate of 0.326 and this equates to 0.03% of the NHZ population. The resultant effect on the species' conservation status would be not significant.
Golden eagle: breeding	*Potential collision with operational turbines*	Regional	Low	not significant	The levels of flight activity recorded from VP surveys resulted in a theoretical annual collision rate of 0.308 fatalities per year equating to 0.16% of the Western Isles population. However, population modelling of the Western Isles population predicts that the Western Isles population would be 129 pairs after 25 years, whilst with additional cumulative mortality from all wind farm developments in the Western Isles, it is predicted to reach 104 pairs.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
					The Western Isles golden eagle population has been found to be genetically isolated from the mainland population, and as the cumulative collisions from all wind farm developments on the Western Isles will not lead to a decline in the golden eagle population, this also indicates that the NHZ population would not be at risk from the Proposed Development in isolation. Effects would therefore be not significant and there would be no adverse significant effect on the Western Isles population.
Golden eagle: non-breeding	*Potential collision with operational turbines*	Regional	Low	not significant	See above
Greenshank: breeding	*Construction and decommissioning disturbance*	Regional	Very low	not significant	A maximum of six pairs of breeding greenshank fall within the ZoI, equivalent to 2.34% of the NHZ population. However, due to the extent of available habitat that would remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ greenshank population is considered to be very low, and the resultant effect on the site's integrity is not significant.
Hen harrier: breeding	*Construction and decommissioning disturbance*	Regional	Low	not significant	Five breeding attempts or 10.5% of the NHZ population may be affected. However, due to the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ hen harrier population is considered to be low, and the resultant effect on the species conservation status is not significant.
	Operational disturbance	Regional	Very Low	not significant	Due to the implementation of a Bird Protection Plan, other embedded measures and the evidence that suggests hen harrier will nest in close proximity to wind turbines, the magnitude of change to the NHZ hen harrier population is considered to be very low, and the resultant effect on the species conservation status is not significant.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
	Operation: Barrier to flights leading to displacement	Regional	Low	not significant	Evidence suggests that wind turbines do not act as a barrier to breeding hen harrier, with any displacement, which appears to be mainly foraging flights rather than direct flights, being considered to be small scale. The resultant effect on the species' conservation status would be not significant.
	Potential collision with operational turbines	Regional	Low	not significant	CRM predicted a mean theoretical 0.123 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.022), resulted in a combined theoretical collision risk of 0.146 fatalities per year. This is equivalent to 0.15% of the NHZ population, 0.16% of the Western Isles population and 0.7% of the Isle of Lewis population. However, population modelling of the Isle of Lewis population predicts that the population would be 21 pairs after 25 years, whilst with an additional annual mortality rate of 0.145 (breeding and non-breeding combined), it is predicted to reach 17 pairs after 25 years, an increase of 7 pairs compared to 2019 population levels. The main limiting factor to the growth of the Isle of Lewis population would appear to be the low level of productivity within the population. Measures proposed in **AI Appendix 9I** are designed to address identifying and reducing the causes contributing to the low levels of productivity. Therefore, the magnitude of change to the NHZ 3/Lewis hen harrier breeding population associated with potential collision with operational turbines is considered to be very low and the effects would be not significant with no adverse significant effect on the conservation status of breeding hen harrier.
Hen harrier: non-breeding	*Construction and decommissioning disturbance*	Regional	Very low	not significant	Six birds or 0.57% of the Scottish population would be affected. However, due to the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ hen harrier non-breeding population is considered to be very low, and the resultant effect on the species conservation status is not significant.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
	Operational disturbance	Regional	Very low	not significant	Due to the implementation of a Bird Protection Plan and other embedded measures, the magnitude of change to the NHZ non-breeding hen harrier is considered to be very low, and the resultant effect on the species conservation status is not significant.
	Operation: Barrier to flights leading to displacement	Regional	Very low	not significant	It is anticipated that operational displacement effects to non-breeding hen harrier within the ZoI would be similar to those experienced by breeding hen harrier. The resultant effect on the hen harrier conservation status would be not significant.
	Potential collision with operational turbines	Regional	Low	not significant	CRM predicted a mean theoretical 0.023 collisions per non-breeding season and combined with the predicted mean collision risk from the breeding season (0.123), resulted in a combined theoretical collision risk of 0.146 fatalities per year. This is equivalent to 0.15% of the NHZ population, 0.16% of the Western Isles population and 0.7% of the Isle of Lewis population. However, population modelling of the Isle of Lewis population predicts that the population would be 21 pairs after 25 years, whilst with an additional annual mortality rate of 0.145 (breeding and non-breeding combined), it is predicted to reach 17 pairs after 25 years, an increase of 7 pairs compared to 2019 population levels. The main limiting factor to the growth of the Isle of Lewis population would appear to be the low level of productivity within the population. Measures proposed in **AI Appendix 9I** are designed to address identifying and reducing the causes contributing to the low levels of productivity. Therefore, the magnitude of change to the NHZ 3/Lewis hen harrier non-breeding population associated with potential collision with operational turbines is considered to be very low and the effects would be not significant with no adverse significant effect on the conservation status of non-breeding hen harrier.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
Red-throated diver: breeding	*Construction and decommissioning disturbance*	Regional	Very Low	not significant	Two pairs or 0.63% of the NHZ population may be affected. However, due to the extent of available habitat within the NHZ that will remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ red-throated diver population is considered to be very low, and the resultant effect on the species conservation status is not significant.
	Operational disturbance	Regional	Very Low	not significant	Due to the implementation of a Bird Protection Plan and other embedded measures, the magnitude of change to the NHZ breeding red-throated diver population is considered to be very low, and the resultant effect on the species conservation status is not significant.
	Operation: Barrier to flights leading to displacement	Regional	Very Low	not significant	It is anticipated that operational displacement effects to the NHZ population of red-throated diver within the ZoI would be similar to those experienced by the SPA population, albeit at a lower magnitude given the population is much larger (317 pairs as opposed to 80 pairs). The resultant effect on the species' conservation status would be not significant.
Whimbrel	*Construction and decommissioning disturbance*	Regional	Very low	not significant	Two pairs or 0.63% of the NHZ population may be affected. However, due to the extent of available habitat within the NHZ that will remain undisturbed during construction and decommissioning, the implementation of a Bird Protection Plan and other embedded measures and the temporary nature of the construction works, the magnitude of change to the NHZ whimbrel population is considered to be very low, and the resultant effect on the species conservation status is not significant.
White-tailed eagle: breeding	*Potential collision with operational turbines*	Regional	Low	not significant	CRM predicted a mean theoretical 0.391 collisions per breeding season and combined with the predicted mean collision risk from the non-breeding season (0.243), resulted in a combined theoretical collision risk of 0.634 fatalities per year. This is equivalent to 0.96% of the increasing NHZ population.

Ecological Feature	Summary of Predicted Effects	Importance of Ecological Feature[7]	Magnitude of Change[8]	Significance[9]	Summary Rationale
					Population modelling of the Western isles population predicts that the Western Isles population would be 318 pairs after 25 years, whilst with additional cumulative annual mortality rate of from all wind farm developments in the Western Isles (1.184), it is predicted to reach 233 pairs. The resultant effect on the species' conservation status would be not significant.
White-tailed eagle: non-breeding	*Potential collision with operational turbines*	Regional	Low	not significant	See above for breeding.
Whooper swan: breeding	*Construction and decommissioning disturbance*	National	Low	not significant	One breeding pair of whooper swan, 2018 only, fell within the ZoI and this is equivalent to between 14 - 33% of the national population. Construction and decommissioning related disturbance/displacement effects to whooper swan within the ZoI would be temporary and sporadic and in light of the embedded measures, would be of low magnitude. Furthermore the sporadic nature of breeding attempts indicates that there may be no pairs present during the construction phase. Additionally, the extent of available habitat within the Isle of Lewis that will remain undisturbed during construction and decommissioning would offer any potential prospective breeding pairs alternative habitats. The magnitude of change to the national whooper swan breeding population is therefore considered to be low, and the resultant effect on the species conservation status is not significant.
	Operational disturbance	National	Very low	not significant	Disturbance effects during the operational phase are generally considered to be less than that experienced during the construction phase. In light of the embedded measures, operational related disturbance/displacement effects to breeding whooper swan within the ZoI are considered to be of very low magnitude. Therefore the resultant effect on the species conservation status is not significant.

8.30 Assessment of Cumulative Effects

8.30.1 Significant effects may not occur when considering a proposed development in isolation, but in combination with other developments, cumulative effects may be significant. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question. The need to consider cumulative effects is a requirement of the EIA process, as specified by the EIA Regulations.

8.30.2 Specific guidance has also been provided for assessment of cumulative impacts of onshore wind farms on bird populations (SNH 2018). Projects to be included in such an assessment must include existing projects as well as those consented but not yet built.

8.30.3 In order to undertake a cumulative impact assessment, it is necessary to define:

- The ornithological features affected by the Proposed Development that may be subject to significant cumulative effects in combination with other projects; and
- The relevant projects for which cumulative effects must be considered.

8.30.4 Upon defining these, a cumulative impact assessment is undertaken by drawing on the assessment of effects for ornithological features affected by the Proposed Development that are also considered in the EIA of other projects. This cumulative assessment considers all wind farms on the Western Isles that are operational and consented but not yet built.

8.30.5 The purpose of the cumulative impact assessment is to determine whether effects are likely to affect the Favourable Conservation Status of an ornithological feature. Where the species is associated with a SPA or other designated site, effects are assessed in context with this population or area. Where species are not associated with a SPA, effects are assessed in a regional context, this being NHZ 3 in the case of the Proposed Development.

8.30.6 The only effects with potential for cumulative impacts were those associated with flight activity and corresponding risk of collisions with turbines.

8.30.7 The receptors taken forward for cumulative assessment were the Western Isles golden eagle, Lewis Peatlands SPA red-throated diver and white-tailed eagle populations. Details are presented in **AI Appendix 8F**, and **Table 8.19** summarises the results of the modelling undertaken.

Table 8.19 Population Modelling Results

Species	Level of Assessment	Starting population (pairs)	Predicted population level after 25 years (pairs)	Additional cumulative mortality / year	Predicted population level at 25 years with additional mortality (pairs)
Golden eagle	Western Isles	95	129	1.035	104
Red-throated diver	Lewis Peatlands SPA	80	93	0.57	86
White-tailed eagle	Western Isles	32	318	1.184	216

Western Isles: Golden Eagle

8.30.8 In the absence of any additional mortality the model predicts that there would be 129 pairs of golden eagle in the Western Isles in 25 years' time. This is an increase of 34 pairs over the 2015 estimate and 48 pairs over the 2003 population.

8.30.9 With an assumed additional loss of 1.035 birds per year as a result of collisions with turbines (assumed to all be breeding adults as a worst-case scenario) the population is still predicted to rise, albeit at a slower rate, to 104 pairs over the course of a 25 year period.

8.30.10 Therefore the magnitude of change to the Western Isles golden eagle population is considered to be low, and any adverse cumulative effects would be not significant, with no adverse significant effect on the conservation status of golden eagle.

Lewis Peatlands SPA: Red-throated Diver

8.30.11 In the absence of any additional mortality the PVA model predicts that there would be 93 pairs of red-throated diver within the Lewis Peatlands SPA in 25 years' time. This is an increase of 13 pairs over the existing cited SPA population. With a predicted additional cumulative loss of 0.57 birds per year as a result of collisions with turbines (assumed to all be breeding adults as a worst-case scenario) the population is still predicted to rise to 86 pairs and 38 non-breeding individuals over the course of a 25-year period.

8.30.12 Therefore, the resultant adverse cumulative effect on the Lewis Peatlands SPA site's integrity or favourable conservation status of the red-throated diver NHZ population would be not significant.

Western Isles: White-tailed Eagle

8.30.13 In the absence of any additional mortality the PVA model predicts that there would be 318 pairs of white-tailed eagles in the Western Isles in 25 years' time, an increase of 286 pairs. This would mean, including young birds, something approaching 1,000 white-tailed eagles in the Western Isles or more than one eagle per 3km^2.

8.30.14 With an assumed additional loss of 1.184 birds per year as a result of collisions with turbines (assumed to all be breeding adults as a worst-case scenario) the population is still predicted to rise, albeit at a slower rate, to 233 pairs over the course of a 25 year period.

8.30.15 The current predicted level of cumulative mortality is equivalent to 1.85% of the Western Isles population. In recognition of the fact that the predicted collision rates for several of the wind farms included in the cumulative assessment are out of date as the survey work for most of the consented wind farm assessments on the Western Isles was undertaken several years ago (more than 10 years ago in some cases when there were far fewer white-tailed eagles on the Western Isles and therefore flight activity rates would have been much lower than they are now), additional modelling was carried out, assuming that 5, 10 and 15% of the Western Isles population were killed annually. The sensitivity analysis was done as a precautionary measure to test at what point the population would fail, and that these scenarios – and the 15% in particular – are considered highly improbable. The population only started to go into decline from its existing population level at a theoretical 15.625% annual mortality, equivalent to the loss of 5 birds per year.

Table 8.20 White-tailed Eagle: Theoretical Population Modelling

Assumed level of annual cumulative mortality	Equivalent to number of birds	Predicted population level at 25 years with additional mortality (pairs)
5%	1.6	211
10%	3.2	126
15%	4.8	42
15.625%	5	31

8.30.16 It should also be noted that all iterations of these models have isolated the Western Isles population from the rest of the Scottish population. In reality studies of natal dispersal rates in the Scottish population (Whitfield, 2009) indicate that there would be migrants feeding into this population which may offset the effects of the collisions .

8.30.17 Furthermore, Sansom et al *(2016*) found that in none of their modelling scenarios of the national population did the estimated number of breeding pairs decline, and that any mortality as a result of collisions would only reduce the rate at which population growth occurs. From their paragraph 3.6 (p26): the bold emphasis has been added.

8.30.18 "*…. Perhaps a more realistic modelling approach is to assume that the annual mortality is related to the overall population size. Three scenarios were modelled using this approach, assuming that 0.5%, 1% and 2% of the total population size were killed annually, with mortality equally spread between the different age classes and between the two sexes. In none of these scenarios did the estimated number of breeding pairs decline. …….Thus, despite potentially limiting the overall population size, the modelled additive mortality levels would not cause a population decline or extinction (across the whole population) and would only reduce the rate at which population growth occurs*."

8.30.19 Impact magnitude is therefore considered to be low and the effects would be not significant. Therefore, there is no adverse significant effect on the conservation status of the Western Isles white-tailed eagle population.

8.31 Consideration of Optional Additional Mitigation or Compensation

8.31.1 **Chapter 9 AI Appendix 9I – Outline Habitat Management Plan** has sought to maximise the biodiversity opportunities presented by the Proposed Development as well as providing the management required to ameliorate the effects of potential constraints to development wherever possible, whilst recognising the constraints posed by species and habitats with competing requirements. In the context of ornithological interest, the primary principle will be to support actions that will go towards maintaining, expanding and enhancing the recently established hen harrier population on the Isle of Lewis. This will be achieved by:

- Measures to determine the main drivers affecting the low productivity of the Isle of Lewis hen harrier population, with subsequent management aimed at targeting the key factors identified:
- Minimising opportunities for encounters between hen harrier and turbines on-site whilst minimising permanent forestry removal;
- Ensuring that the habitat on site (not solely the areas of conifer plantation) remain suitable for breeding and foraging hen harrier;
- Managing off-site compensatory habitat over a large area to benefit hen harrier, encouraging birds off-site;
- Maximising opportunities for bog enhancement and restoration on-site, ensuring proposals will not affect the suitability of habitat for breeding and foraging hen harrier;
- Maximising opportunities for scattered woodland planting where creation of these habitats will not affect the integrity of Annex 1 habitat types;
- Restoration and/or management of off-site Annex 1 habitat to offset impacts on-site.

8.32 Conclusions of Significance Evaluation

8.32.1 An assessment has been made of the likely effects of the Proposed Development during the construction, operation and decommissioning stages. Some adverse effects are predicted for all ecological features scoped into this assessment, but these are all considered to be not significant in terms of the EIA Regulations.

8.32.2 It is concluded that provided good practice is followed to avoid disturbance to breeding birds, including the use of exclusion zones during construction and avoiding damage or destruction of occupied nests, significant effects on any ecological feature are unlikely.

8.32.3 An outline Habitat Management Plan (**Chapter 9 AI Appendix 9I**) would include measures aimed at supporting the recently established hen harrier breeding population and the restoration of peatland habitats offsite that will have an overall positive effect on moorland birds, including waders and raptors associated with the adjacent Lewis Peatlands SPA.

8.32.4 Climate change is widely accepted as the cause of some adverse ecological events and predictions indicate that declines will occur in many habitat types and ecological taxa. It is also important in the decision-making process to consider the positive contribution that the Proposed Development would have in tackling the issue of climate change.

8.33 Implementation of Environmental Measures

8.33.1 **Table 8.21** describes the ornithological measures embedded within the Proposed Development and the mechanism by which they would be implemented and who is responsible for their implementation.

Table 8.21 Summary of Environmental Measures Relevant to Biodiversity (Including Ornithology)

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
CONSTRUCTION		
Preparation of Construction Environmental Management Plan (CEMP)	Developer	Planning condition
Preparation of Species Protection Plans (including bird protection plan)	Developer	Planning condition
Tool box talks	Construction Manager and ECoW	Set out in a planning condition requiring a CEMP
Pre-construction surveys to be set out in an Ornithological Monitoring Plan and implemented.	Developer/Contractor	Planning condition
OPERATION PHASE		
All maintenance working areas would be clearly defined and checked for breeding birds before works undertaken.	Developer and ECoW	Planning condition
Monitoring of effects on ornithology through an Ornithological Monitoring Plan.	Developer	Planning condition

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
DECOMMISSIONING		
Preparation of a Restoration and Decommissioning Plan.	Developer	Planning condition
Monitoring of effects on ornithology through an Ornithological Monitoring Plan.	Developer/Contractor	Planning condition

8.34 Comparison of Impacts

8.34.1 A comparison of ornithological impacts for the consented 36 turbine Stornoway Wind Farm and the current proposal based on the survey data collected between October 2017 to September 2019 is summarised in **Table 8.22**. Where an increase in impacts has occurred in comparison to the consented scheme, it is primarily due to an increase in recorded activity.

Table 8.22 Comparison of Impacts

	Number of breeding territories within ZoI		Number of roosting birds within ZoI		Predicted Collisions per year	
	Proposed Development	**Consented Development**	**Proposed Development**	**Consented Development**	**Proposed Development**	**Consented Development**
Black-throated diver	1	1	-	-	0.059	0.055
Golden eagle: breeding	0	0	0	0	0.235	0.179
Golden eagle: non-breeding	-	-	0	0	0.073	0.058
Hen harrier: breeding*	5	6	-	-	0.123	0.243
Hen harrier: non-breeding	-	-	6	6	0.022	0.082
Red-throated diver: breeding*	2	3	-	-	0.444	0.334
White-tailed eagle: breeding	0	0	0	0	0.391	0.289
White-tailed eagle: non-breeding	0	0	0	0	0.243	0.187

* 2019 nest locations

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9. Ecology

Non-Technical Summary

The layout of the turbines, road network and associated infrastructure has evolved through the iterative design process, taking consideration of environmental constraints to avoid potentially significant adverse effects on ecological features. Specifically, the layout was designed to avoid otter resting sites and path networks, the most sensitive areas of blanket bog habitat and rare plant species.

Similarly the iterative design process has incorporated embedded measures to minimise or 'design-out' the risk of significant effects on freshwater ecology: numbers of watercourse crossings have been restricted to a practical minimum; watercourse crossings have been designed in accordance with good practice, maintaining connectivity of watercourse habitat and avoiding impeding fish passage/migration; a minimum stand-off ('buffer') of 50m between wind farm infrastructure (permanent and temporary) and watercourses / waterbodies (with the exception of watercourse crossings) has been incorporated into the design; and the timing of in-channel works would avoid sensitive life stages of fish.

Working practices to minimise effects on terrestrial and freshwater ecology during construction would be set out in a Construction Environmental Management Plan and implemented under the direction/supervision of an Environmental Clerk of Works. A full Habitat Management Plan would be developed following the principles presented in the Outline Habitat Management Plan which accompanies the EIA Report.

9.1 Introduction

9.1.1 **AI Chapter 9** assesses the likely significant effects[1] of the Proposed Development with respect to ecology. The chapter should be read in conjunction with the development description provided in **AI Chapter 4 Description of the Proposed Development** and with respect to relevant parts of other chapters, including **AI Chapter 8 Ornithology** and **EIA Chapter 11 Geology, Hydrology and Hydrogeology**, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects. In the Ecology Chapter, receptors are referred to as ecological features, to accord with the Chartered Institute of Ecology and Environmental Management (CIEEM 2018) "*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*". The term ecological feature is defined in the guidance as pertaining to habitats, species and ecosystems.

9.1.2 Potential effects on European sites[2] are considered with regard to the Conservation of Habitats and Species Regulations 2017 within the Habitats Regulations Appraisal (HRA). A HRA Screening Report/HRA report is provided in **AI Appendix 8H Habitats Regulations Appraisal**.

[1] In this Ecology chapter, the term "potentially significant effects" is used in the sections prior to the "scope of the assessment" (**Section 9.7**) being determined, as it accords with CIEEM guidance. The term "likely significant effects" is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of the Habitats Regulations Appraisal.

[2] European sites include Special Protection Areas (SPA), Special Areas of Conservation (SAC), candidate SACs (cSAC) and Sites of Community Importance (SCI); these sites are collectively referred to as Natura 2000 sites. Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites and proposed Ramsar sites should also be considered in the same manner in accordance with national planning policy.

9.2 Scope and Limitations of this Assessment

9.2.1 The results of a desk study and field surveys have been used to determine the baseline context of the Development Site. The information available provides a robust basis for undertaking an Ecological Impact Assessment (EcIA) as:

- Desk study data are available for adjacent areas and this suggests that these are not markedly different to the Development Site in respect of the potential presence of notable ecological features[3];
- Aerial imagery and observation during field survey indicates that habitats within adjacent areas are similar to those within the Development Site. It is reasonable to assume therefore that ecological features in adjacent areas that may be affected by the Proposed Development are similar to those that occur within the Development Site;
- The likelihood of potentially significant effects generally diminishes with distance from a Proposed Development, particularly where these relate to direct effects.

9.2.2 Field surveys predominantly followed the survey guidance that is widely recognised, including by Scottish Natural Heritage (SNH). Full details are provided in the accompanying survey reports, which also note where deviations occurred due to issues including adverse weather, health and safety concerns and land access (**AI Appendix 9B Phase 1 Habitat and NVC Survey; AI Appendix 9C Otter Survey 2018/19; and EIA Appendix 9D Freshwater Fish Survey**).

9.2.3 In the Scoping Report, SEPA confirmed that additional NVC surveys would not be required. However, since then the NVC results of a different application which overlaps the Proposed Development were appraised and it was suggested by SEPA that the **AI Appendix 9B** may no longer reflect the quality or sensitivity of the habitats present. It is not entirely unexpected that there is likely to be some shift in the type and distribution of specific plant communities, and surveyors rarely come up with exactly the same interpretation of results when carrying out an NVC survey so this is likely to account for some differences. The surveys set out in **AI Appendix 9B** recorded a healthy suite of bog communities and it remains that this baseline is unlikely to have changed substantially since then. Carrying out a further NVC survey would not change the level of sensitivity allocated to the bog habitat, nor would it change the level of assessment identified in this chapter, which is considered to be significant (see **Table 9.14**). Therefore there would be no benefit in updating the NVC to further inform the EIA.

9.2.4 The fish surveys were undertaken in accordance with good practice (SFCC 2007). The limitations on the fish surveys are set out in **EIA Appendix 9D.** The survey method does not provide a quantitative assessment of non-salmonid species and therefore a precautionary approach has been adopted in assessing effects on these species. Similarly, the assessment relies on two years of fish survey data, which reflects guidance but does not allow definitive conclusions to be reached on trends in fish numbers, plus there was some, albeit limited, variation between the 2010 and 2018 survey locations. Therefore, limited emphasis is placed on any apparent variation in fish numbers between the two survey years. Water levels were high to very high at a number of survey locations, which can influence the numbers of fish caught during the survey. Similarly in the event of low or patchy fish distribution this can make it more difficult to draw conclusions on fish density. The importance of fish populations is assigned based on the populations recorded within each watercourse, over multiple survey locations and two survey years, rather than at individual survey locations in any given year. Therefore a precautionary approach is adopted in categorising the importance of fish populations and in assessing the effects of the Proposed Development on them.

[3] Notable ecological features are those with conservation designations, but no legal protection.

9.2.5 It is considered that the limitations of the survey programme do not affect the robustness of the assessment of the likely significant effects of the Proposed Development.

9.3 Relevant Legislation, Planning Policy, Technical Guidance

Legislative Context

9.3.1 The legislative context of this EIA is set out in **EIA Chapter 5 Legislation and policy overview**. The following legislation has been considered in the assessment of the effects on ecological features[4]:

- Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) as transposed into Scots Law by the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (the "Habitats Regulations");
- Wildlife and Countryside Act 1981 (as amended in Scotland);
- Nature Conservation (Scotland) Act 2004 (as amended);
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003; and
- Marine (Scotland) Act 2010.

Planning Policy Context

National Policies

9.3.2 A summary of the relevant national planning policies is given in **Table 9.1**.

Table 9.1 National Planning Policy Issues Relevant to Ecology

Policy Reference	Policy Issue
SCOTTISH PLANNING POLICY (2014)	
Valuing the Environment Subject Policy (paragraphs 193-218)	The 'Valuing the Natural Environment' subject policy within the Scottish Planning Policy (SPP) (2014) sets out detailed policy provisions relating to the protection and enhancement of different types of natural resources and natural heritage assets, as detailed below: • Natural Heritage Planning Principles (paragraph 194); • Protecting Designated Sites (paragraph 196); • Development Management Decisions (paragraphs 202-206); • Non-Native Species (paragraph 206); • Protected Species (paragraph 214); and Woodland (paragraph 216).
Protecting Designated Sites (paragraph 196)	The SPP requires designated areas and sites to be identified and appropriately protected through development plans, without the use of buffer zones (paragraph 196). Within the same paragraph the SPP states that "*the level of protection given to local designations should not be as high as that given to international or national designations*".

[4] The Chartered Institute for Ecology and Environmental Management (CIEEM) refer to biodiversity receptors within technical guidance as ecological features.

Policy Reference	Policy Issue
Development Management Decisions (paragraphs 202-206)	The SPP states that planning decisions "*should take account of potential effects on landscapes and the natural and water environment, including cumulative effects*". The SPP further states that "*planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment*". It is noted in the same paragraph that whilst direct and indirect effects on statutorily protected sites will be an important consideration, this designation *does not impose an automatic prohibition on development*". In particular paragraph 205 states "*Where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO2) emissions. Where peatland is drained or otherwise disturbed, there is liable to be a release of CO2 to the atmosphere. Developments should aim to minimise this release*."
Non-Native Species (paragraph 206)	The SPP states that "*where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species*".
Protected Species (paragraph 214)	The SPP notes that "*the presence (or potential presence) of a legally protected species is an important consideration in decisions on planning applications. If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application*".
Woodland (paragraph 216)	The SPP notes that the Scottish Government's Control of Woodland Removal Policy "*includes a presumption in favour of protecting woodland. Removal should only be permitted where it would achieve significant and clearly defined additional public benefits*". The SPP also confirms that where woodland is removed in association with a proposed development, compensatory planting will generally be expected.
LOCAL PLANNING POLICY	
Outer Hebrides Local Development Plan (LDP) (2018)	The adopted Outer Hebrides LDP policies of relevance to this chapter include: • Policy EI3 Water Environment (seeks to ensure that new developments protect, and where possible deliver improvements to, water bodies (rivers, streams, lochs, groundwater, estuaries, coastal waters (to 3 nautical miles) and wetlands). • Policy EI5 Soils (seeks to ensure that developments are designed to minimise impacts on soil and unnecessary disturbance is avoided through application of sustainable management practices. Development proposals will only be approved where it has been demonstrated that unnecessary disturbance of carbon rich soils, such as peat and associated vegetation, has been avoided). • Policy NBH2 Natural Heritage (seeks to protect European, national and local conservation areas, protected species, biodiversity and geodiversity). • Policy NHB3 Trees and Woodlands (places stipulations on development proposals that require woodland removal);
BIODIVERSITY POLICY	
UK Biodiversity Action Plan (UKBAP) / UK Post-2010 Biodiversity Framework (UKBAP)	The UKBAP, produced in 1994 by the UK Government, was a national strategy for the conservation of biodiversity. The UKBAP was updated in July 2012 with a plan which covers the period 2011-2020. This framework is implemented individually by each of the four UK devolved areas. Within Scotland, the UKBAP is coordinated through the Biodiversity Action Reporting System (BARS), which is an online tool which contains a list of Scottish priority habitats and species (The Scottish Biodiversity List). All UKBAP species and habitats are listed in the SBL.
Scottish Biodiversity List (SBL)	The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004.

Policy Reference	Policy Issue
Western Isles Local Biodiversity Action Plan (LBAP)	The SBL is referred to instead of the LBAP as the previous version of the LBAP is no longer relevant.

Development Plan Policies

9.3.3 A summary of the relevant development planning policies is given in **Table 9.2**.

Table 9.2 Development Plan Policy Issues Considered within the Assessment of Ecology

Policy reference	Policy description
Outer Hebrides Local Development Plan Adopted Plan (2018)	
Policy NBH2: Natural Heritage	Where there is good reason to suggest that a European Protected Species (EPS)* is present on site, or may be affected by a proposed development, the Comhairle will require any such presence to be established and, if necessary, a mitigation plan provided to avoid or minimise any adverse impacts on the species, prior to determining the application. Planning permission will not be granted for development that would be likely to have an adverse effect on an EPS unless the Comhairle is satisfied that: a) There is no satisfactory alternative; and b) The development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; and c) the development will not be detrimental to the maintenance of the population of an EPS at a favourable conservation status in its natural range. Development proposals should avoid having a significant adverse effect on, and where possible should enhance, biodiversity and ecological interests of the site. Developers are encouraged to assess the impacts of their proposed development on UK Biodiversity Action Plan (BAP) priority species and habitats and Local BAP habitats and species. Developers should refer to the Scottish Biodiversity List for a full list of animals, plants and habitats considered to be of principal importance for biodiversity conservation in Scotland (this list includes all UK priority species).
Policy NBH3: Trees and Woodland	There is a strong presumption against the removal of established individual trees and woodland of mixed native species which have a landscape and amenity value and/or contribute to nature conservation, unless removal would achieve significant additional economic, environmental or social benefits. In order to minimise any adverse impacts on amenity, biodiversity or landscape value, developers will be required to incorporate existing trees and woodland into developments through sensitive siting and design. Where loss is unavoidable, appropriate replacement planting should be sought through the use of planning conditions or through a legal agreement if appropriate. The Comhairle will seek opportunities to create new woodland and plant native trees in association with new development. The Comhairle will support proposals associated with the restoration and enhancement of the native woodland resource as identified in the Western Isles Native Woodland Restoration Survey Report.
Outer Hebrides Local Development Plan Supplementary Guidance: Wind Energy Development	
Natural Heritage	All provisions of Policy NBH2 Natural Heritage and Policy NBH3 Trees and Woodland of the Outer Hebrides Local Development Plan apply in assessing the potential impact of wind energy developments on natural heritage. In addition, the following policy provisions apply to wind farm proposals:

Policy reference	Policy description
	• International and national sites are identified as areas of constraint; in these areas wind farms may be appropriate in some circumstances but further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation; • In relation to other nationally important environmental interests, the policy principles relating to 'carbon rich soils, deep peat and priority peat-land' are outlined in Policy ' Soil Resources' and for 'areas of wild land' as shown on 2014 SNH Map of Wild Land Areas in Policy 'Landscape and Visual Impact'. It is important to assess whether there are processes or pathways by which a proposal lying outwith a designated site may still influence the sites' 'qualifying interests'. For proposals within such 'supporting habitat', further assessment may be required to establish impacts on the integrity of sites.

Technical Guidance

9.3.4 Publications that provide guidance that is relevant to the assessment of potentially significant effects on ecology are listed below:

- Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester;
- SEPA (2010a) Land use planning system SEPA guidance note 4: Planning Guidance on wind farm developments (including guidelines for groundwater unit staff and ecologists when assessing the impacts of wind farms on groundwater and associated receptors);
- SNH (2010) Floating Roads on Peat;
- SEPA (2008) Engineering in the water environment good practice guide: construction of river crossings;
- Forestry Commission (2003) Forests and Water Guidelines fourth edition;
- Anderson, R. (2001) Deforesting and restoring peat bogs: a review. Forestry Commission Research Paper/Report;
- Anderson, R. (2010) Restoring afforested peat bogs: results of current research. Forestry Commission Research Note http://www.forestry.gov.uk/pdf/fcrn006.pdf/$FILE/fcrn006.pdf;
- CIRIA C648 (2006), Control of water pollution from linear construction projects;
- SNH (2013) Constructed tracks in the Scottish Uplands. Updated September 2015;
- Scottish Renewables, SNH, SEPA, Forestry Commission Scotland and Historic Environment Scotland (2015). Good Practice during Wind Farm Construction (3rd Edition);
- Welstead, J., Hirst, R., Keogh, D., Robb G. and Bainsfair, R. (2013). Research and guidance on restoration and decommissioning of onshore wind farms. Scottish Natural Heritage Commissioned Report No. 591; and
- Godfrey (2005) Site Condition Monitoring of Atlantic Salmon SACs. SFCC to Scottish Natural Heritage, Contract F02AC608.

9.3.5 Technical guidance used to define the survey methods and inform this assessment are referenced in **AI Appendix 9B; AI Appendix 9C; and EIA Appendix 9D.**

9.4 Data Gathering Methodology

Study Area

9.4.1 The "Study Area" encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this chapter. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the study area. The Study Area comprises:

- The Development Site (as defined in **AI Chapter 4** and **EIA Figures 1.1, 1.2** and **AI Figure 4.1**);
- The desk study area for European sites;
- The desk study area for legally protected and notable ecological features; and
- The field survey areas.

9.4.2 The extent of the desk study area(s) and field survey area (see **Table 9.3**) were determined based on best practice guidance and a high-level overview of the types of ecological features present, and the potential effects that could occur (see Figure 9A.1 Biodiversity Study Area in **EIA Appendix 9A Ecological Desk Study**). The Study Area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence[5] (ZoI) relevant to all ecological features (see **Table 9.8** and **Section 9.7**) were covered during baseline data collection activities.

9.4.3 As the design of the Proposed Development has evolved iteratively, the Study Area, and its constituent parts, has been regularly reviewed to ensure that its extent was adequate to enable the assessment of all potentially significant effects of the ecological features identified. Changes to the initial developable area, or the precise nature of the development, have been reviewed in light of the ecological features present (this being informed by the data gathering exercise) and the potential effects that could occur. At each stage of design evolution, the extent of the Study Area, including all of its components, was tested using the methodology described in **Section 9.7** to ensure adequate information was available on which to base an assessment.

Desk Study

9.4.4 A desk-based data-gathering exercise was undertaken to obtain existing information relating to relevant ecological features, these being: statutory and non-statutory biodiversity sites; habitats and species of principal importance[6]; legally protected and controlled species; and other conservation notable species that have been recorded over the previous 10 years (i.e. since 2009). **Table 9.3** lists the data compiled within the desk Study Area (which is the Development Site and the additional areas of search beyond and is shown in **EIA Appendix 9A** at Figure 9A.1 Study Area).

9.4.5 Where appropriate, data were drawn from existing ecological records and site information obtained through field surveys conducted in 2010/ 11 as part of the 2012 Stornoway Wind Farm application. Field data collected during this period that is pertinent to this assessment included Phase 1 Habitat and National Vegetation Classification (NVC) Surveys (See **AI Appendix 9B**); otter surveys (See **AI Appendix 9C)**; and freshwater fish surveys (**EIA Appendix 9D**). **Section 9.4.7 to 9.4.13** describe survey work that was carried out in 2018.

[5] The Zone of Influence (ZoI) in this context is the area over which an individual ecological feature may be subject to a potentially significant effect resulting from changes in the baseline environment due to the Proposed Development.
[6] Scottish Biodiversity List features.

Table 9.3 Information Relevant to the Desk Study

Ecological Feature	Example/Description	Study Area[7]
Statutory sites designated under International conventions or European legislation	Wetlands of International Importance (also known as Ramsar sites), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)	The Development Site and within 20km of it.
Statutory sites designated under national legislation	Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)	The Development Site and within 2km of it.
Locally designated sites	Often termed as Local Wildlife Sites (LWS), County Wildlife Sites (CWS), Sites of Interest for Nature Conservation (SINC)	The Development Site and within 2km of it.
Scottish Biodiversity List; Red listed species[8]; and Legally protected species.	Flora, fauna and habitats of principal importance for the conservation of biodiversity in Scotland. Species recorded on The IUCN Red List of Threatened Species and/or local Red Lists for the UK or relevant sub-units (e.g. regions or counties) and legally protected habitats and species include those listed on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended in Scotland), those included on Schedules 2 and 5 of the Habitats Regulations. Badgers are protected under the Protection of Badgers Act 1992.	The Development Site and within 2km of it.
Legally controlled species	Legally controlled species include those listed on Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended in Scotland).	The Development Site and within 2km of it.

9.4.6 **Table 9.4** lists the organisations and other sources that have supplied data, together with the nature of the information provided.

Table 9.4 Sources of Desk Study Data

Source	Nature of information provided
SNH's interactive map facility at (**https://sitelink.nature.scot/home**)	Access to data and information on key protected areas across Scotland.
Scottish Environment Protection Agency (SEPA) website (**www.sepa.org.uk)**	Information on the classification of the ecological status of waterbodies under the Water Framework Directive (WFD) and Freshwater Fish Directive (FFD).
National Biodiversity Network (NBN) gateway's information service (**http://data.nbn.org.uk**)	Commercially-available records of protected and/or notable species from within the last ten years.
Forestry Commission online map (**http://map.environment.scotland.gov.uk/landinformationsearch/lis_map.html**);	Extents of woodland and forests (including ancient woodland inventory areas) and Scottish Forestry (SF) approved areas for plantation.
Stornoway Wind Farm 2012 Environmental Statement (ES) Stornoway Wind Farm Variation 2016 ES	Phase 1 Habitat and National Vegetation Classification, Otter and Fish baseline surveys together with contextual material regarding the now consented wind farm. Ecology site walkover (February 2014), fisheries pre-construction baseline monitoring plan and fisheries crossing photos.

[7] Justification for the extent of the desk study areas is provided in Appendix 9A.

[8] Red listed species for the purposes of this assessment refer to those noted using IUCN criteria as being "Near Threatened", "Vulnerable", "Endangered" and "Critically Endangered", and those on present on local Red Lists in the categories "Nationally Scarce" and "Nationally Rare".

Source	Nature of information provided
Outer Hebrides Biological Recording group	Records of protected and/or notable species within a 2km radius of the Development Site.
Findlay, M., Alexander, L. & Macleod, C. 2015. Site condition monitoring for otters (*Lutra lutra*) in 2011-12. Scottish Natural Heritage Commissioned Report No. 521.	Baseline condition status of Lewis Peatlands SAC with respect to otters.
Ellendale Environmental (2017). Habitat Assessment of Abhainn Ghridda for Freshwater Pearl Mussel. Report for Point and Sandwick Trust	Freshwater pearl mussel survey and assessment of habitat suitability at two locations on the River Creed.

Survey Work

Habitat Survey

9.4.7 It was agreed through the scoping exercise (**EIA Appendix 2A Scoping Report and 2B Scoping Opinion**) that the comprehensive NVC survey carried out for the Stornoway Wind Farm in 2011 would be sufficient for this EcIA and no further vegetation survey was therefore carried out for the Proposed Development. See **Section 9.2.3** for further commentary.

Otter Surveys

9.4.8 An otter survey following standard methods was carried out on all watercourses and waterbodies within the Study Area between 03 and 07 September 2018 and 07 and 11 January 2019 (see **AI Appendix 9C**).

9.4.9 The survey comprised a walkover assessment of the main water features, associated banks, and up to 50m from bank tops within the Development Site and associated 200m buffer (100m buffer for proposed access tracks) (**AI Figure 9C.1 Study Area** located in **AI Appendix 9C**). Two surveyors worked in parallel to survey the watercourse edges/banksides of each watercourse in order to cover the area efficiently, and also to comply with health and safety requirements associated with work in/near water.

Fish Surveys

9.4.10 Electrofishing Surveys were conducted at 19 separate sites (**Figure 9D** located in **EIA Appendix 9D**) covering the three river catchments that intersect the Development Site: River Laxdale (Abhainn Lacasdail), Glen River (Abhainn a' Ghlinn Mhoir) and River Creed (Abhainn Ghrioda), with the River Creed being notably larger than the other rivers, plus the River Tope, which is situated to the south of the Development Site. The surveys were undertaken during one season and were completed between the 24th and 29th September 2018. The survey sites correspond approximately with the locations of previous similar surveys in 2010, which are reported in the 2012 Stornoway Wind Farm ES. The surveys are reported in detail in a separate report (**EIA Appendix 9D**).

9.4.11 The surveys were conducted by suitably qualified and experienced personnel in accordance with good practice. Fully quantitative methods were adopted, employing a multiple run (survey) approach at each survey location. All salmonids caught were identified (species), counted and measured (fork length). Non-salmonid species were recorded but not measured. Estimates of salmonid abundance were calculated based on the depletion in fish numbers recorded during successive survey runs at each survey location. Fish ages were derived based mainly on length, with the ages of some older fish verified by taking scale samples for inspection under a microscope.

9.4.12 Estimates of minimum fish density were calculated, separated into fry (0+ or young of the year) and parr (juveniles, typically 1 to 2 years old) for both salmon and trout, by dividing the number of fish caught by the area of habitat surveyed. Juvenile fish densities were classified according to the SFCC classification scheme - Outer Hebrides region (Godfrey 2005) and then categorised on a scale from excellent to very poor.

9.4.13 At each electrofishing site, instream habitat characteristics were also recorded in accordance with good practice (SFCC 2007), including instream cover, depths, substrates, flow types, bankside cover, bank face vegetation, overhanging boughs and canopy cover. This information was used to derive an evaluation (High, Good, Moderate or Poor) of the Fish (salmonid) Utilisation Potential and Fisheries (salmonid) Habitat Quality at each survey site, based upon professional judgement.

Freshwater Invertebrate Surveys (Including Freshwater Pearl Mussel)

9.4.14 The previous (2010/11) freshwater invertebrate surveys and freshwater pearl mussel surveys of the watercourses that cross the Development Site are detailed in the 2012 Stornoway Wind Farm ES and this information was reviewed as part of the desk study as set out above. These surveys did not record freshwater pearl mussels, recording mainly unsuitable or sub-optimal habitat for this species. Diverse assemblages of common and widespread invertebrate species that are typical of small upland watercourses in north Scotland were recorded. The baseline status of freshwater invertebrates is unlikely to have changed substantively since 2010/11 and no additional freshwater invertebrate surveys have been completed. This has been agreed with Scottish Natural Heritage (**Section 9.6**).

9.5 Overall Baseline

9.5.1 The description of the ecological features below provides a summary of the ecology baseline as determined through desk study and field survey. Further details of the desk study and field survey programme are provided in **Sections 9.10 – 9.17**, and detailed descriptions of the desk study and field survey results are provided in **EIA Appendix 9A** and **AI Appendices 9B and 9C**.

Current Baseline

Site Context and Surrounding Habitats

9.5.2 The Development Site is located south west of Stornoway and east of the Lewis Peatlands SAC, SPA and Ramsar on land owned by the Stornoway Trust. The terrain is characterised by low lying blanket bog and moorland, with fragmented coniferous plantation forest. The Development Site is intersected by three river catchments, from north to south the catchments are - the River Laxdale (Abhainn Lacasdail), Glen River (Abhainn a' Ghlinn Mhoir) and River Creed (Abhainn Ghrioda). The River Tope (Abhainn Leireabhaigh) is situated to the south of the Development Site. The River Creed is notably larger than the other watercourses. There are also a number of freshwater lochs within the Development Site.

9.5.3 Current land management practices comprise extensive sheep grazing and small-scale (crofter) peat cutting. In Arnish, to the south of the Development Site, sheep numbers are higher and grazing here is more intense. As a result, the vegetation here is much less lush and there are more frequent and extensive patches of bare peat with signs of trampling.

Statutory Nature Conservation Sites (International/European)

9.5.4 Figure 9A.2 Statutory Nature Conservation Sites (**EIA Appendix 9A**) illustrates the locations of the statutory nature conservation sites designated under international conventions or via European directives within the Study Area. These comprise:

- The Lewis Peatlands SAC, located to the west of the Proposed Development (1,065m from the closest proposed infrastructure); and
- The Lewis Peatlands Ramsar is designated, in part, for its blanket bog, and is located adjacent to and extends along the western and northern boundaries of the Development Site (<100m from the closest proposed infrastructure).

9.5.5 Sites designated primarily for ornithological interest are discussed in **AI Chapter 8**.

Statutory Nature Conservation Sites (National)

9.5.6 Figure 9A.2 (**EIA Appendix 9A**) illustrates the locations of the statutory nature conservation sites designated under national legislation within the Study Area. These comprise:

- Tong Saltings SSSI (3.5km east of the Proposed Development); and
- Achmore Bog SSSI (2.4km south west of the Proposed Development).

Non-Statutory Nature Conservation Sites

9.5.7 No non-statutory nature conservation sites were recorded within the Study Area.

Habitats

9.5.8 A detailed summary of the habitats/vegetation communities present across the Development Site is presented in **AI Appendix 9B**.

- A Phase 1 Habitat map is presented **in AI Figures 9B.1a-f**;
- NVC maps are presented in **AI Figures 9B.2a-n**.

9.5.9 **Table 9.5** summarises the status and classification of the vegetation communities recorded within the survey area and identifies whether these have the potential to be groundwater dependant terrestrial ecosystems (GWDTE) under SEPA guidance (SEPA 2010).

Table 9.5 Vegetation Communities Recorded on Site

Community Type	Phase 1 Habitat Classification (JNCC, 2010)	NVC Community Code	Potential Groundwater Dependant Terrestrial Ecosystem? (SEPA 2010)
Blanket Bog/Mire Communities	Blanket bog, Modified Bog	M1 *Sphagnum denticulatum* bog pool	No
		M3 *Eriophorum angustifolium* bog pool	No
		M17a *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire *Drosera rotundifolia - Sphagnum spp.* sub-community	No
		M17b *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire *Cladonia* spp. sub-community	No
		M17mod modified *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire (variant devised for survey)	No
		M19a *Calluna vulgaris-Eriophorum vaginatum* blanket mire *Erica tetralix* sub-community	No
Marshy grassland/ rush and pasture	Marshy grassland	M25a *Molinia caerulea-Potentilla erecta* mire *Erica tetralix* sub-community	Yes
		M23b *Juncus effusus/acutiflorus-Galium palustre* mire *Juncus effusus* sub-community	Yes
Flushes, soakways and springs: acidic and base-rich	Acid Flush	M6ci *Carex echinata-Sphagnum fallax* mire *Juncus effusus* sub-community *Sphagnum fallax* variant	Yes
		M6di *Carex echinata-Sphagnum fallax* mire *Juncus acutiflorus* sub-community *Sphagnum fallax* variant	Yes
	Basic flush	M10 *Carex dioica-Pinguicula vulgaris* mire	Yes
Dry Heath communities	Dry dwarf shrub heath, acid dry heath	H10a *Calluna vulgaris-Erica cinerea* heath Typical sub-community	No
		H10b *Calluna vulgaris-Erica cinerea* heath *Racomitrium lanuginosum* sub-community	No
		H12a *Calluna vulgaris-Vaccinium myrtillus* heath *Calluna vulgaris* sub-community	No
		H12c *Calluna vulgaris-Vaccinium myrtillus* heath *Galium saxatile-Festuca ovina* sub-community	No
Wet Heath communities	Wet heath	M15b *Trichophorum cespitosum-Erica tetralix* wet heath Typical sub-community	Yes
		M15c *Trichophorum cespitosum-Erica tetralix* wet heath *Cladonia spp.* sub-community	Yes
Acid Grassland communities	Semi improved acid grassland	U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland *Holcus lanatus-Trifolium repens* sub-community	No
Mesotrophic Grassland communities	Marsh/ marshy grassland	MG10a *Holcus lanatus-Juncus effusus* rush pasture typical sub-community	Yes

Community Type	Phase 1 Habitat Classification (JNCC, 2010)	NVC Community Code	Potential Groundwater Dependant Terrestrial Ecosystem? (SEPA 2010)
Broadleaved woodland	Planted broadleaved woodland		No
Coniferous woodland	Planted coniferous woodland		No

Groundwater Dependent Terrestrial Ecosystems

9.5.10 The NVC survey identified the presence of a number of potential GWDTEs within the Proposed Development Site.

9.5.11 A summary of NVC communities within the Study Area that may indicate the presence of GWDTE is provided within the Desk Study (**EIA Appendix 9A**). Each potentially groundwater dependent area was allocated a unique number identifier and five separate NVC plant communities were assessed for actual groundwater dependence. A full description of this assessment and the GWDTEs is provided in **EIA Chapter 11** and **EIA Appendix 11F GWDTE Risk Assessment**.

Watercourses and Waterbodies

9.5.12 The site is intersected by three river catchments, from north to south: River Laxdale (Abhainn Lacasdail), Glen River (Abhainn a' Ghlinn Mhoir) and the River Creed (Abhainn Ghrioda). The River Tope (Abhainn Leireabhaigh) is situated to the south of the Development Site. These are relatively small watercourses, crossing moorland/heath, with the River Creed being comparatively larger than the other watercourses. The watercourses are characterised by variable flow types, including riffle/run/glide sequences, and the water is generally less than 1m deep with variable substrates comprising mainly cobble, pebble and boulder. The watercourses connect a number of freshwater lochs on the Development Site. Further details of these watercourses and waterbodies are included in **EIA Chapter 11.**

Species

Otter

9.5.13 Otter surveys conducted between September 2018 and January 2019 identified relatively widespread distribution of otter activity along waterbodies within the Development Site, in the form of spraints, paths, prints, feeding signs and resting sites (comprising holts and couches). Areas of highest otter activity appear to be located within the Abhainn Ghrioda catchment, surrounding Loch a Chlachain, the Abhainn Ghrioda watercourse and associated tributaries, Loch Speireag and Fedan Loch Lochan. This generally accords with the findings of the 2011 surveys.

9.5.14 Further details on the methods and findings of the otter field surveys together with the results of an ecological desk study are detailed in the technical baseline report (**AI Appendix 9C**).

Freshwater Fish

9.5.15 The watercourses that cross the Development Site, and the River Tope to the south, support salmonid fisheries, mainly comprising Atlantic salmon (*Salmo salar*) and sea trout/brown trout

(*Salmo trutta*)[9], as well as eels (*Anguilla anguilla*) and three-spined stickleback (*Gasterosteus aculeatus*).

9.5.16 Salmon were not recorded on the Glen River in 2010 or 2018, but were recorded on the other three watercourses. The 2010 and/or 2018 fish surveys of the site recorded very high (or 'excellent') densities of salmon fry and salmon parr on the River Creed and River Tope. Salmon fry and parr were recorded at 'excellent' and 'good' densities respectively on the River Laxdale in 2018. Sea/brown Trout were recorded on all four watercourses, with trout fry and parr reaching very high densities on the River Creed, Glen River and River Tope and high densities on the River Laxdale.

9.5.17 Sea Lamprey has previously been recorded on the River Creed (https://scotland.nbnatlas.org/). One or more lamprey species (brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) or sea lamprey (*Petromyzon marinus*)) could occur within the catchments of watercourses that cross the Development Site.

9.5.18 Further details on the methods and results of the freshwater fish surveys undertaken in 2018 are detailed in the technical baseline reports (**EIA Appendix 9D**). The 2010 fish surveys at approximately the same survey locations are reported in detail in the 2012 Stornoway Wind Farm ES.

Freshwater Pearl Mussel and Other Freshwater Invertebrates

9.5.19 Previous (2010/11) freshwater invertebrate surveys of the Development Site are reported in detail in the Stornoway Wind Farm 2012 ES and focused on the River Creed, Glen River and River Laxdale. These surveys recorded diverse assemblages of common and widespread invertebrate species that are typical of small upland watercourses in north Scotland and with no rarities or protected species recorded. The assemblages recorded were indicative of clean/unpolluted, well-oxygenated conditions in these watercourses (which were slightly acidic).

9.5.20 Previous (2010/11) freshwater pearl mussel surveys of the watercourses that cross the Development Site are also reported in detail in the 2012 Stornoway Wind Farm ES. The reaches sampled are distributed throughout the Development Site and were recorded as mainly unsuitable or sub-optimal habitat for freshwater pearl mussels; and none were found. A subsequent freshwater pearl mussel survey of two locations (one towards the upstream limit of the Development Site and one downstream of the Development Site) on the River Creed was undertaken as part of the planning application for Sandwick North Street Community Wind Turbine (Ellendale Environmental 2017). This survey recorded 'low suitability' habitat for this species at the survey location on the upper Creed and 'medium suitability' habitat at the survey location on the lower Creed but no freshwater pearl mussels were recorded.

Future Baseline

9.5.21 Determining a future baseline draws upon information about the likely future use and management of the site in the absence of development, known population trends (for species), climate change and any other proposed developments (consented or otherwise) that may act cumulatively with the Proposed Development to affect ecological features.

9.5.22 It is unlikely that in the absence of the Proposed Development, any future baseline would be markedly different from the current baseline. Land use/management is currently anticipated to remain largely unchanged in the absence of development and it is therefore considered appropriate to use the current baseline for the purpose of this assessment.

[9] Sea trout and brown trout are the same species, however sea trout are anadromous, migrating to the sea as juveniles and returning to rivers as adults to spawn.

9.5.23 There are emerging, downward trends in the status of some freshwater fish populations, including migratory salmonids, on watercourses throughout Scotland/UK, which could also influence the future baseline ecological status of watercourses/waterbodies. There are however also legal drivers (Water Environment and Water Services (Scotland) Act 2003) with the objective of achieving 'no deterioration' and 'enhancement' in the ecological status of waterbodies/watercourses, including fish populations. It is therefore appropriate to conclude that the future baseline status of freshwater ecological receptors would not be markedly different from the current baseline and use the current baseline for the purpose of the assessment of effects on freshwater ecology.

9.6 Consultation

Table 9.6 provides a summary of consultee comments about the Proposed Development at scoping stage and how these have been considered in this assessment. Consultation comments on the **EIA Report 2019** are set out in the Interim Response Report (see **Appendix AI 3A Interim Response Report**) at **Table 3.2**.

Table 9.6 Summary of Consultee Comments Regarding Ecology

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
Forestry Commission Scotland (July 2018)	Up to 8 turbines are to be located either within or immediately adjacent to the woodland areas. The scale of tree felling required to accommodate the wind turbines and supporting infrastructure (e.g. a borrow pit or an access track) is difficult to predict. The impact on the woodland asset is similarly difficult to assess, for which reason SF would welcome the inclusion of a dedicated Forestry chapter within the EIA report for the proposed development. The scale of woodland removal (both temporary, to accommodate construction, and permanent – for infrastructure, and potentially, as a result of future habitat management proposals) needs to be clearly stated within the EIA report. SF expects to see information on areas that are to be replanted post construction on-site, and areas of permanent woodland loss, for which compensatory planting might be required. SF will seek that the requirement for compensatory planting (should there be any permanent loss) was a condition of approval and that planting had to be in place prior to construction commencing. There may be requirement for a Compensatory Planting Plan.	Coniferous plantation woodland has been scoped out of the ecology assessment (see Table 9E.2 in **EIA Appendix 9E Scoping assessment summary**). A dedicated forestry chapter has not been included in the EIA Report, however **AI Appendix 9J Forestry** sets out the forestry position for the EIA which has been updated in the Interim Response Report (December 2019) on Page 3. The scale of woodland removal is considered in **AI Appendix 9J** Compensatory planting will be across the Development Site and would be limited to native planting in discrete areas where this would be ecologically beneficial and, importantly, where the trees should be able to establish and grow successfully. The principles for such planting are set out in the OHMP (**AI Appendix 9I**), and illustrated on **Figure 9I.4.1**. .	**AI Appendix 9J Section 9.8** **AI Appendix 9I**
SNH	As discussed with the applicant pre-scoping, we agree that the data previously collected will suffice for assessment of impacts upon freshwater pearl mussel and freshwater invertebrates. • Both Loch Orosay and Stornoway Castle Woodlands SSSIs has been de-notified since the 2011 application, so need not be considered further. • Achmore Bog SSSI is, in our view, at a distance beyond which we would not expect there to be connectivity with the development. • We agree with the identification of habitats and species of conservation concern to be scoped in. We note that the now-consented development was considered unlikely to have significant effects on the Lewis Peatlands SAC qualifying habitats. Please see HRA screening which draws the same conclusion.	Previously collected data on freshwater pearl mussel and freshwater invertebrates are used to inform the assessment. Loch Orosay and Stornoway Castle Woods SSSI have been scoped out of further assessment. **AI Appendix 8H** provides Habitats Regulations Screening.	**EIA Appendix 9A, EIA Appendix 9E,** **EIA Appendix 9E**

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
Comhairle nan Eilean Siar	Agrees with the developers undertaking to carry out surveys of otter at the substation and access track locations, and agrees that further work may be required depending on the initial findings of this work and on the advice of SNH.	Otter surveys were undertaken in 2018 and 2019, providing an up to date baseline for this species.	**AI Appendix 9C**
	Designated sites - Please note that Stornoway Castle Woods SSSI and the Loch Orasay SSSI have been declassified and are no longer designated. Therefore these two may be scoped out of the assessment for the EIA. Please ensure that data sets you are using for the assessment are up-to-date.	Loch Orosay and Stornoway Castle Woods SSSI have been scoped out of further assessment	**EIA Appendix 9E**
	Species and Habitats of Conservation Concern – We agree that the potential impact and potential effects of the Proposed Development on biodiversity, specifically on the blanket bog, marshy grassland, acid flush, dry heath, wet heath, acid grassland, (GWDTESs) and watercourse habitats and on otters should be fully considered.	A scoping assessment has been undertaken for all species and habitats of conservation concern. Ecological features have been scoped in for further assessment where they occur within a ZoI of the Proposed Development.	**Section 9.7, EIA Appendix 9E**
	The Comhairle is supportive of strategies to reduce negative effects and mitigate against predicted habitat and biodiversity loss. We would advise the developer to consult with SEPA and SNH for specialised advice and guidance on habitat restoration and on increasing biodiversity on the proposed site. For example, planting native woodland to increase biodiversity, create bird habitat and to offset carbon emissions.	Environmental Measures embedded into the Development Proposals would reduce negative effects and mitigate against predicted habitat and ecological loss. Additional mitigation, restoration and compensation proposals are proposed to address effects on sensitive blanket bog habitats and compensatory planting in specific areas to address forestry removal **(AI Appendix 9I OHMP**).	**Section 9.8** **Section 9.18**
SEPA	We consider that the following key issues must be addressed in the EIA process. To avoid delay and potential objection, the following information must be submitted in support of the application: a) Map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications; b) Map and assessment of impacts upon GWDTE and buffers; c) Map and assessment of impacts upon groundwater abstractions and buffers; d) Peat depth survey and table detailing re-use proposals; e) Map and table detailing forest removal; f) Map and site layout of borrow pits; g) Schedule of mitigation including pollution prevention measures; h) Borrow Pit site management plan of pollution prevention measures;	All engineering activities with potential to impact the water environment (including GWDTEs) are considered and assessed fully within **EIA Chapter 11**. All engineering activities with potential to impact upon peat are considered in the Peat Management Plan (**AI Appendix 9H PMP**) and Peat Slide Risk Assessment (**AI Appendix 9H**, appendix E). This chapter includes the assessment of effects on ecological features associated with water bodies and watercourses.	**EIA Chapter 11** **AI Appendix 9H** **Section 9.15**

Consultee	Comments	Response and How Considered in this Chapter	Section Ref
	i) Map of proposed surface water drainage layout; j) Map of proposed water abstractions including details of the proposed operating regime; k) Decommissioning statement.	Environmental measures embedded into the development proposals are presented, including proposed buffers and details relating to pollution prevention measures. The assessment considers forestry removal and presents the extent of permanent or temporary habitat loss. Proposed environmental measures relating to woodland removal are presented, which would be developed and implemented in consultation with CnES, and SNH (**AI Appendix 9I**).	**Section 9.8** **Section 9.8**
Fisheries Management Scotland (FMS)	The Outer Hebrides Fishery Trust, the relevant Scottish District Salmon Fisheries Trust, should be consulted on the development proposals. The guidelines issued to District Salmon Fisheries Boards and Trusts in dealing with planning applications should be fully considered throughout the planning, construction and monitoring phases of the development.	The OHFT was consulted on the development proposals but no response received from the Outer Hebrides Fishery Trust. Wood E&IS invited the Trust to carry out an electrofishing survey but they were unable to do so due to other commitments. This survey was subsequently carried out by Mhor Ecology and the results are presented in this assessment.	**EIA Appendix 9D**
Marine Scotland Science	The following is recommended, to be detailed in the EIA Report: • Site characterisation surveys; fully quantitative electrofishing surveys; and hydrochemical (including turbidity and flow data) sampling, to assess fish populations and water quality; • Appropriate site-specific mitigation measures; and • A robust integrated hydrochemical, macroinvertebrate and fish monitoring programme (before, during and after construction).	The assessment is informed by fully quantitative electrofishing surveys. Water quality is addressed in **EIA Chapter 11**. Site specific mitigation measures are outlined in this chapter and will be incorporated into a Construction Environmental Management Plan (CEMP).	**EIA Appendix 9D** **EIA Chapter 11** **Section 9.8**

9.7 Scope of the Assessment

9.7.1 The method for determining the scope of the assessment within the ecology chapter differs from that used in other technical chapters within the EIA in order to correspond with topic specific guidance (i.e. CIEEM 2018). However, the relevant receptors (i.e. ecological features), the spatial and the temporal scope are all defined in this section. The methodology followed has multiple stages, enabling the scope of the assessment to be progressively refined.

Ecological Features

Scoping - Determining Importance

9.7.2 For this ecological assessment the first stage in determining the scope of the assessment is to identify which ecological features identified through the desk study and field surveys (see **Section 9.5**) are 'important'[10] in the context of the Proposed Development. Following CIEEM (2018) guidance, the importance of ecological features is first determined with reference to UK legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Proposed Development.

9.7.3 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the Proposed Development, the level of importance can differ from that which would be conferred by legislative protection or identification as a conservation notable species and from one development to another. For example, watervole is important at a national level because it is a SBL species and has experienced a population decline of more than 25% in the last 25 years. However, a small population that could be affected by a development would be assessed as being of less than national importance if there is alternative well-connected and suitable habitat nearby that has the capacity to support individuals that may be displaced.

9.7.4 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the categorisation described in **Table 9.7** to determine importance for the purposes of this assessment. Where detailed criteria or contextual data are not available, professional judgement was used to determine the level of importance.

9.7.5 An explanation of all determinations of importance are provided in this section, **Table 9.8** (for scoped in ecological features) and **EIA Appendix 9E** (Tables 9E.1 and 9E.2) (for all ecological features both those scoped in and out) to ensure transparency.

[10] Importance relates to the quality and extent of designated sites and habitats, habitat/species rarity and its rate of decline. Ecological features that are not considered to be important are those that are sufficiently widespread, unthreatened and resilient and with populations that will remain viable and sustainable irrespective of the Proposed Development.

Table 9.7 Importance of the Proposed Development for Ecological Features

Geographic Context of Importance	Example / Description
International or European	1. European sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI), potential SPAs (pSPA) and possible SACs (pSACs) should also be considered in the same manner in accordance with National Planning Policy. 2. Areas of habitat or populations of species[11] which meet the published selection criteria based on discussions with SNH and field data collected to inform the EcIA for designation as a European site or Ramsar site, but which are not themselves currently designated at this level.
National	1. A nationally designated site including SSSIs and National Nature Reserves (NNRs). 2. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected, and in agreement with SNH. 3. Scottish Biodiversity List (SBL) habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance. 4. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory.
Regional	1. SBL species considered to be of regional importance in the context of published information on population size and distribution.
County	1. Local Nature Reserves and Non-statutory designated sites. 2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	1. SBL habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread semi-natural habitats occurring in proportions greater than may be expected in the local context. 3. Common and widespread native species occurring in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area. 2. Areas of heavily modified or managed land uses (e.g. hard standing used for car parking, as roads etc.)

9.7.6 Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features. With the exception of such species receiving specific legal protection, or those subject to legal control (e.g. invasive species), all ecological features that were determined to be of negligible importance have been scoped out of the assessment at this stage. Furthermore, ecological features of local importance were also scoped out at this stage where there was a specific technical justification to do so. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Proposed Development (in other words a significant effect in EIA terms could not occur). This approach is consistent with that described in CIEEM 2018. Specific justification for exclusion of each of these ecological features is provided in **EIA Appendix 9E** (Tables 9E.1 and 9E.2).

9.7.7 All legally protected species and ecological features that are of sufficient importance were then taken through to the next stage of the scoping assessment.

[11] This includes habitats and species listed under Annex I and Annex II of the Habitats Directive.

Spatial Scope

9.7.8 The construction, operation and decommissioning phases of the Proposed Development may result in the following direct and indirect environmental changes that could significantly affect ecological features/receptors:

- Land take for construction or decommissioning of infrastructure (turbine bases, access tracks, site compounds, borrow pits);
- Direct loss, harm or disturbance during construction or decommissioning;
- Changes to the surface hydrology that could affect drainage and/or dewatering;
- Disturbance as a result of light, noise and vibration;
- Pollution associated with accidental spillage of fuels, oils, run-off and dust emission i.e. via direct contact, air or water.

9.7.9 Key to establishing which environmental changes may result in likely significant effects, is the determination of a ZoI for each important ecological feature identified. ZoIs differ depending on the type of environmental change (i.e. the change from the existing baseline) as a result of the Proposed Development and the ecological feature being considered.

9.7.10 The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with the Proposed Development. This ZoI is the same for all affected ecological features.

9.7.11 By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (e.g. increased noise associated with construction activities within the land-take area), the ZoI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a water vole might only be disturbed by noise generated close to its burrow, while nesting marsh harrier might be disturbed by noise generated at a much greater distance, and other species (e.g. many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed (as far as possible) by a review of published evidence (e.g. disturbance criteria for various species) and discussions with the technical specialists who are working on other chapters of the EIA Report.

9.7.12 It should be noted that the avoidance of potentially significant effects through the design process is implicitly taken into account through the consideration of each ZoI, as are standard construction practices that are common place. When scoping in or out ecological features from further assessment, environmental measures (see **Section 9.8**) associated with general good practice that are described within the Code of Practice for planning and development (BSI, 2013**)** and Good Practice during Wind Farm Construction (Scottish Renewables *et al.*, 2015) have been taken in to account (e.g. dust suppression, appropriately scheduled vegetation removal etc.) and referenced in **EIA Appendix 9E**.

9.7.13 Ecological features that are scoped into the assessment (i.e. those of sufficient importance occurring within a relevant ZoI) are summarised in **Table 9.8**, along with a summary of the explanation behind their inclusion. For each ecological feature presented in **Table 9.8**, the potential environmental changes and potential significant effects resulting from the Proposed Development are provided. Ecological features that are scoped out of the assessment are identified in Table 9E.2 (**EIA Appendix 9E**).

Table 9.8 Likely Effects, ZoIs and Justification for Scoped in Ecological Features

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Lewis Peatlands SAC - Otter	European	National	Disturbance/displacement effects to SAC otter population	32km from the proposed construction/ maintenance/ decommissioning area	Otter is a European protected species, an SBL Priority species and a designated feature of the Lewis Peatlands SAC. The Proposed Development footprint is outwith all areas specifically designated for otter populations; however, the Proposed Development is within the home range (generally acknowledged to be up to 32km[12]) of otters from this designated site and therefore construction activity may give rise to the disturbance of otters that are part of the SAC population and there may be impacts to their prey species – either from the placement of infrastructure or due to noise disturbance.
			Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased noise, lighting, and human presence) during construction/operation and decommissioning related works.	Non-breeding resting sites: 30m from the proposed construction/ maintenance/ decommissioning area (based on SNH protected species advice)	Otter resting sites and signs were recorded within the Study Area, along the majority of watercourses in all four catchments. 32 resting sites were recorded within the Study Area. Of these, 25 were identified as 'low' status and seven were identified as 'moderate' status. All recorded non-breeding holts were recorded at least 30m from proposed activities; however, one 'low status' resting place and another moderate status resting place were identified within a potential disturbance threshold (within 30m of proposed works areas). A European Protected Species (EPS) Licence is likely to be required should proposed works occur within a threshold of disturbance within 30m of a resting site.

[12] https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
				Breeding resting sites: 200m from the proposed construction/ maintenance/ decommissioning area (based on SNH protected species advice)	No 'high status' resting sites were recorded within the Study Area and no evidence of breeding was recorded; nonetheless, pre-construction surveys have the potential to identify a breeding site, which would require appropriate measures and potentially an EPS licence to avoid contravention of legislation.
			Temporary severance of otter habitat and commuting routes	Within the construction/ maintenance/ decommissioning area	Evidence of otter activity was recorded along a number of watercourses and waterbodies within the Study Area, in the form of spraints, paths, prints, feeding remains, and resting sites. The Proposed Development could therefore lead to temporary habitat severance and fragmentation of territories during construction or decommissioning phases, particularly during the construction of water crossings.
			Direct mortality due to construction related activities	Within the construction/ maintenance/ decommissioning area	Evidence of otter activity was recorded along a number of watercourses and waterbodies within the Study Area, in the form of spraints, paths, prints, feeding remains, and resting sites. The Proposed Development could lead to an increase in mortality as a result of vehicle collision during construction or decommissioning phases in particular.
			Reduction in habitat quality as a result of hydrological connectivity and pollution incidents and impacts on prey	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	Inputs of silt and other fine material including peat can cause damage to fish habitats and direct mortality to fish and fish eggs. During surveys undertaken in 2010, it was observed that spawning habitat for salmonids in most burns appeared to be limited in extent and therefore any loss or damage to such habitat would likely be detrimental to trout and salmon populations and hence to otters.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Tong Saltings SSSI	National	Local	Reduction in habitat quality as a result of hydrological connectivity, silt release and pollution incidents from construction activities	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	Tongs Saltings SSSI is located approximately 3.5km downstream of the Development Site boundary. The site is designated for its breeding bird assemblage, maritime cliffs, mudflats, saltmarsh and sand dunes. There is a potential effect pathway along the catchment of the River Laxdale, which could lead to reduction in habitat quality of SSSI features, notably saltmarsh.
Blanket bog/mire habitats (M1, M3, M17a, M17b, M17mod & M19a) **Rare bog species: *Sphagnum austinii***	European	National	Permanent loss and temporary damage to terrestrial habitats Indirect disturbance and changes to composition of plant communities resulting from hydrological change	Within the construction/ maintenance/ decommissioning area 50m beyond the Development Site boundary	Blanket bog communities are the most abundant habitat within the Study Area and generally in good condition. These are a restricted and declining habitat in the UK and Europe. Blanket bog is a SBL Priority habitat and includes habitats / vegetation communities listed on Annex I to the EC Habitats Directive. However, there are frequent peat cuttings and areas of planted coniferous woodland, which have had detrimental impacts upon the condition of blanket mire plant communities within these areas. *Sphagnum austinii* is an important indicator species of undisturbed blanket bog and was mapped in M17a blanket mire vegetation. Three hummocks were recorded in a single location in M17a blanket bog. Overall, the Development Site is assessed as being of National importance for blanket bog including *Sphagnum austinii*. Land take and land use during construction is likely to lead to the loss/disturbance of this habitat and species.
Wet heath (M15b & M15c)	European	Regional	Permanent loss and temporary damage to terrestrial habitats Indirect disturbance and changes to composition of plant communities resulting from hydrological change	Within the construction/ maintenance/ decommissioning area 250m beyond construction/ maintenance/ decommissioning areas	Wet heath contains vegetation communities listed on Annex I of the EC Habitats Directive and is an SBL Priority habitat. The Development Site is assessed as being of Regional importance for wet heath. Land take and land use during construction and operation may lead to the loss/disturbance of this habitat. It may be also be sensitive to damage during construction works and contains GWDTE NVC communities (including M15 wet heath).

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Dry heath (H10a & H10b)	European	Regional	Indirect disturbance and changes to composition of plant communities resulting from hydrological change	50m beyond construction/ maintenance/ decommissioning areas	Dry heath is an SBL Priority habitat and includes habitats / vegetation communities listed on Annex I to the EC Habitats Directive. Dry heath is always dominated by heather and localised but not extensive within the Development Site. It is generally in good condition supporting a typical range of species and with no, or very light, grazing. The Development Site is assessed as being of Regional importance for Dry heath. This habitat type was not recorded within the Proposed Development footprint. However, dry heath contains GWDTE NVC communities (including H10 dry heath), which may be sensitive to damage during construction works - please see GWDTE assessment (**EIA Appendix 11f**).
Marshy grassland	National	County	Permanent loss and temporary damage to terrestrial habitats	Within the construction/ maintenance/ decommissioning area	Certain types of marshy grassland are SBL Priority habitat (Purple moor grass and rush pasture), which is commonly found around drained areas within the Study Area. However, the majority of this habitat comprises M25a, which is often symptomatic of degraded blanket bog and, together with M23b are generally impoverished and of low species diversity. The Development Site is assessed as being of County importance for marshy grassland. Land take and land use during construction may lead to the loss/disturbance of this habitat. Marshy grassland t also contains GWDTE NVC communities (including M25 mires and M23 rush pasture), which may be sensitive to damage during construction works.
			Indirect disturbance and changes to composition of plant communities resulting from hydrological change	250m beyond construction/ maintenance/ decommissioning areas	
			Indirect disturbance and changes to composition of plant communities resulting from hydrological change	250m beyond construction/ maintenance/ decommissioning areas	

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Waterbodies (Rivers and Lochs)	National	National	Localised loss of, and modification to, watercourse habitat at watercourse crossing locations; pollution/sediment release leading to degradation of river and loch habitats.	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	Rivers and lochs that meet certain criteria are SBL habitats. The rivers on the site also support SBL species. The Proposed Development includes a number of bridge and culvert river crossings. Works on these crossings during the construction and decommissioning phases could disturb instream and bank habitats and have associated risks of silt/pollutant discharges to watercourses. The operational development is also likely to have limited associated pollution risk [only arising from maintenance activities which are likely to be small scale and infrequent].
Atlantic salmon	European	Regional	Deterioration in fish populations due to: loss of, or damage to, juvenile salmonid habitat at watercourse crossings; obstruction of spawning migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	The watercourse that intersect the Development Site support comparatively high densities of salmon fry/parr, within the context of the Outer Hebrides Region. Atlantic salmon is a SBL species and has been subject to population declines on many rivers throughout Scotland. In the absence of a national or international nature conservation designation to protect the salmon populations associated with watercourses that cross the Development Site, or evidence to indicate that the populations/watercourses qualify for such designation, the Atlantic salmon populations are assigned 'Regional' importance. The Proposed Development includes a number of watercourse crossings. Works on these crossings during the construction and decommissioning phases could disturb instream habitats, create a temporary barrier to fish movement have associated risks of silt/pollutant discharges to watercourses. The operational development may have associated electromagnetic emissions and limited pollution risk.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Sea/Brown trout	National	Regional	Deterioration in fish populations due to: loss of, or damage to, juvenile salmonid habitat at watercourse crossings; obstruction of spawning migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	The watercourses that intersect the Development Site supports comparatively high densities of sea/brown trout fry/parr, within the context of the Outer Hebrides Region. Sea/brown trout is a SBL species. Sea trout in particular have been subject to population declines on many rivers throughout Scotland. The Proposed Development includes a number of watercourse crossings. Works on these crossings during the construction and decommissioning phases could disturb instream habitats, create a temporary barrier to fish movement have associated risks of silt/pollutant discharges to watercourses. The operational development may have associated electromagnetic emissions and limited pollution risk.
Lamprey (Sea lamprey, river lamprey and/or brook lamprey)	European	Local	Deterioration in fish populations due to: loss of, or damage to, juvenile/spawning habitat at watercourse crossings; disruption/obstruction of migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	No lamprey species were recorded during the fish survey however the catchments potentially support lamprey. All three UK lamprey species are SBL species. The Development Site has been assigned Local importance for Lamprey species populations on a precautionary basis, given the suitability of the habitats present and the possibility that one or more of these species may occur in low numbers within the Development Site and remained undetected during the surveys. The Proposed Development includes a number of watercourse crossings. Works on these crossings during the construction and decommissioning phases could disturb instream habitats, create a temporary barrier to fish movement have associated risks of silt/pollutant discharges to watercourses. The operational development may have associated electromagnetic emissions and limited pollution risk.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
European eel	European	Regional	Deterioration in fish populations due to: loss of, or damage to, habitat at watercourse crossings; disruption/obstruction of migration; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	This SBL species has been recorded in watercourses on the Development Site and has been assigned as being of Regional Importance on a precautionary basis, recognising that it has been subject to steep population declines in the UK and Europe. The Proposed Development includes a number of watercourse crossings. Works on these crossings during the construction and decommissioning phases could disturb instream habitats, create a temporary barrier to fish movement have associated risks of silt/pollutant discharges to watercourses. The operational development may have associated electromagnetic emissions and limited pollution risk.
Three-spined stickleback	Local	Local	Deterioration in fish populations due to: loss of, or damage to, habitat at watercourse crossings; harm to fish (direct physical harm/noise); degradation of fish habitats due to pollution/siltation; and harm to fish during operation (electromagnetic emissions).	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	This species is common, abundant and widespread. The Proposed Development includes a number of watercourse crossings. Works on these crossings during the construction and decommissioning phases could disturb instream habitats and have associated risks of silt/pollutant discharges to watercourses. The operational development may have associated electromagnetic emissions and limited pollution risk.
Freshwater Pearl Mussel	National	Local	Indirect effects due to effects on host fish species (salmonids) as set out above; and degradation of habitats due to pollution/siltation.	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	Although this SBL species has not been recorded, the Development Site has been assigned Local importance for freshwater pearl mussel as it could occur within suitable habitats that are found within the catchments that cross the Development Site. Works on watercourse crossings during the construction and decommissioning phases could disturb river habitats/substrates and have associated risks of silt/pollutant discharges to watercourses. The operational development is also likely to have limited pollution risk.

Ecological Feature	Importance – Legislation and Policy	Importance – Proposed Development	Environmental changes and potential significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
					The effects on salmonids outlined above could also have adverse effects on freshwater pearl mussels indirectly because salmonids are host vectors of juvenile mussels and have an important role in the establishment of local populations.
Freshwater Invertebrates	National (certain species)	Local	Deterioration in species populations and assemblages due to loss of, or damage to, habitat at watercourse crossings and degradation of habitats due to pollution/siltation.	River catchments (River Laxdale, Glen River, River Creed) that intersect the Development Site	The freshwater invertebrate assemblages at the Development Site are characterised by common and widespread species. Works on watercourse crossings during the construction and decommissioning phases could disturb instream habitats and associated freshwater invertebrate assemblages and have associated risks of silt/pollutant discharges to watercourses. The operational development is likely to have limited pollution risk.

Temporal Scope

9.7.14 The temporal scope of the ecological assessment is consistent with the period over which the Proposed Development would be carried out and therefore covers a.) construction; b.) operation; and c.) decommissioning periods (as outlined in **AI Chapter 4**).

a. Construction of the Proposed Development would be completed over a period of up to 30 months. Working hours are likely to vary through the year, depending on day length, but would typically be 12 hours per day Monday to Friday, and 7-1pm on Saturdays (**AI Chapter 4**);

b. Operation of the Proposed Development is anticipated to run for 25 years; and

c. Decommissioning would be anticipated to take less than 6 months - wind turbines (towers, nacelle, hub, blades and electrical kiosk) and substations would be dismantled using a crane and removed from the Development Site, whilst access tracks and sub-surface infrastructure below 1m deep would likely remain in situ.

9.7.15 The environmental changes identified in **Section 9.7.8** could occur during the construction phase, operational phase and decommissioning phases of the Proposed Development. The effects of the environmental changes are considered with respect to their duration, frequency, timing and reversibility for each of the scoped in ecological features in **Table 9.8**.

9.8 Environmental Measures Embedded into the Development Proposals

9.8.1 An iterative design process has been carried out, (**EIA Figure 3.2** and **AI Chapter 3**) and range of environmental measures have been embedded into the Proposed Development as outlined in **AI Chapter 4**. **Table 9.9** outlines how these embedded measures would influence the ecological assessment.

Table 9.9 Summary of the Embedded Environmental Measures and how these Influence the Ecological Assessment

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
CONSTRUCTION PHASE:		
Blanket bog communities	Direct habitat loss and temporary disturbance during construction	Design measures for minimising effects to sensitive habitats include: The layout of the wind turbines has been designed to ensure that turbines are constructed on areas of peat of <3m where possible to minimise peat excavation on the Development Site (**AI Appendix 9H**). Adopting the approach outlined in **AI Appendix 9F: Vegetation Sensitivity and Approach to Avoidance of Blanket Bog**, areas of most sensitive vegetation are avoided as much as possible, with preference to development in areas broadly categorised as lower sensitivity habitat including modified bog and areas of shallower peat. Access track layout was designed as far as reasonably practicable to use the minimum land take. In addition, all access track has been designed to be linear, without loops, to avoid creating islands of habitat fragmentation. The potential borrow pit search area, the permanent central/main substation and temporary construction compound areas have been sited to avoid sensitive vegetation communities where possible.

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
		Furthermore, since the submission of the EIA Report in May 2019, further design iterations have taken place, and the two secondary substations and laydown areas have been removed for the layout (see **Figure AI Figure 4.1**). Tight construction footprints would be adhered to in order to minimise damage to sensitive habitats. Foundations of all turbines would be excavated to bedrock (using either rock anchor, rock cage or excavation methods), and all access tracks on peat depths exceeding 1m would be of floating design (either Option A or Option B), to minimise effects on peat. The following measures would be incorporated in order to minimise construction effects to sensitive blanket bog habitats: ● As part of an overarching Construction Environmental Management Plan (CEMP), a Peat Management Plan would be developed and submitted pursuant to a condition of the deemed planning permission (based on **AI Appendix 9H**), in consultation with the Project Ecologist and the relevant consultees, in advance of construction works commencing. This would include the method of removal and storage for vegetated turves and peat together with good practice reinstatement and restoration measures for the re-use of excavated peat within the Development Site; ● Site supervision would be provided by a suitably experienced Environmental Clerk of Works (ECoW), who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention (see below), monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction good practice; ● Pre-construction surveys of all works areas over blanket bog would be undertaken by a suitably qualified ECoW in order to identify locations of any rare bog species (notably *Sphagnum Austinii*) and propose suitable avoidance buffers. ● A Habitat Management Plan (HMP) would also be implemented with the aim of ensuring successful restoration and reinstatement of affected blanket bog and wet heath within the Development Site. The HMP would be submitted pursuant to a condition of the deemed planning permission, following consultation with SNH and SEPA.
Watercourses, otters and freshwater fish	Silt/sediment and pollutant release, damaging fish habitats (inc. spawning habitat), potentially harming fish and associated adverse effects on fish and otter populations.	The following measures have been incorporated in order to minimise the risk of pollution and to ensure that impacts on watercourses' are either avoided or reduced: ● A Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) would be prepared and subject to consultation with SEPA and SNH in advance of any construction activities and implemented as part of the overall CEMP. This would set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs); ● All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings (2010) and, where culverts are required, have been designed in accordance with the CIRIA Culvert Design and Operation Guide (2010);

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
		• Bridge construction would be undertaken by vehicles operating from the bankside rather than in the watercourse; and • A construction area stand-off of at least 50m has been applied to all watercourses (except for watercourse crossings).
Freshwater Fish	Obstruction of migration and associated adverse effects on fish spawning and recruitment. Risk of harm to fish during works at watercourse crossings.	Watercourse crossing designs/construction would be informed by SEPA Good Practice Guide for the Construction of River Crossings (SEPA 2010b) and CIRIA Culvert Design and Operation Guide (CIRIA 2010). Bridged watercourse crossings would be used where feasible/practicable. Where this is impracticable, bottomless culverts will be used, having the benefit over more conventional culverts of maintaining the existing channel bed, substrate and hydromorphology. Culverts/bridges would be installed (and decommissioned) from the bank, in low flows, outside the period October to May inclusive and where possible during the period July to September inclusive. This timing restriction would apply to any construction/excavation work within 30m of watercourses. Any damming/over-pumping during work on watercourse crossings would be accompanied by a fish rescue scheme under the supervision of an ECoW. Culverts would be subject to a programme of inspection throughout the construction and operation of the Proposed Development. An integrated fish, freshwater invertebrate and water quality and river habitat monitoring plan would be prepared and implemented by an experienced ecologist to monitor the effects of the construction and decommissioning of the Proposed Development on freshwater ecology.
	Loss/severance of, or damage to, watercourse habitat at watercourse crossings, including associated adverse effects on fish spawning and recruitment;	Watercourse crossing would be micro-sited to avoid unconsolidated gravel and pebble substrates and riffle habitats. Culverts would be a single pipe structure i.e. not comprising multiple pipes. Culverts would be full pipes where the base would be covered with a natural bed. Culvert construction would be supervised by the ECoW, with culverts transferred to watercourse crossings intact, avoiding mixing concrete near to watercourse crossings. With the exception of work at watercourse crossings a buffer/exclusion zone (50m radius) around watercourses would be implemented.
	Silt/sediment and pollutant release, damaging fish habitats (inc. spawning habitat), potentially harming fish and associated adverse effects on fish populations.	With the exception of work at watercourse crossing, a buffer/exclusion zone (50m radius) around the watercourse network would be implemented. Additional measures to minimise the risk of pollution sediment release to watercourses are set out in detail in **EIA Chapter 11**. These include for example: avoiding construction activity and temporary or permanent infrastructure in flood zones, steeper gradients and areas at risk of peat slide. Drainage designs and a Peat Management Plan and Water Management Plan would avoid silt-laden run-off entering watercourses, directing drainage away from watercourses. Dewatering designs would allow collection and settlement of suspended sediment (silt traps, fences, straw bales or where necessary swales and settlement lagoons). A PPP and PIRP would be implemented as part of the CEMP. The ECoW would inspect all dewatering regularly and get any identified defects fixed within a day.
	Noise and vibration and associated harm to fish.	With exception of watercourse crossing (construction and operation), a buffer/exclusion zone (50m radius) around the watercourse network would be implemented, which would minimise noise/vibration effects on fish. Culverts would be installed (and decommissioned) from the bank, in low flows, outside the period October to May inclusive and where possible during the period July to September inclusive to avoid sensitive periods for fish. This timing restriction would also apply to any construction/ excavation work within 30m of watercourses. Construction of watercourse crossings would be completed over a period of short duration and taking care to minimise noise/vibration, such as avoiding impacts between plant and river bed/bank substrate and carefully lowering culverts into place.

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
		Other measures to be implemented as part of good site working practice to restrict noise emissions are detailed in **EIA Chapter 12 Noise**.
Freshwater pearl mussel (and other freshwater invertebrates)	Disturbance/harm to freshwater pearl mussel and other freshwater invertebrates due to habitat degradation and disturbance.	Freshwater pearl mussels were not recorded during surveys in 2010 of the watercourses that cross the Development Site and the majority of the habitats at the survey locations were recorded as sub-optimal or unsuitable for this species. This species is therefore unlikely to be affected by the development proposals. However, on a precautionary basis, each watercourse crossing would be inspected for this species in advance of construction, extending 50m upstream and downstream, to verify this conclusion. In the unlikely event that freshwater pearl mussel is recorded, the crossing would be micro-sited to avoid this species in consultation with SNH. The measures set out above to minimise effects on fish would also minimise effects of changes in downstream water quality on freshwater invertebrates.
Coniferous plantation woodland	Tree removal (direct habitat loss)	A Tree Removal Plan would be required along with a felling licence. If Consent is granted a Compensatory Planting Plan to replace all felled trees within the Development Site could be requested by conditions. The Compensatory Planting Plan would include: i. Assessment of existing Forestry on site – type, yields class etc. ii. Appraisal of Areas of Forestry to be lost as a result of the development to ascertain type and amount of Forestry to be replaced. iii. Replacement of up to 40.6ha of woodland, comprising: a. Appropriate areas of the site, expected to be along the eastern boundary of the Development Site, would be planted with native broadleaf / conifer species. The areas selected for native planting will consist of primarily Downy Birch, Rowan, areas of Alder, Willow and Scots Pine - all species preferred to be from local provenances where available and will be planted in the most suitable site conditions i.e. willow in the wetter areas, birch / Scots pine on the drier knolls, etc. b. Wetter parts of the Development Site, on land considered as less suitable for conventional restocking, will be planted as peatland edge woodland (PEW) which will consist of primarily Birch, Rowan, Alder and Scots Pine. The areas of PEW will contain a low density woodland which will help avoid net carbon loss that would result from conventional restocking on the poorer ground. The sole purpose of the PEW and Native plantations are for biodiversity benefits of woodland on peatland. The objective of the PEW area is to achieve at least a 20% canopy cover and planting will comprise of 50% planted and 50% open ground; i.e. 550 stems per hectare. An element of non-native natural regeneration will be tolerated within the PEW areas as long as it does not compromise the growth of the native species. c. Retain significant areas of open ground to be retained of which a component relates to ground managed for environmental objectives including bog restoration.
Otter	Disturbance, Kill /injure /destroy habitat, affect distribution.	A Species Protection Plan (SPP) for otter would be prepared to ensure compliance with legislation. It would include details of pre-construction surveys to check on the presence of otters and the following suite of embedded measures that would be implemented across the Development Site to avoid causing harm to, or disturbing this species: • During normal working hours throughout the construction period the ECoW would be onsite to ensure that all environmental measures relevant to otter are delivered and ensure compliance with legislation.

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
		• Avoid working or artificial lighting within 50m of watercourses/ waterbodies during the hours of darkness, taken to be 30 minutes before sunset to 30 minutes after sunrise. • All works in proximity to waterbodies / watercourses would follow measures outlined in the CEMP to ensure their complete protection against pollution, silting and erosion as further outlined in the PPP and PIRP; • Culverts would be fitted with mammal ledges and a suitably textured ramp extending to the level of the road; • Strict speed limits would be followed on access tracks during all phases of development, and 'otter crossing' signs would be placed on the access tracks at all water crossings; • Trenches, holes and pits would be kept covered at night or provide a means of escape for otters (and other fauna) that may become entrapped. Gates to compound areas would be designed sensitively to prevent mammals from gaining access and would be closed at night. Any temporarily exposed pipes would be capped when contractors are off site to prevent otter from gaining access; • Any lighting used to accommodate such works must be positioned to minimise light spill onto watercourses/ waterbodies. The ECoW would monitor otter activity upstream and downstream of the works using camera traps and may stop site activities at any time should they consider that the works are having a detrimental effect on otter; • An emergency procedure would be implemented by site workers if otter are encountered. All works within 30m would cease as soon as it is safe to do so, and the ECoW would inspect the site and define appropriate measures (if required); and • Should construction activities take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity. This includes any works taking place within 50m of the watercourse. <u>EPS licence-specific measures to prevent disturbance to otters at resting sites within 30m of proposed works [Couch TN5 and Holt TN10]:</u> • An ECoW would provide supervision during the works and would set up a 10m exclusion zone around the resting site in advance of works commencing; • A tool-box talk would be provided to all site construction workers to raise awareness of potential disturbance effects to otters; • Construction works on the access track and water crossings would be limited to daytime hours (avoiding early morning and early evening; and • Surveys would be undertaken prior to, during and following works to assess the status of the resting site.

Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
OPERATIONAL PHASE		
Watercourses, otters and freshwater fish	Pollution	The majority of the specific measures applied during ongoing and operational activities relate to the application of good practice in terms of managing and controlling activities to minimise the risk of pollution upon receptors and hydrological features. A detailed explanation of the general site pollution control, emergency procedures and contingency planning is set out within **EIA Chapter 11.** The potential risks to surface water during operation are likely to be limited and localised based on the planned turbine servicing works and the nature and volume of potentially polluting substances required. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance.
Freshwater fish	Electromagnetic emissions and harmful effects on fish.	Cabling along access tracks would be over 50m from the watercourse network and buried. In a limited number of instances where cables cross watercourses these would be installed on the bridge
Otter	Disturbance, Kill /injure /destroy habitat, affect distribution.	All operational and maintenance work requirements would be undertaken within working areas clearly defined in advance of works and the storage of materials would be restricted to areas of hardstanding e.g. permanent tracks, crane pads or substation and control building, and associated infrastructure.
DECOMMISSIONING PHASE		
All ecological features	Similar changes and effects to construction phase	During the decommissioning of the Proposed Development, potential effects on ecological features are expected to be similar to those encountered during the construction phase and therefore similar environmental measures would be required. Any new legislation published prior to decommissioning would be adhered to and incorporated into an EMP prior to decommissioning taking place.

9.9 Assessment Methodology

Introduction

9.9.1 The generic project-wide approach to the assessment methodology is set out in **AI Chapter 4**, and specifically in **Section 4.2**. However, whilst this has informed the approach that has been used in this ecological assessment, it is necessary to align to the standard industry guidance provided by CIEEM (2018).

9.9.2 The assessment has been based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped in to the assessment, where this information is available), and professional knowledge of ecological processes and functions.

9.9.3 For each scoped-in ecological feature (see **Table 9.8**), potential effects were assessed against the current baseline conditions for that feature during construction, operation and decommissioning.

9.9.4 Throughout the assessment process, the initial results of the assessment regarding potentially significant effects have been used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Proposed Development to avoid or reduce adverse effects or to deliver enhancements (see **Section 9.8**). The results of the assessment, as set out in **Section 9.10** to **9.17**, therefore reflect the final scheme design (i.e. incorporating the environmental measures described in **Section 9.8** and **Table 9.9**).

9.9.5 The spatial extent of the assessment (see **Table 9.8**) reflects the area occupied by the ecological feature that is being assessed and, as a minimum, the ZoI of the changes that may affect it.

9.9.6 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change as a result of the Proposed Development, an assessment has been made of the effects on the designated site as a whole. A similar approach has been taken for areas of notable habitat.

9.9.7 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g. for foraging or as breeding territories) rather than the footprint of the Development Site.

Significance Evaluation Methodology

Overview

9.9.8 CIEEM (2018) defines a significant effect as one "*that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general*".

9.9.9 When considering potentially significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[13]:

- Extent – the spatial or geographical area over which the environmental change may occur;
- Magnitude – the size, amount, intensity or volume of the environmental change;
- Duration – the length of time over which the environmental change may occur;

[13] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2018. Other chapters in this EIA Report may use some of the same terms albeit with a different definition.

- Frequency – the number of times the environmental change may occur;
- Timing – the periods of the day/year etc. during which an environmental change may occur;
- Reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of Change

9.9.10 A scale for the magnitude of the environmental change as a result of the Proposed Development has been described in **Table 9.10** to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

Table 9.10 Guidelines for the Assessment of the Scale of Magnitude

Scale of Change	Criteria and Resultant Effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project ZoI.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the project ZoI.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the project ZoI.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

Determining Significance - Adverse and Beneficial Effects

9.9.11 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Proposed Development. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (e.g. increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 9.10**.

9.9.12 Conservation status is defined as follows (as per CIEEM, 2018):

- "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area;*

- *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*".

9.9.13 The decision as to whether the conservation status of an ecological feature would alter has been made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Proposed Development.

9.9.14 A similar procedure is used where designated sites may be affected by the Proposed Development, except that the focus is on the effects on the integrity of each site; defined as:

- "*The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

9.9.15 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, which is often the case for non-statutory biodiversity sites, it is necessary to use professional judgement to identify the interest features or obtain additional information about the interest features from SNH, Scottish Wildlife Trust or the local planning authority responsible for identifying these sites, so that sufficient information on which to base an assessment is available.

9.10 Assessment of Effects: Lewis Peatlands Special Area of Conservation – Otter

Baseline Conditions

9.10.1 The Lewis Peatlands SAC is located approximately 900m from the western edge of the Development Site at its closest point. The SAC is designated for the following qualifying features: acid peat-stained lakes and ponds; blanket bog; clear water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels; wet heathland with cross-leaved heath; and otter populations. The only feature considered for further assessment is otter given that it is a wide ranging species that is known to occur within the Development Site; the SAC is sufficiently distant from the Proposed Development that significant effects on all other features are unlikely.

Desk Study

9.10.2 A review of the most recent condition monitoring assessment of Lewis Peatlands SAC otter population was undertaken (Findlay *et al.*, 2015). The recommended condition assessment for the site was assessed as favourable. Evidence of otter was found at 89% of sites surveyed with a predicted occupancy of 90%. There was 100% occupancy in 2004 so there has been a reduction in positive sites, but no loss of positive 10km squares. The number of positive mink sites has reduced from 13 sites in 2004 to two in 2012, presumably as a result of the Hebridean Mink Project (eradication programme).

9.10.3 Two records obtained from Outer Hebrides Biological Recording group indicate the presence of otter within 2km of the Development Site.

9.10.4 A review of the otter survey report prepared by Waterside Ecology in 2010/11 for the 2012 Stornoway Wind Farm ES found that resting sites and signs were present along the majority of watercourses in all four catchments with a high density of signs found along the River Creed in the centre of the survey the area, and along the Allt na Craoibhe/Abhainn Leireabhaigh, which forms its southern boundary. Few signs were identified away from the watercourses and immediate riparian zone (up to 10m from the watercourses), the main exception being the otter paths linking

catchments and sub-catchments. Paths crossing moorland often did so where watercourses or lochs came close to each together.

9.10.5 Evidence gathered during these surveys indicated that otters were present on the Development Site throughout the year.

Field Surveys

Otter surveys 2018/19

9.10.6 Otter surveys (following the same methods and Study Area as previous) were undertaken between September 2018 and January 2019 and identified relatively widespread distribution of otter activity along waterbodies within the Development Site, in the form of spraints, paths, prints and feeding signs; and resting sites (comprising holts and couches).

9.10.7 The locations of all recorded field signs are provided in **AI Appendix 9C** (Table 9C-A1), including grid references and detailed descriptions. Target Note (TN) reference numbers were applied to each resting site record, as detailed in Table 9C-A2. AI Figures 9C.2a otter field signs and 9C.2b otter resting places present the locations of otter field signs and resting features identified during the survey.

9.10.8 Evidence of otter activity was recorded along a number of watercourses and waterbodies within the Study Area, including Loch Garbhaig, Allt Loch Garbhaig, Allt Hulabie, Loch a' Leadharain, Loch a Chlachain and Abhainn Ghrioda, Loch Speireag and Fedan Loch Lochan, Struth Thoma Dhuibhe, and Loch Briodag. Field signs observed included spraints, paths, prints and feeding remains. The greatest density of otter field signs was recorded along Abhainn Ghrioda and associated tributaries, which is also the largest catchment within the Development Site. Few signs were recorded away from the watercourses and immediate riparian zone.

9.10.9 During the survey, seventeen resting sites, including seven holts and ten couches were identified, with an additional fifteen potential resting sites also recorded within the Study Area. Several well-established paths that serve as important commuting and foraging routes for otter were also identified.

9.10.10 When comparing results of the 2018/19 otter survey to those conducted in 2010/11, levels of otter activity across the Proposed Development site appear to be relatively similar. Several of the resting sites recorded in 2010/11 displayed signs of continued use during the 2018/19 surveys, indicating that these features are relatively permanent and serve as important otter habitat.

9.10.11 A slight variation in the pattern and location of otter activity between the two survey periods was observed in some areas. For example, the level of otter activity recorded further west along the main stem of Abhainn Ghrioda in 2018/19 appears to have reduced when compared to results from 2010/11. Otter activity also appears to have reduced within the Abhainn a' Glinn Mhoir catchment (situated immediately north of the Pentland Road) during the 2018/19 surveys compared to 2011 surveys, in terms of a reduced number of fresh/ recent otter field signs. In contrast, several additional resting sites were identified along tributaries to the north and south of Abhainn Ghrioda during the 2018/19 otter survey when compared to those carried out in 2010/11.

Future Baseline

9.10.12 In the absence of the Proposed Development, otters are likely to continue to utilise the Development Site. Given the abundance of suitable potential shelter on the Development Site, it is likely that the limiting factor on the population is prey resource. Spraint analysis undertaken at the in 2011 identified otters to be mainly feeding on freshwater fish and frogs, with limited evidence of

feeding in the marine environment. There is potential for otters to travel to the coast to feed if prey resources are reduced in the area of the Proposed Development. On this basis, it is assumed that the future baseline in respect of otter would be similar to the current baseline.

Predicted Effects and their Significance

Disturbance and Displacement of the Lewis Peatlands SAC Otter Population including Damage to Resting Sites (Construction)

9.10.13 The SAC is located upstream and approximately 900m from the Proposed Development. Given the distance from the Proposed Development, no otter resting sites within the SAC would be affected. However, individual otters supporting the SAC population will range over catchments connecting the Proposed Development and the SAC.

9.10.14 As an EPS, otters (and their resting sites) are classed to be of international importance and the Development Site is assessed as being of National importance for otters based on the survey results (see **EIA Appendix 9E**).

9.10.15 During surveys in 2018/19, several well used and apparently long-established otter travel routes were identified on the Development Site and the location of these and resting sites were taken into account when designing the Proposed Development, to avoid potential disturbance of these features wherever possible. This included:

- The number of watercourse crossings (four bridge crossings and 12 culverted crossings) was kept to a minimum to reduce the risk of pollution to watercourses;
- All turbines and infrastructure (save for watercourse crossings) have been located a minimum 50m from watercourses; and
- All construction works areas have been located a minimum 50m from resting sites with the exception of two resting sites (see **Section 9.10.17**).

9.10.16 No high-status resting sites (as identified in Table 9C.1 of **AI Appendix 9C**) were recorded and there was no evidence of breeding identified at any of the resting sites, which were categorised as being of moderate or low sensitivity (**AI Appendix 9C**).

9.10.17 Otters are highly mobile and can move away from areas of disturbance as the Development Site and wider areas are resource abundant for shelter; however, regardless of classification, any resting site that may be disturbed during construction or operation would have to be subject to the following site-specific measures and, if necessary, standard licensing procedures. Two resting sites are located within a 50m construction buffer and are also within a standard distance threshold (30m) for disturbance to otters and are considered further:

- Couch TN5 is located 14m from an access road and 23m from a watercourse crossing. The couch is assessed as a low status resting site, providing limited shelter in the form of a small sheltered alcove, which could provide suitable short-term shelter, but would be unlikely to provide prolonged day time use. Two other couches (TN6 and TN7) are situated within 75m and 100m respectively, as well as a holt (TN4) 190m away, providing alternative resting sites. Whilst the likelihood of disturbance to otters at this resting site is considered limited, given the proximity to the proposed construction area, as a precaution an EPS licence is likely to be required in order to avoid contravention of legislation protecting otters;
- Holt TN10 is located 30m from an access road and potentially within 30m from the works area around the turbine bases. Detailed plans are not currently available for the extent of works areas, therefore a precautionary approach assumes that there is likely to be a requirement to

undertake works within 30m of the holt (unless the turbine is microsited beyond this 30m). The holt is assessed as a moderate status resting site, owing to the presence of a tunnel feature that stretches for approximately 4m, some cover provided by dense rushes and many prints, a recent spraint and claw marks were present inside the feature. The resting site showed several signs of recent use and offers opportunity for more prolonged day time use. Further south along the same tributary, there are two holts and a couch (TN11, TN12 and TN13), approximately 125m, 275m and 335m respectively, providing alternative resting sites nearby. Given the proximity of two potential works areas and the greater likelihood of use, as a precaution an EPS licence is likely to be required in order to avoid contravention of legislation protecting otters.

9.10.18 Construction related disturbance/displacement effects to otters within the Development Site would be temporary and sporadic, and in light of the embedded measures outlined in **Table 9.9**, the magnitude of change would be low (and operational effects would be neutral).

9.10.19 Due to the extent of available watercourses/waterbodies and abundant resting sites within the Study Area that will remain undisturbed during construction and decommissioning, availability of foraging shelter habitat resource is not considered to be a limiting factor within the Development Site. Given the temporary nature of the construction works, the magnitude of change to the otter population that may form part of the Lewis Peatlands SAC population is considered to be low, and the resultant effect on the site's integrity and the species conservation status is not significant.

Temporary Severance of Otter Habitat and Commuting Routes (Construction)

9.10.20 There is also potential for construction activities to cause fragmentation of otter habitat and prevent the free movement of otters across their territories.

9.10.21 Access tracks have avoided crossing watercourses where possible, but due to the number of watercourses on the Development Site, and limitations regarding access locations, it is not possible for the development to take place without some being crossed. The Proposed Development includes four crossings and 12 culverted crossings. In the event that construction activities are scheduled to take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity.

9.10.22 Whilst otter is present across the Development Site, otter territories are likely to cover many kilometres of watercourses/water bodies, potentially within four catchments (Abhainn Lacasdail (River Laxdale), Abhainn a Ghlinn Mhoir (Glen River), Abhainn Ghrioda (River Creed), and Abhainn Leireabhaigh (River Tope)), much of which would be largely unaffected. Furthermore, the Proposed Development is likely to represent only a very small proportion of an otter's foraging territory, with alternative routes available including overland routes, and as such, the works would not be expected to result in permanent blockage of existing commuting routes.

9.10.23 On this basis, and in light of the embedded measures outlined in **Table 9.9**, the temporary loss or barrier effects during the construction of watercourse crossings would result in a low magnitude of change to the otter population that may form part of the Lewis Peatlands SAC population, and the resultant effect on the site's integrity and the species conservation status is not significant.

Direct Mortality of Individual Otters (Construction)

9.10.24 Construction and decommissioning phases of the Proposed Development would bring vehicles to a previously undeveloped area, and therefore there is potential for otters to be hit by vehicles. However, with the adoption of the environmental measures detailed in **Table 9.9**, the risk of direct mortality to individuals during the construction and decommissioning phases is low and would result in a low magnitude of change to the otter population that may form part of the Lewis

Peatlands SAC population, and the resultant effect on the site's integrity and the species conservation status is not significant.

Reduction in Habitat Quality as a result of Pollution Incidents (All Phases)

9.10.25 Whilst the access track and turbine layout were designed wherever possible to avoid sensitive otter features including resting sites and paths, it is also necessary to protect otters' food resource by avoiding pollution to the watercourses from the Proposed Development.

9.10.26 With the adoption of the environmental measures detailed in **Table 9.9**, degradation of food resource by pollution of habitats used by otter, during all phases of the Proposed Development is considered to be neutral. The overall magnitude of change to the otter population that may form part of the Lewis Peatlands SAC population is also considered neutral and the resultant effect on the site's integrity and the species conservation status is not significant.

Disturbance and Displacement of the Lewis Peatlands SAC Otter Population (Operation)

9.10.27 Operational effects on otters would be limited to potential occasional disturbance during routine maintenance and monitoring visits during the day to the Proposed Development. Such disturbance is likely to be for short duration and sporadic, resulting in a 'very low' magnitude of change and the resultant effect on the Lewis Peatlands SAC's integrity and the species conservation status is not significant.

Disturbance and Displacement of the Lewis Peatlands SAC Otter Population (Decommissioning)

9.10.28 During the decommissioning of the Proposed Development, potential effects on otters would be expected to be similar in nature to those during the construction phase and similar environmental mitigation measures are likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

9.10.29 The resultant magnitude of change on the otter population that may form part of the Lewis Peatlands SAC population is considered to be low and the resultant effect on the site's integrity and the species conservation status is not significant.

9.11 Tong Saltings SSSI

Current Baseline

9.11.1 Tong Saltings SSSI is located 3.5km to the east of the Development Site and is designated for its breeding bird assemblage, maritime cliff, mudflats, saltmarsh and sand dunes.

9.11.2 The site contains one of the largest areas of saltmarsh and tidal flats in the Outer Hebrides and is the best representative intertidal system on the eastern seaboard. It lies at the confluence of two river estuaries, the intertidal flats have plentiful invertebrate fauna and grade into saltmarsh and *Calluna* heath. Sand dunes occur on the sand and shingle spit of Teanga Tunga and on the exposed eastern accreting spit and sandy shore at the head of Broad Bay. Maritime grassland covers Teanga Tunga and Steinish Island. The outcrops on the beaches are conglomerate rock.

9.11.3 The site is also important for wintering, breeding and feeding birds, including terns, waders and wildfowl.

Predicted Effects and their Significance

Habitat Damage Due to Silt Release and Pollution during Construction, Operation and Decommissioning

9.11.4 Potential effects on the hydrology of surface waters are addressed in detail in **EIA Chapter 11**.

9.11.5 In summary, Tong Saltings SSSI is 3.5km downgradient of the Development Site, but the Abhainn Lacasdail (W01 – River Laxdale) (**Table 11.16**) connects two locations within the Development Site and would be a potential pathway for any, albeit diluted, effects.

9.11.6 Embedded environmental measures that look to protect this and other surface watercourses are extensive (**Section 11.8**). They include a 50m buffer zone applied to the entire river network, micro-siting of turbines, tracks and other infrastructure, careful access track drainage and watercourse crossing design (e.g. **Table 11.18**), and adherence to numerous relevant protocols, including the CEMP, good practice guidance regarding wind farm construction (Scottish Renewables *et al*., 2015) and the construction of river crossings, the SF and SNH (2010) guidance, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements (**Section 11.8**). Any dewatering would necessitate the use of silt traps, fences, straw bales, settlement lagoons, swales and SUDS, and any discharge to surface water would require consent from SEPA and would be subject to conditions attached to the consent. Other pollution prevention and emergency response planning measures are also relevant.

9.11.7 In summary, the potential effects on the River Laxdale would be limited to localised loss/disturbance of river habitats during installation of culverts and limited release of sediment at watercourse crossings. Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to the interest features of the SSSI. The effect on site integrity would be not significant.

9.12 Assessment of Effects: Blanket Bog Communities

Current Baseline

9.12.1 The vast part of the survey area (1358.85ha) is covered by blanket bog vegetation on deep peat.

9.12.2 The blanket bog in the Study Area conforms well to the documented NVC types (M1, M3, M17a, M17b) and it is considered to be in good condition throughout, except where drained for the planting of conifers. A detailed description of blanket bog vegetation communities is provided in **AI Appendix 9B**.

9.12.3 New peat continues to form and slowly deepen from the component mire species. Peat formation 'activity' is considered to be relatively high within the Study Area, with virtually no grazing over most of it, and the bog supports a very spongy and lush surface of mosses and lichens with vascular plants growing through it.

9.12.4 Parts of the blanket bog have undergone erosion in the past, resulting in dendritic gullying of the blanket bog. Although there is still some erosion in parts of the blanket bog, many of these areas now support actively re-generating vegetation and there is very little bare peat here compared to other areas of blanket bog on the Isle of Lewis and Scotland in general.

9.12.5 Around the edges of the blanket bog, where access is easier, there are many areas of peat cuttings. As a result, the peat is generally less deep but blanket bog species continue to grow and re-generate.

9.12.6 Although all the blanket bog is considered important, there are some areas that are particularly sensitive in nature, being generally much wetter, often with extensive pool systems. These have therefore been highlighted (**AI Appendix 9F**).

9.12.7 *Sphagnum austinii* is an important indicator species of undisturbed blanket bog and was mapped in M17a blanket mire vegetation. Three hummocks were recorded in a single location in M17a blanket bog. Full details of the NVC communities are provided in **AI Appendix 9B.** NVC communities are illustrated in **AI Figures 9B.1a-m**; a Phase 1 Habitat map is presented in **AI Figures 9B.2a-f**.

Future Baseline

9.12.8 Based on the 2011 baseline, the blanket bog habitat within the Development Site was found to be in healthy condition, with evidence of natural bog re-generation occurring in the previously disturbed peat cutting ground. Without the construction of the Proposed Development, over a 25-year timescale, it is likely that vegetation within peat cuttings would continue to re-establish within 3-5 years, as was observed at the time of survey. It is anticipated that peat cutting activity is likely to continue, with associated impacts on local hydrology. The current baseline is therefore considered to be representative of the future baseline.

Predicted Effects and their Significance

Direct Loss and Temporary Disturbance of Blanket Bog Habitats (Construction)

9.12.9 The Proposed Development would result in permanent habitat loss due to land take (prior to any habitat reinstatement or restoration) associated with the construction of access tracks, wind turbine foundations, crane pads, construction compounds, borrow pits and other associated infrastructure (Further details are provided in **AI Appendix 9G Habitat loss calculations**).

9.12.10 The anticipated permanent blanket bog habitat loss as a result of the Proposed Development is expected to be 28.68ha (comprising 27.1ha 'blanket bog' habitat and 1.58ha 'wet modified bog' habitat). These permanent habitat losses are broken down by plant communities in Table 9G.2 (**AI Appendix 9G)**.

9.12.11 A vegetation sensitivity classification was also undertaken (**AI Appendix 9F**) to provide an approach for avoiding or reducing impacts to very good quality blanket bog habitat.

9.12.12 The Development Site was sub-classified into specific areas on a traffic light scale (see **Table 9F-1** and **AI Figure 9F.1**).

- Areas containing higher percentage cover of M17a/M1 communities were classed as being of high sensitivity (red in **Table 9.11** and **AI Figure 9F.1**);
- Areas containing good quality blanket bog but largely drier (M17b type) with lower percentage cover of more sensitive M17a/M1 communities were classed as being of medium sensitivity (amber in **Table 9.11** and **AI Figure 9F.1**);
- Areas containing poorer blanket bog (usually a high concentration of peat cuttings) were also classed as being of medium sensitivity (yellow in **Table 9.11** and **AI Figure 9F.1**);
- Areas of modified blanket bog where it has previously been drained and planted with conifers (either modified or dried out through drainage or planting) were classed as being of low sensitivity (green in **Table 9.11** and **AI Figure 9F.1**).

9.12.13 **Table 9.11** provides a breakdown of predicted direct loss of for each vegetation sensitivity classification.

Table 9.11 Predicted Direct Loss of Sensitive Vegetation Communities

Vegetation Sensitivity Classification (See Paragraph 9.12.12)	Predicted Permanent Loss of Habitat (ha)	Total Areas of Habitat in Development Site (ha)	Percentage of Total Habitat in Development Footprint Affected by Construction
Red (high sensitivity)	1.39	182	0.8%
Amber (medium sensitivity)	23.65	1,007	2.3%
Yellow (medium sensitivity)	3.56	184	1.93%
Green (low sensitivity)	7.6	295	2.6%

9.12.14 Preference has been given to construct on the least sensitive habitats wherever possible.

9.12.15 In addition to direct habitat loss, it is expected that indirect or temporary disturbance to blanket bog habitat (that will be reinstated following construction) will occur within the following zones of influence (as discussed in **AI Appendix 9G**):

- A precautionary 25m disturbance zone around all turbine bases and the borrow pits; and
- A 10m hydrological disturbance zone around all other hard infrastructure comprising crane hardstandings, access tracks, substations, compounds, storage and laydown areas.

9.12.16 Based on calculations presented in **Table 9G.5** (**AI Appendix 9G),** the anticipated temporary disturbance to blanket bog habitat loss during construction of the Proposed Development is estimated to be up to 72.3ha (comprising 71.4ha 'blanket bog' habitat and 0.9ha 'wet modified bog' habitat).

9.12.17 **Table 9.12** provides a breakdown of predicted temporary disturbance of for each vegetation sensitivity classification.

Table 9.12 Predicted Extent of Temporary Disturbance to Sensitive Vegetation Communities

Vegetation Sensitivity Classification (See Paragraph 9.12.12)	Predicted Temporary Loss of Habitat (ha)	Total Areas of Habitat in Development Site (ha)	Percentage of Total Habitat in Development Footprint Affected by Construction
Red (high sensitivity)	3.86	182	2.1%
Amber (medium sensitivity)	55.1	1,007	5.47%
Yellow (medium sensitivity)	11.81	184	6.42%
Green (low sensitivity)	9.14	295	3.1%

9.12.18 The Proposed Development is predicted to result in a temporary disturbance of up to 72.3ha sensitive vegetation communities, of which 3.86ha of the highest sensitivity vegetation could be disturbed; a combined total of 66.91ha of medium sensitivity could be disturbed; and 9.14ha of low sensitivity could be disturbed.

9.12.19 The area of direct loss (28.68ha) comprises 2% of the blanket bog habitat resource and the area of temporary disturbance (72.3ha) comprises up to 5.25% within the Development Site. These areas combined equate to 7.35% of the blanket bog resource within the Development Site.

9.12.20 The Proposed Development would result in the direct loss of 28.68 ha of blanket bog together with potential indirect effects on up to 72.3 ha. The effects of this would be minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. This would be a medium magnitude of change affecting a large area of blanket bog within the Development Site, which is assessed as being of National importance for this habitat. Although vegetation within the disturbed area would be expected to recover in the medium to longer term, the overall effect is considered to be **significant**.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Construction)

9.12.21 The following assessment considers effects to blanket bog plant communities which are sensitive to changes to surface water or groundwater hydrology resulting from construction activities associated with the Proposed Development. Potential impacts on the hydrology of surface waters are addressed in detail in **EIA Chapter 11**.

9.12.22 Across much of the Development Site, the water table in general would be expected to be close to the surface, often likely to be within 0.1m of the surface, to support the active blanket bog which is widely distributed within the Development Site.

9.12.23 The upper layer of peat (the acrotelm) can extend up to 0.5m below the surface and the water table naturally fluctuates throughout the year within this layer. The deeper catotelm layer (usually more than 0.5m below the surface) is located within the water table and is permanently saturated. Unmodified blanket bog vegetation requires a permanently raised water level which is derived directly from rainfall and in the case of peat deposits on slopes also through lateral seepage of rainfall in the acrotelm. The high-water level is maintained by high rainfall and the low hydraulic conductivity at lower levels within the peat profile (hydraulic conductivity, or permeability, is negatively correlated with the degree of peat humification, which decreases with peat depth). Blanket bogs often display complexes of hydrologically connected formations, or landforms, which develop primarily in response to the underlying topography.

9.12.24 Hydrological changes including fluctuations in water levels, flows and quality and physical disturbance of the peat, leading to derogation and/or pollution of groundwater and surface water and disruption and breakdown of peat structure supporting blanket bog communities, can occur for a variety of reasons:

- Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels;
- Dewatering during construction associated with the excavation of the turbine foundations and borrow pits leading to a decline in groundwater levels;
- Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of groundwater;
- Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works and peat stockpiling/removal;
- Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention;

- Disruption of ground during construction leading to increased sediment loading; dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses; discharge to surface water of groundwater intercepted during construction associated with the excavation of the turbine foundations and borrow pits and increasing flows and sediment loading; and
- Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of surface waters.

9.12.25 On areas of peat depths greater than 1m (i.e. covering the majority of the Development Site), floating roads are proposed. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need to construct foundations extending through to the underlying solid stratum. Even with floating roads, some interruption of surface and near-surface flows can occur, which could in turn lead to loss of blanket bog specialised vegetation in nearby areas.

9.12.26 Changes in the local hydrological regime as a result of disturbance can be particularly accentuated if drainage ditches are placed in areas of deep peat therefore where possible these areas would be avoided. Although the area directly disturbed by the construction works is relatively localised, the nature of the peat is such that where the living bog vegetation is located, disturbance can result in a wider zone of potential hydrological perturbation. Longer-term, a change in surface water levels could result in a habitat dominated by plant species that prefer drier conditions, such as grasses and marginal or inundation species depending on the hydrological changes.

9.12.27 The Peat Slide Risk Assessment concludes that there is no significant risk of peat slide as a result of the construction of the Proposed Development (**AI Appendix 9H**).

9.12.28 The assessment of local hydrology in **Section 11.5** (**EIA Chapter 11)**, anticipates any long-term change to surface or subsurface water movement would be limited to within five metres around each extraction (**AI Appendix 9F**). Effects would be further minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site.

9.12.29 In summary, the Proposed Development is anticipated to cause temporary (long term) change to the local hydrology regime (low magnitude), with possible minor changes in the composition of blanket bog vegetation of National Importance up to five metres from proposed infrastructure. The effect on the conservation status of blanket bog resulting from hydrological change during construction would be not significant.

Direct Loss and Temporary Disturbance of Blanket Bog Habitats (Operation)

9.12.30 It is not expected that there would be any further direct loss or temporary disturbance of blanket bog, and therefore no likely significant effects on this receptor during the operational phase.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Operation)

9.12.31 It is anticipated that the operational phase of the Proposed Development would not result in further habitat loss or degradation beyond that identified above in respect of construction. It is however possible that there may be some localised changes to the composition of blanket bog communities within the vicinity of infrastructure due to changes in hydrology resulting from longer-term changes in surface water flows.

9.12.32 It is very unlikely that there would be pollution or sedimentation to running water, unless major maintenance work was required on watercourse crossings or there was an accidental spillage of oil,

concrete or other materials during maintenance of wind farm infrastructure. However, good practice would be adopted to minimise the potential for any accidental pollution or sedimentation events during maintenance works.

9.12.33 Any such effects are considered to be of 'low' magnitude and the effect on the conservation status of blanket bog resulting from hydrological change during operation would be not significant.

Direct Loss and Temporary Disturbance of Blanket Bog Habitats due to Land take associated with the Decommissioning of Site Infrastructure and Indirect Disturbance and changes to Composition of Plant Communities Resulting from Hydrological Change

9.12.34 During the decommissioning of the Proposed Development, potential effects on blanket bog communities would be expected to be similar in nature to those during the construction phase and similar environmental mitigation measures would be likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

9.13 Assessment of Effects: Wet Heath Communities

Baseline Conditions

9.13.1 Wet heath (NVC sub-communities M15b/c) is present where the blanket peat thins around knolls and hummocks across the Development Site. Wet heath can be variable in terms of heather cover and looks like, and often grades into, blanket bog. Areas of wet dwarf shrub heath can also occur throughout the blanket bog but is not usually extensive. Wet heath is an Annex I habitat and, where it occurs, is in good condition supporting a typical range of species:

- Indicative species of the M15b *Trichophorum cespitosum-Erica tetralix* wet heath (Typical sub-community) comprise: *Trichophorum cespitosum* (A), *Calluna vulgaris* (A), *Eriophorum angustifolium* (F), *Molinia caerulea* (F), *Erica tetralix* (F), *Narthecium ossifragum* (F), *Sphagnum capillifolium* (A);
- Indicative species of the M15c *Trichophorum cespitosum-Erica tetralix* wet heath *Cladonia spp.* sub-community comprise: *Calluna vulgaris* (F), *Trichophorum cespitosum* (F), *Erica cinerea* (F), *Racomitrium lanuginosum* (F), *Eriophorum angustifolium* (F), *Potentilla erecta* (F), *Molinia caerulea* (F), *Cladonia portentosa* (F), *Cladonia uncialis* (F).

9.13.2 Wet heath communities cover approximately 32ha of the Development Site.

Predicted Effects and their Significance

Direct Loss and Temporary Disturbance of Wet Heath Habitats due to Land take associated with the Construction of Site Infrastructure (Construction)

9.13.3 The anticipated direct loss of wet heath habitats during construction of the Proposed Development is expected to be 2.4ha, with an additional area of up to 1.3 ha predicted to be temporarily disturbed during construction. These habitat losses are broken down by plant communities in Table 9G.2 and 9G.4 (**AI Appendix 9G**).

9.13.4 The area of direct loss (2.4ha) comprises 7.5% of the wet heath habitat resource and the area of potential temporary disturbance (1.3ha) comprises 4.1% within the Development Site. These areas combined equate to 11.6% of the wet heath resource within the Development Site.

9.13.5 The effects on wet heath would be minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. Nevertheless, this would be a medium magnitude of change on wet heath within the Development Site over the short to long term. This would result in a **significant** effect on this Regionally important habitat, although vegetation within the temporarily disturbed area would be expected to recover in the medium term.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Construction)

9.13.6 Potential effects on the hydrology of surface waters and GWDTEs are addressed in detail in **EIA Chapter 11**.

9.13.7 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to wet heath vegetation within the Development Site which is assessed as being of Regional importance for this habitat. The effect on the conservation status of wet heath resulting from hydrological change during construction would be not significant.

Direct Loss and Temporary Disturbance of Wet Heath Habitats due to Land Take (Operation)

9.13.8 It is not expected that there will be any direct loss or temporary disturbance of wet heath and therefore no likely significant effects on this receptor during the operational phase.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Operation)

9.13.9 It is anticipated that the operational phase of the Proposed Development would not result in further habitat loss or degradation beyond that identified above in respect of construction, although it is possible that there may be some localised changes to the composition of wet heath communities during operation due to changes in hydrology resulting from longer-term changes in surface water flows.

9.13.10 However, effects would be further minimised through the implementation of best practice measures (**Table 9.9**). Accordingly, there should be no pollution or sedimentation to running water, unless major maintenance work was required on watercourse crossings or there was an accidental spillage of oil, concrete or other materials during maintenance of wind farm infrastructure.

9.13.11 Any such effects are considered to be of 'low' magnitude and the effect on the conservation status of wet heath resulting from hydrological change during operation would be not significant.

Direct Loss and Temporary Disturbance of Wet Heath Habitats due to Land take associated with the Decommissioning of Site Infrastructure and Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change

9.13.12 During the decommissioning of the Proposed Development, potential effects on wet heath communities would be expected to be similar in nature to those during the construction phase and similar environmental measures would be likely to be employed. Any new legislation published

prior to decommissioning would be adhered to and incorporated a management plan prior to decommissioning taking place.

9.14 Assessment of Effects: Dry Heath communities

Baseline Conditions

9.14.1 Dry heath (NVC sub-communities H10a and H10b) is present where the peat is free-draining and is characterised by a dense cover of heather and an absence of *Sphagnum* moss. It is restricted to the shallowest well-drained peats and can be found occasionally throughout the survey area where there are undulations in the underlying substrata sufficient to protrude through the blanket peat. Dry heath is therefore never very extensive, localised and variable in character.

9.14.2 Dry heath is an SBL Priority habitat and an Annex 1 habitat and, where it occurs, is considered to be in good condition supporting a typical range of species and with no or very light grazing. Around Arnish, to the south of the survey area, grazing levels are higher but impacts are only low to moderate.

9.14.3 The vegetation is characterised by a dominance of *Calluna vulgaris* forming an extensive uniform short canopy over a carpet of the hypnaceous mosses *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*. *Potentilla erecta* is usually constant and sparsely dotted through the heather. Where the heath also had some *Erica cinerea* it most resembled the H10 community and where *Racomitrium lanuginosum* was also present it.

9.14.4 Dry heath communities cover approximately 1.3ha of the Development Site and would not be directly affected by the Proposed Development.

Predicted Effects and their Significance

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Construction/Operation/Decommissioning)

9.14.5 Potential effects on the hydrology of surface waters are addressed in detail in **EIA Chapter 11**.

9.14.6 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Development Site. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to dry heath vegetation within the Development Site which is assessed as being of Regional importance for this habitat. The effect on the conservation status of dry heath resulting from hydrological change during construction would be not significant.

9.15 Assessment of Effects: Marshy Grassland Communities

Baseline Conditions

9.15.1 This habitat is generally impoverished and provides low species diversity on the Development Site. Marshy grassland comprises areas of mire totally dominated by purple moor-grass (M25a), dense with dead litter and with only a few sparse associates. The habitat is common around the areas of bog that have been drained for tree planting. Some areas of blanket bog also have a high cover of

purple moor-grass which can resemble M25a and are transitional to it. Also included are areas of rush-pasture (M23), which resemble acid flush but are more neutral and lack the *Sphagnum* carpet. This community is found in small patches alongside channels and soakways along with M6, as well as larger stands close to the edge of the blanket bog where the ground is more improved.

- Indicative species of the M25a: *Molinia caerulea*, *Calluna vulgaris*, *Potentilla erecta* and *Hylocomium splendens*;
- Indicative species of the M23b: *Juncus effusus*, *Agrostis canina*, *Potentilla erecta*, *Anthoxanthum odoratum* and *Polytrichum commune*.

9.15.2 Marshy grassland communities cover approximately 18ha of the Development Site.

Predicted Effects and their Significance

Direct Loss and Temporary Disturbance of Marshy Grassland due to Land take associated with the Construction of Site Infrastructure (Construction)

9.15.3 The anticipated direct loss of marshy grassland during construction of the Proposed Development is expected to be 0.03ha, with an additional area of up to 0.14ha predicted to be temporarily disturbed during construction. These habitat losses are broken down by plant communities in Table 9G.2 and 9G.4 (**AI Appendix 9G**).

9.15.4 The area of direct loss (0.03ha) comprises 0.2% of the marshy grassland resource and the area of potential temporary disturbance (0.14ha) comprises 0.8% within the Development Site. These areas combined equate to 1% of the marshy grassland resource within the Development Site, which is assessed as being of County importance for this habitat.

9.15.5 Direct loss and temporary disturbance of marshy grassland during construction activities is anticipated to be of a very low magnitude of change in the short to medium term. The resultant effect on its conservation status is not significant.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Construction)

9.15.6 Potential effects on the hydrology of surface waters are addressed in detail in **EIA Chapter 11**.

9.15.7 The assessment of local hydrology does not anticipate long term change to surface or subsurface water movement. Effects would be further minimised through the implementation of good practice measures (**Table 9.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat. The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with potential minor changes to marshy grassland vegetation within the Development Site which is assessed as being of County importance for this habitat. The effect on the conservation status of marshy grassland resulting from hydrological change during construction would be not significant.

Direct Loss and Temporary Disturbance of Marshy Grassland due to Land take associated with the Construction of Site Infrastructure (Operation)

9.15.8 It is not expected that there would be any direct loss or temporary disturbance of marshy grassland and therefore no likely significant effects on this receptor during the operational phase.

Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change (Operation)

9.15.9 It is anticipated that the operational phase of the Proposed Development would not result in further habitat loss or degradation beyond that identified above in respect of construction, although it is possible that there may be some localised changes to the composition of marshy grassland communities during operation due to changes in hydrology resulting from longer-term changes in surface water flows.

9.15.10 Similarly, there should be no pollution or sedimentation to running water, unless major maintenance work was required on watercourse crossings or there was an accidental spillage of oil, concrete or other materials during maintenance of wind farm infrastructure. However, good practice would be adopted to minimise the potential for pollution or sedimentation events during maintenance works.

9.15.11 Any such effects are considered to be of 'low' magnitude and the effect on the conservation status of marshy grassland resulting from hydrological change during operation would be not significant.

Direct Loss and Temporary Disturbance of Marshy Grassland due to Land take associated with the Decommissioning of Site Infrastructure and Indirect Disturbance and Changes to Composition of Plant Communities Resulting from Hydrological Change

9.15.12 During the decommissioning of the Proposed Development, potential effects on marshy grassland communities would be expected to be similar in nature (although not necessarily in extent or intensity as tracks and sub-surface infrastructure below 1m are expected to remain in situ) to those during the construction phase and similar environmental measures would be likely to be employed. Any new legislation published prior to decommissioning would be adhered to and incorporated into a management plan prior to decommissioning taking place.

9.16 Assessment of Effects: Waterbodies (Rivers and Lochs)

Baseline Conditions

9.16.1 The site is intersected by three river catchments, from north to south: River Laxdale (Abhainn Lacasdail), Glen River (Abhainn a' Ghlinn Mhoir) and the River Creed (Abhainn Ghrioda). The River Tope (Abhainn Leireabhaigh) is situated to the south of the Development Site. These are relatively small watercourse reaches, crossing moorland/heath, with the River Creed being comparatively larger than the other watercourses. The watercourses are characterised by variable flow types, including riffle/run/glide sequences, and water depth is generally less than 1m with variable substrates comprising mainly cobble, pebble and boulder.

9.16.2 Rivers that meet certain criteria (BRIG (ed. Ant Maddock) 2008, updated 2011) are SBL habitats. The watercourses that cross the Development Site support a number of SBL species (for example Atlantic salmon, eel and otter) and are assumed to qualify as SBL habitats on a precautionary basis. Similarly, the watercourses connect a number of freshwater lochs on the Development Site, which are assumed to qualify as Oligotrophic and Dystrophic Lakes, which is also an SBL habitat type.

9.16.3 SEPA categorises rivers according to their 'ecological status' in accordance with the Water Framework Directive (WFD). The River Creed is at 'High' ecological status (fish and invertebrates are at high status). The River Laxdale is at 'Good' ecological status (fish at high status and invertebrates at good status). The River Tope is at High ecological status (fish and invertebrates are at high status). The ecological status of the Glen River is not currently indicated on the SEPA web tool.

Predicted Effects and their Significance

Habitat Loss/Damage and Temporary Disturbance (Rivers and Lochs) during Construction

9.16.4 The Proposed Development is not predicted to alter flow or water levels in waterbodies (**EIA Chapter 11**). Therefore, potential effects of the Proposed Development are related to the disturbance of the watercourse habitats during the construction of watercourse crossings; the release of sediment/silt into the channel during construction and risk of accidental pollution spills.

9.16.5 The effects on waterbodies (rivers and lochs) would be minimised through the implementation of embedded environmental measures (**Table 9.9**), which would result in construction/decommissioning effects on watercourses being limited to localised loss/disturbance of river habitats during installation of culverts and limited release of sediment at watercourse crossings, which would be localised, temporary and of short duration.

9.16.6 During construction, the Proposed Development would result in a low magnitude of change over a short duration and not alter the conservation status of waterbodies (rivers and lochs) considered to be of National importance. The effects would be not significant.

Habitat Loss/Damage and Temporary Disturbance (Rivers and Lochs) during Operation

9.16.7 The potential risks to watercourse habitats during the operation of the Proposed Development are likely to be limited and localised, relating to planned turbine servicing works. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure major environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance (refer to **EIA Chapter 11**).

9.16.8 During operation, the Proposed Development would result in a very low magnitude of change and not alter the conservation status of waterbodies (rivers and lochs). The effects would be not significant.

Habitat Loss/Damage and Temporary Disturbance (Rivers and Lochs) during Decommissioning

9.16.9 During the decommissioning of the Proposed Development, potential effects on waterbodies (rivers and lochs) would be expected to be similar to those during the construction phase. Similar environmental measures as those embedded in the design/construction phase would be employed to mitigate the effects of decommissioning on waterbodies. Any new legislation published prior to decommissioning would also be adhered to and reflected/incorporated in the environmental measures (an EMP) to be implemented during decommissioning.

9.17 Assessment of Effects: Fish

Baseline Conditions

9.17.1 The watercourses that cross the Development Site support salmonid fisheries, mainly comprising Atlantic salmon and sea/brown trout, as well as eels and three-spined stickleback. Previous (2010) fish surveys of the site, reported in the Stornoway Wind Farm 2012 ES recorded very high densities of salmon fry and salmon parr on the River Creed and River Tope, the latter being to the south of the Development Site. Trout were recorded on all four watercourses, with trout fry and parr reaching very high densities on the River Creed, Glen River and River Tope.

9.17.2 Sea Lamprey has previously been recorded on the lower River Creed and one or more lamprey species could occur within catchments of watercourses that cross the Development Site.

9.17.3 The baseline status of fish populations within the Development Site and neighbouring catchment (River Tope) in 2018 is set out in detail in the appended survey report (**EIA Appendix 9D**) and briefly summarised in **Table 9.13**. The numbering of survey sites is non-consecutive due to previous changes in the numbering of sites (no survey sites are omitted).

- On the River Creed salmon fry, salmon parr and trout fry occur up to densities categorised as 'Excellent' and trout parr occur up to densities categorised as 'Good';
- Juvenille salmon were absent from the Glen River, where trout fry occur up to densities categorised as 'Excellent' and trout parr up to densities categorised as 'Good';
- On the River Laxdale salmon fry occur up to densities categorised as 'Excellent' and salmon parr at densities up to 'Good'; Trout fry and parr occur up to densities categorised as 'Good';
- On the River Tope salmon fry occur up to densities categorised as 'Excellent' and salmon parr at densities up to 'Good'; Trout fry occur up to densities categorised as 'Excellent' and trout parr up to 'Moderate'.

9.17.4 **EIA Appendix 9D** briefly compares the baseline status of fish species recorded in 2018 with their status reported previously in the 2012 Stornoway Windfarm 2012. However, limited emphasis is placed on apparent differences/trends in fish numbers/densities between the two survey years in this EIA report, recognising that two years of survey data are insufficient to inform definitive conclusions on trends in fish populations.

Table 9.13 Baseline Status of Fish (2018)

River and Survey Location (Figure 9D)	Density Classification (Salmonids)	Habitat Utilisation Potential (Salmonids)	Habitat Quality (Salmonids)	Other Species	Summary Description (Fish Habitat)
River Creed (CRE01)	Salmon Fry: Excellent Salmon Parr: Good Trout fry: Good Trout parr: Good	Moderate / High	Moderate	Eels (x19); Three-spined stickleback (x17)	Juvenile & adult salmonid habitat. Flow type run/riffle/glide sequences with deep pool and weir 20m upstream. Wet width ~8m. Depth ranging from 11-90cm. Cobble/pebble/gravel substrate with boulder and bedrock upstream. Moderate instream cover. Undercut bank in places providing moderate bankside cover. Adjacent land is moorland heath and road/bridge downstream.
River Creed (CRE03)	Salmon Fry: Excellent Salmon Parr: Good Trout fry: Good	High	Good	Eels (x6);	Juvenile & adult salmonid habitat. Flow type run/riffle sequences. Wet width ranging from 8-12m. Depth ranging from 11- 75cm. Cobble/pebble/gravel substrate with boulder. Moderate instream cover. Undercut bank both sides providing moderate/good bankside cover. Adjacent land is moorland heath. Spawning habitat in survey area.
River Creed (CRE05)	Salmon Fry: Excellent Salmon Parr: Excellent Trout fry: Good Trout parr: Good	Moderate / High	Moderate	Eels (x1);	Juvenile salmonid habitat. Flow type run/riffle sequences with large pool at bottom of run (not included in survey – good adult holding area). Wet width ~8m. Depth ranging from 21- 70cm. Cobble/pebble/gravel substrate with boulder and small area of bedrock on left bank. Moderate instream cover. Undercut bank both sides providing good bankside cover. Adjacent land is moorland heath. Spawning habitat in survey area.
River Creed (CRE06)	Salmon Fry: Poor Salmon Parr: Poor Trout fry: Very Poor Trout parr: Very Poor	Moderate / High	Moderate	Eels (x3); Three-spined stickleback (x2)	Juvenile salmonid habitat. Flow type predominantly run with glide/riffle sequences and torrent. Wet width ranging from 3-5m. Depth ranging from 21-55cm. Cobble/pebble substrate with small amount of boulder. Moderate instream cover. Undercut bank both sides with vegetation rooted in riparian zone providing moderate/good bankside cover. Adjacent land is moorland heath.
River Creed (CRE08)	Trout fry: Very Poor Trout parr: Very Poor	Moderate	Moderate	-	Juvenile salmonid habitat. Flow type predominantly glide with run/pool sequences. Wet width 1-3m. Depth ranging from 21-90cm. Predominantly pebble/cobble substrate with areas of fine organic matter/silt and sand providing moderate/poor instream cover. Good bankside cover with undercut bank throughout. Adjacent land is moorland heath. Water level classed as very high.

River and Survey Location (Figure 9D)	Density Classification (Salmonids)	Habitat Utilisation Potential (Salmonids)	Habitat Quality (Salmonids)	Other Species	Summary Description (Fish Habitat)
River Creed (CRE09)	Salmon Parr: Very Poor Trout fry: Excellent Trout parr: Very Poor	Moderate	Moderate	-	Juvenile salmonid habitat. Flow type predominantly deep glide/run sequences with riffle in places. Wet width 2-4m. Depth ranging from 11-65cm. Predominantly boulder/cobble/pebble substrate with areas of fine organic matter/silt providing moderate/poor instream cover. Undercut bank providing moderate bankside cover. Adjacent land is moorland heath.
River Creed (CRE10)	Trout fry: Excellent Trout parr: Moderate	Moderate	Moderate	-	Fry (salmonid) habitat. Flow type riffle/run with a wet width ranging from 2–3m. Depth <20cm. Predominantly pebble/cobble/gravel with limited boulder. Moderate instream cover, moderate bankside cover. Collapsed dyke/weir upstream. Adjacent land is upland moorland heath. Spawning habitat in survey area.
River Creed (CRE13)	Salmon Fry: Very Poor Trout fry: Excellent Trout parr: Moderate	Moderate	Moderate	-	Fry (salmonid) habitat with Parr (salmonid) habitat in places. Flow type predominantly run with riffle/glide sequences. Wet width 2-3m. Depth ranging from 11-70cm. Predominantly gravel/pebble/cobble substrate with areas of fine organic matter/silt and sand. Limited bedrock and boulder upstream section. Moderate/poor instream cover. Good bankside cover with undercut bank throughout. Adjacent land is moorland heath.
River Creed (CRE14)	Trout fry: Excellent Trout parr: Poor	Moderate	Moderate	Eels (x2)	Juvenile salmonid habitat. Flow type predominantly run with riffle/glide sequences. Wet width ~1m. Depth ranging from <10-50 m. Predominantly gravel/pebble/cobble substrate with areas bedrock and boulder. Moderate/poor instream cover. Good bankside cover with undercut bank throughout. Discarded cattle grid recorded in mid-section. Small weir upstream – not considered to impact on fish migration. Adjacent land is moorland heath.
River Creed (CRE16)	Salmon Parr: Very Poor Trout fry: Poor Trout parr: Very Poor	Moderate	Moderate	Three-spined stickleback (x7)	Parr habitat. Flow type deep glide/run. Wet width approx. 1-3m. Depth ranging from 21-90cm. Mix of pebble/cobble/boulder substrate with areas of bedrock and gravel throughout. Moderate instream cover. Good bankside cover. Water flow was classed as very high. Adjacent land is moorland heath.

River and Survey Location (Figure 9D)	Density Classification (Salmonids)	Habitat Utilisation Potential (Salmonids)	Habitat Quality (Salmonids)	Other Species	Summary Description (Fish Habitat)
River Creed (CRE17)	Trout fry: Good Trout parr: Very Poor	Moderate	Good	Eels (x1); Three-spined stickleback (x6)	Juvenile salmonid habitat. Flow type predominantly run with riffle/glide sequences. Wet width ranging from 1.5-3m. Depth ranging from 11-50cm. Predominantly pebble/cobble substrate at the upstream section providing good instream cover. Downstream section of sand/silt substrate considered poor instream cover. Good bankside cover, with undercut bank throughout. Adjacent land is moorland heath.
Glen River (GLE01)	Trout fry: Excellent Trout parr: Good	Moderate	Good	-	Juvenile salmonid habitat. Flow type predominantly run/riffle sequences with areas of glide. Wet width ranging from 2.5-3.5m. Depth ranging from 11-55cm. Predominantly pebble/cobble/gravel substrate providing moderate instream cover. Good bankside cover, with undercut bank and draped vegetation. Adjacent land is moorland heath. Potential spawning habitat within mid-section.
Glen River (GLE02)	Trout fry: Good Trout parr: Moderate	Moderate	Moderate	Three-spined stickleback (x11)	Juvenile salmonid habitat. Flow type predominantly run/riffle sequences with areas of deep glide and pool. Wet width approx. 1-5m. Depth ranging from 11-60cm. Mix of fine organic matter/silt and sand at the downstream section caused by bank erosion. Upstream predominantly pebble/cobble/gravel substrate. Moderate/poor instream cover. Good bankside cover. Adjacent land is moorland heath.
Glen River (GLE03)	Trout fry: Good Trout parr: Moderate	Moderate	Moderate	Eels (x18)	Juvenile salmonid habitat. Flow type predominantly run/riffle sequences. Wet width ranging from 2.5-4.5m. Depth ranging from 11-50cm. Predominantly cobble/pebble/boulder substrate providing good instream cover. Moderate bankside cover. Adjacent land is moorland heath and road. Bridge footing at upstream section.
River Laxdale (LAX01)	Salmon Fry: Excellent Salmon Parr: Good Trout fry: Good Trout parr: Good	Moderate / High	Good	Eels (x3)	Juvenile & adult salmonid habitat. Flow type predominantly run/riffle/glide sequences. Wet width ranging from 8-12m. Depth ranging from 11-60cm. Predominantly cobble/pebble/gravel substrate with areas of boulder providing good/moderate instream cover. Good/moderate bankside cover with undercut bank in places. Adjacent land is moorland heath. Good spawning habitat 20m from gabion baskets.

River and Survey Location (Figure 9D)	Density Classification (Salmonids)	Habitat Utilisation Potential (Salmonids)	Habitat Quality (Salmonids)	Other Species	Summary Description (Fish Habitat)
River Laxdale (LAX02)	Trout parr: Moderate	Moderate	Moderate	Eels (x2)	Parr (salmonid) habitat. Flow type run/ glide. Wet width approx. 2.5-4m. Depth ranging from 30-90cm. Mix of cobble/boulder substrate with areas of bedrock and gravel/pebble throughout. Good instream cover. Good bankside cover. Water flow was classed as very high. Adjacent land is moorland heath.
River Tope (TOP01)	Salmon Fry: Excellent Salmon Parr: Good Trout fry: Very Poor Trout parr: Very Poor	Moderate	Moderate	Eels (x4)	Juvenile salmonid habitat. Flow type predominantly run with riffle/glide sequences. Wet width ranging from 1.5-3m. Depth ranging from 11-65cm. Predominantly boulder/bedrock with areas of cobble/pebble/gravel substrate providing moderate instream cover. Good bankside cover, with undercut bank throughout. Adjacent land is moorland heath.
River Tope (TOP02)	Salmon Fry: Very Poor Salmon Parr: Poor Trout fry: Moderate Trout parr: Moderate	Moderate	Moderate/ Good	Eels (x1)	Juvenile salmonid habitat. Flow type predominantly run with riffle/glide sequences. Wet width ranging from 2.5-4.5m. Depth ranging from 11-55cm. Substrate predominantly boulder/bedrock with areas of pebble/cobble/fine organic matter in places. Moderate, poor in places, instream cover. Instream vegetation. Good bankside cover, with undercut bank throughout. Adjacent land is moorland heath.
River Tope (TOP03)	Salmon Fry: Very Poor Salmon Parr: Very Poor Trout fry: Excellent Trout parr: Poor	Moderate	Moderate	Eels (x3)	Juvenile salmonid habitat. Flow type run/riffle/glide sequences. Wet width ranging from 2.5-4m. Depth ranging from 11-50cm. Predominantly gravel/pebble substrate with areas of cobble and fine organic matter. Limited boulder/bedrock. Moderate, poor in places, instream cover. Instream vegetation. Good bankside cover, with undercut bank throughout. Adjacent land is moorland heath.

Predicted Effects and their Significance

Obstruction of Upstream or Downstream Fish Migration (Construction)

9.17.5 Construction of watercourse crossings can lead to obstruction of upstream or downstream migration of anadromous species (including salmon, sea trout, sea lamprey and river lamprey), catadromous species (including eels) and species that do not migrate to sea but which migrate within river catchments (such as brown trout and brook lamprey), with associated adverse effects on fish spawning and recruitment.

9.17.6 The construction of watercourse crossings would take place over short/discrete sections of watercourse and the work would be of short duration. The effects on fish would be minimised through the implementation of best practice measures (**Table 9.9**).

9.17.7 The construction of watercourse crossings is therefore likely to have localised, short duration, very low magnitude effects on fish, avoiding the main period when salmonids migrate and spawn. The Proposed Development is therefore not predicted to create obstacles to migration/spawning and the effect on the conservation status of fish would be not significant.

Harm to Fish at Watercourse Crossings (Construction).

9.17.8 Work within and near the channel has the potential to harm fish, for example where a discrete section of watercourse is temporarily dammed and depleted to allow culvert installation or due to noise/vibration impulses which can harm fish. The effects on fish would be minimised through the implementation of good practice measures (**Table 9.9**).

9.17.9 These measures would mean noise/physical disturbance of fish is of short duration and very low magnitude, potentially affecting only small numbers of fish, over a small area and avoiding sensitive periods. The effect on the conservation status of fish would therefore be not significant.

Damage/Disturbance to Fish Habitats at Watercourse Crossings (Construction)

9.17.10 The construction (and decommissioning) of watercourse crossings would result in limited loss/disturbance of in-channel and bankside habitats, which can result in loss of streambed refugia, cover (all recorded species) and spawning habitat (salmonids, lamprey and stickleback). The effects on fish would be minimised through the implementation of good practice measures (**Table 9.9**).

9.17.11 These measures would mean that the connectivity of watercourse habitats is maintained and effects on fish habitats are localised, of short duration, very low magnitude and avoid spawning redds/habitats. The effects on the conservation status of fish would therefore be not significant.

Silt/Sediment and Pollutant Release to Watercourses (Construction)

9.17.12 The release of silt/sediment and or accidental pollution (e.g. oil spill from plant/equipment) can harm fish directly or damage fish habitats, for example by smothering spawning redds with silt or discharging toxic pollutants. The effects on fish would be minimised through the implementation of good practice measures (**Table 9.9**).

9.17.13 These measures would result in construction effects of sediment/pollutant release on watercourses being limited to localised loss/disturbance of river habitats and limited release of sediment at watercourse crossings, which would be localised, temporary and of short duration. This would result in a low magnitude of change and the effects on the conservation status of fish would therefore be not significant.

Silt/Sediment and Pollutant Release to Watercourses (Operation)

9.17.14 The potential risks of discharges to watercourse habitats during the operation of the Proposed Development are likely to be limited and localised, relating to planned turbine servicing works. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with good practice and SEPA guidance (refer to **EIA Chapter 11**). The operational effects of the Proposed Development on fish are therefore likely to be of very low magnitude and the effect on the conservation status of fish would be not significant.

Electromagnetic Emissions (Operation)

9.17.15 The effects of electromagnetic emissions from turbines and cabling on freshwater fish are not well documented, therefore the risk of effects on these species has been minimised through the iterative wind farm design process. The turbines would be over 100m from the watercourse network and cabling would extend along access tracks and hence be over 50m from the watercourse network and buried. In a limited number of instances where cables cross watercourses these would be installed on the bridge. These design measures should minimise exposure of fish to electromagnetic emissions during the operational phase. This would result in a very low magnitude of change and the effect on the conservation status of fish would be not significant.

Effects during Decommissioning

9.17.16 During the decommissioning of the Proposed Development, potential effects on fish (all recorded species) would be expected to be similar (although not necessarily of the same extent or magnitude as tracks and sub-surface infrastructure below 1m are expected to remain in situ) to those during the construction phase. Similar environmental measures as those embedded in the design/construction phase would be employed to mitigate the effects of decommissioning on fish. Any new legislation published prior to decommissioning would also be adhered to and reflected/incorporated in the environmental measures (an EMP) to be implemented during decommissioning.

9.18 Assessment Summary

9.18.1 A summary of the assessment is provided in **Table 9.14**.

9.18.2 The summary assessment below deals in an integrated way, with the effects of all phases of the Proposed Development. Potential effects are considered together as the assessment focuses on the favourable conservation status of each feature and as such, is assessed throughout the lifespan of the Proposed Development. Often changes to a feature would occur during several stages of the Proposed Development and the resultant effect may reverse during different phases. For example, during construction a population may decline, however, this effect may be reversed during operation. The summary below presents the magnitude of overall change, and whether that is adverse, beneficial or neutral.

Table 9.14 Summary of Significance of Effects

Ecological Feature	Summary of Predicted Effects (During Construction, Operation and Decommissioning)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Lewis Peatlands SAC - Otter	*Disturbance/displacement effects to SAC otter population*	National	Low	Not significant	The magnitude of change as a result of the Proposed Development is low in respect of the otter population that utilises the Development Site; which may be part of the Lewis Peatlands SAC population. This is on the basis of the availability of alternative resting places and foraging habitat within the wider vicinity, the temporary and sporadic nature of disturbance effects and the likelihood of complete reversibility following removal of disturbance. Sensitive design layout and the protection of watercourses, as well as the implementation of an Otter Species Protection Plan and other embedded measures during construction would ensure that the magnitude of any disturbance/displacement effects low and the resultant effect on the species' conservation status and SAC integrity would be not significant.
	Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased noise, lighting, and human presence) during construction/operation and decommissioning related works.		Low		Construction and decommissioning related disturbance/displacement effects to otters within the Development Site would be temporary and sporadic. In light of the embedded measures and the abundance of alternative suitable foraging habitat and resting sites within the Development Site, the resultant effect on the species' conservation status and SAC integrity would be not significant.
	Temporary severance of otter habitat and commuting routes		Low		Embedded mitigation would reduce the risk from the temporary loss or barrier effects during the construction of watercourse crossings and the resultant effect on the species' conservation status and SAC integrity would be not significant.
	Direct mortality due to construction related activities		Low		Embedded mitigation would reduce the risk of direct mortality to individuals during the construction and decommissioning phases and the effect on the conservation status of otter would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction, Operation and Decommissioning)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Reduction in habitat quality as a result of hydrological connectivity and pollution incidents		Neutral		Embedded mitigation measures would reduce the risk from the degradation of food resource by pollution of habitats used by otter, during all phases of the Proposed Development and the resultant effect on the species' conservation status and SAC integrity would be not significant.
Tong Saltings SSSI	*Habitat damage due to silt release and pollution during construction, operation and decommissioning*	Local	Low	Not significant	The effects on the River Laxdale (the potential effects pathway) would be limited to localised loss/disturbance of river habitats during installation of culverts and limited release of sediment at watercourse crossings. Through the implementation of embedded measures, the Proposed Development is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with negligible effects to the interest features of the SSSI, which would not alter the integrity of the Site.
Blanket bog communities	*Direct loss and temporary disturbance of blanket bog habitats due to land take associated with the construction of site infrastructure*	National	Medium	**Significant**	The Proposed Development is predicted to result in the combined loss of 100.98ha of bog habitat. This comprises a permeant loss of 28.68ha bog habitat (blanket bog (27.1ha) and wet modified bog (1.58) and a temporary disturbance of 72.3ha of bog habitat (71.4ha of blanket bog, and 0.9ha of wet bog). This equates to 7.2% of the resource within the Development Site, however less than 3% of the most sensitive habitat would be affected. Direct loss and temporary disturbance of sensitive blanket bog habitats during construction activities is anticipated to be of a medium scale of magnitude in the short to medium term and this would have a **significant** effect on the conservation status of blanket bog. Some vegetation recovery within the permanent disturbed areas (i.e. around the track verges) would be expected in the medium to longer term.
	Indirect disturbance and changes to composition of plant communities resulting from hydrological change		Low	Not Significant	The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with some potential change in the composition of vegetation. However, the effect on the conservation status of blanket bog would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction, Operation and Decommissioning)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Wet heath communities	*Permanent loss of wet heath habitat due to land take associated with the construction of site infrastructure*	Regional	Medium	**Significant**	The Proposed Development is predicted to result in the combined loss of 3.7ha of wet heath (2.4ha of permanent loss and 1.3ha of temporary disturbance. This equates to 11.6% of the wet heath resource within the Development Site. Direct loss and temporary disturbance of wet heath during construction activities is anticipated to be of a medium scale of magnitude in the short to medium term and this would have a **significant** effect on the conservation status of wet heath. Some vegetation recovery within the permanent disturbed areas would be expected in the medium term.
	Indirect disturbance and changes to composition of plant communities resulting from hydrological change		Low	Not Significant	The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with some potential localised change in the composition of vegetation. However, the effect on the conservation status of wet heath would be not significant.
Dry heath communities	*Indirect disturbance and changes to composition of plant communities resulting from hydrological change*	Regional	Low	Not Significant	The Proposed Development is anticipated to cause temporary (medium term) change to the local hydrology regime (low magnitude), with some potential localised change in the composition of vegetation. However, the effect on the conservation status of dry heath would be not significant.
Marshy grassland, rush pasture communities	*Permanent loss of marshy grassland due to land take associated with the construction of site infrastructure*	County	Low	Not Significant	The Proposed Development is predicted to result in the combined direct loss and temporary disturbance of 0.17ha, comprising 0.17% of the on-site resource; and an additional 0.14 ha of temporarily disturbance habitat, comprising 0.78% of the on-site resource. These areas combined equate to <1% of the marshy grassland resource within the Proposed Development site. Direct loss and temporary disturbance of marshy grassland during construction activities is anticipated to be of a low scale of magnitude. Effects on the conservation status of marshy grassland/rush pasture would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction, Operation and Decommissioning)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Indirect disturbance and changes to composition of plant communities resulting from hydrological change		Low	Not Significant	The Proposed Development is anticipated to cause temporary change in the medium term to the local hydrology regime at low magnitude, with some potential change in the composition of vegetation. However, the effect on the conservation status of marshy grassland would be not significant.
Waterbodies (Rivers and Lochs	*Habitat damage due to silt release and pollution during construction, operation and decommissioning*	National	Low	Not Significant	The effects on waterbodies would be limited to localised loss/disturbance of river habitats during installation of culverts and limited release of sediment at watercourse crossings. These would be localised, temporary and of short duration. They would not alter the conservation status of waterbodies (rivers and lochs) and would be not significant.
Atlantic salmon, sea trout, brown trout and Eel	*Population declines due to obstruction to migration/spawning, habitat degradation and physical harm.*	Regional	Very Low	Not Significant	Embedded mitigation measures would reduce the risk of effects on these species due to the construction of watercourse crossings, with the effects being localised and of short duration, avoiding the main period when salmonids migrate and spawn. The Proposed Development would not create obstacles to migration/spawning and the effects on these fish species would be not significant.
Sea Lamprey, River Lamprey, Brook lamprey	*Population declines due to obstruction to migration/spawning, habitat degradation and physical harm.*	Local	Very Low	Not Significant	Lampreys were not recorded within the Development Site during the 2010 or 2018 surveys, therefore effects on these species are unlikely. The measures to mitigate effects on salmonids would also limit the risk of effects on these species should they migrate into watercourses that cross the Development Site prior to construction.
Three-spined stickleback	*Population declines due to habitat degradation and physical harm.*	Local	Very Low	Not Significant	Three-spined stickleback are common and widespread and the measures to mitigate effects on salmonids would further minimise effects on this species.

Ecological Feature	Summary of Predicted Effects (During Construction, Operation and Decommissioning)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Freshwater pearl mussel	*Population declines to habitat disturbance and habitat degradation (siltation/pollution)*	Local	Very Low	Not Significant	Freshwater pearl mussels have not been recorded within the Development Site and are unlikely to be affected by the Proposed Development. The measures to mitigate effects on salmonids would also protect this species should they be present within the catchments of watercourses that cross the Development Site.

1. The importance of the feature is defined as per **Table 9.7**, **Section 9.7**, using the criteria set out in **Table 9.7**, and method in **Section 9.7**.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Section 9.9**, **Table 9.10** above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in **Section 9.9**.

9.19 Assessment of Cumulative Effects

9.19.1 As outlined in **Section 4.8**, consideration has been given as to whether any of the ecological features that have been taken forward for assessment in this chapter are likely to be subject to cumulative effects on ecological features because of the effects generated by other developments.

9.19.2 With embedded measures (**Section 9.8**), any effects on habitats due to the Proposed Development are not anticipated to extend beyond the Development Site. However, the potential for cumulative effects needs to be considered in respect of designated sites, habitats and fauna identified as ecological features in this chapter, in particular, aquatic ecology features (given the pathway via watercourses to off-site features) and highly mobile species such as otter.

9.19.3 This cumulative assessment comprises all developments within the spatial area within a 32km radius of the Proposed Development including wind farms (consented and in planning). This is based upon the range of a dog otter (see **Table 9.8**). In total, four other wind energy developments are included in the assessment as listed in **Table 9.15** (and illustrated in **EIA Figure 6.8**,).

Table 9.15 Wind Energy Development Included in Ecology Cumulative Impact Assessment

Wind Farm Site	Approximate Distance from the Proposed Development (km)	Status	Number (and tip height) of Proposed Turbine	Important Ecological Features	Predicted Residual Impacts on Ecological Features
Muaitheabhal (Beinn Mhor)	16.6	Consented	33 turbines 145m	Blanket bog, Otter, and Freshwater fishes	Residual minor negative impacts on fisheries, otter and streams and rivers during the construction phase. Residual impacts of moderate significance on blanket bog and wet dwarf shrub heath. During the operational phase all impacts will be of either minor or negligible significance. .
Druim Leathann	16.6	Consented	14 turbines 126.5m	Blanket bog, Otter, and Freshwater fishes	A **significant** impact on blanket bog and related habitats is predicted due to the direct loss of approximately 12.4ha and indirect impacts on approximately 22.8ha. No predicted residual impacts on other ecological features.
Muaitheabhal (East Extension)	17	Consented	6 turbines 150m	Blanket bog, wet heath Otter, and Freshwater fishes	Residual minor negative impacts on fisheries, otter and streams and rivers during the construction phase, and residual impacts of moderate significance on blanket bog and wet dwarf shrub heath. During the operational phase all impacts will be of either minor or negligible significance.
Muaitheabhal (South Extension)	20.1	Consented	6 turbines 150m/ 130m	Blanket bog, Otter, and Freshwater fishes	The assessment concludes that effects on otter and fisheries would be not **significant** at any level. However, impacts on blanket bog and wet heath habitats are largely as a result of the extent of habitat loss, and therefore, despite mitigation, **significant** negative impacts to wet heath and blanket bog remain, albeit at the Site level only.

9.19.4 Given the predicted significant effects on blanket bog habitat anticipated within the Development Site, as well as Druim Leathann, Muaitheabhal (East Extension) and Muaitheabhal (South Extension), cumulatively the loss and disturbance to blanket bog habitat in the context of the blanket bog resource within Lewis and Harris could be **significant**. However, provided each scheme implemented a reinstatement/ restoration plan, vegetation recovery within the disturbed areas would be expected in the medium to longer term. Compensatory habitat management measure could also reduce potential impacts, although details are unknown for these other cumulative sites.

9.19.5 Given the extensive home ranges of otters (up to 35km of watercourse for males; and overlapping territories with females), the otter(s) which use the Development Site could potentially be the same individuals as are reported to be using the watercourses within the Muaitheabhal and Druim Leathann sites. However, given the extent of available foraging and resting site habitat within each of these sites, the risk of increased disturbance/displacement and severance of habitats, given the proposed embedded measures described in **Section 9.8** would be limited. The Proposed Development is likely to have only localised, temporary effects on otter that are of low magnitude and short duration and are likely to be not significant. The Proposed Development is also likely to have no significant effects on the SAC otter population in combination with other developments or activities.

9.19.6 The Proposed Development is likely to have only localised, temporary effects on rivers/lochs, fish and freshwater invertebrates that are of very low magnitude and short duration and are likely to be not significant. The Proposed Development is also likely to have no significant effects on these ecological features in combination with other developments or activities.

9.19.7 In summary, given the **significant** effects to blanket bog and wet heath communities as a result of the Proposed Development and at each of the above schemes (where assessment is available), **significant** cumulative effects are possible in combination with the above schemes.

9.20 Consideration of Optional Additional Mitigation or Compensation

9.20.1 There is the potential for **significant** adverse impacts arising from construction works to active blanket bog and wet heath). The following outlines additional mitigation and compensation measures proposed to address these effects.

Habitat Reinstatement and Compensatory Habitat Restoration

9.20.2 Habitat re-instatement would take place alongside cut roads, alongside cranepads and substation, within the borrow pit and on temporary compounds and lay down areas. There is therefore potential for up to 70% of the habitat disturbed for construction to be reinstated in the Development Site in the medium to long term (10 to 20 years) following construction activities. This re-instatement would be informed by further surveys prior to reinstatement and future site monitoring, as outlined in **AI Appendix 9H**.

9.20.3 Consideration has been given to the possibility of removing plantation forestry that has been planted on blanket bog and implementing habitat management measures such as ditch blocking which would raise the water table and restore hydrological function for the benefit of the mire communities. The reason for this is that plantation forestry on this habitat does not meet with the principles of sustainable forest management and Scotland's Forestry Strategy 2019-2029[14] states that the impacts of inappropriate tree planting on deep peat should be addressed to meet the UK Forestry Standard. The trees that have been planted within the Development Site are generally in poor condition with many being stunted, diseased or dead. However, surveys have found that the

[14] https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/pages/6/

forested areas are of importance for hen harrier (see **AI Chapter 8**) and removal of forestry for the benefit of blanket bog has therefore been discounted.

9.20.4 Blanket bog habitats elsewhere within the Development Site consist of a range of mire communities which are in good condition and peat is likely to be actively forming throughout, probably even within old peat cuttings. As a result, it is considered that there is no possibility of undertaking habitat management within the Development Site which would compensate for the loss of important habitats.

9.20.5 **AI Appendix 9I** sets out criteria for identifying and delivering compensatory blanket bog habitat management offsite. This would be approximately double that of the permanent disturbed bog habitats and wet heath. The Outline Habitat Management Plan (OHMP) also sets out proposal for small scale native tree planting within the Development Site and criteria for identifying and managing rush pasture and woodland habitats offsite for the benefit of hen harrier.

9.20.6 All habitat restoration proposals would be following consultation with SNH.

Woodland Removal Policy

9.20.7 In accordance with the UK Forestry Standard (UKFS) and The Scottish Government's Policy on Control of Woodland Removal, compensatory tree planting will be provided to fully offset loss of coniferous plantation woodland in this case 40.61ha.

9.20.8 Should consent be granted a condition could be imposed to require a compensatory planting scheme setting out the quantity (area) of planting required, their location, species, and planting density. **AI Appendix 9I (Figure AI 9I.4.1**) identifies the opportunity for planting up to 5ha of riparian trees within the Development Site. Consideration will be given to further areas of planting on site, if it complies with the OHMP and doesn't impact on the sensitive bog habitats. Where this is not possible the addition planting sufficient to meet the compensatory planting requirement will be provided on adjacent land controlled by the Stornoway Trust. Trees planted would be of native species, and planting proposals would be subject to consultation with SNH and SF prior to commencing development.

9.21 Conclusions of Significance Evaluation

9.21.1 The permanent habitat loss of blanket bog and wet heath within the footprint of the Proposed Development is considered to be a **significant** effect. However, the OHMP (**AI Appendix 9I**) sets out criteria for identifying and delivering compensatory habitat management offsite (to cover an area of up to 62ha) which would compensate for the area of blanket bog/wet heath (approximately 31.08ha) that would be permanently lost due to the Proposed Development. This would reduce the residual effect of habitat loss to not significant.

9.22 Implementation of Environmental Measures

9.22.1 **Table 9.16** describes the environmental measures embedded within the Proposed Development and the mechanism by which they would be implemented (e.g. planning condition) and who is responsible for their implementation.

Table 9.16 Summary of Environmental Measures Relevant to Ecology

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
CONSTRUCTION		
Preparation of Habitat Management Plan as part of the Construction Environmental Management Plan (EMP)	Developer	Planning condition
Preparation of Tree Removal Plan	Developer	Planning condition
Preparation of Otter Species Protection Plan	Developer	Planning condition
Preparation of reinstatement and restoration plan	Developer	Planning condition
Tool box talks	Construction Manager and ECoW.	CEMP
Adherence to Pollution Prevention Plan as fully detailed in **EIA Chapter 11**.	Construction Manager and ECoW.	Planning condition
Watercourse exclusion zones (50m buffers) and restrictions on timing of works within these zones implemented through the CEMP	Developer/Contractor	Planning condition
Bottomless culvert and bridge designs and construction in accordance with SEPA good practice. Construction/installation and monitoring requirements implemented via the CEMP	Developer/Contractor	Planning condition
Measures to control silt/sediment and pollution and limit noise emissions implemented through the CEMP, Water Management Plan, Peat Management Plan and Pollution Prevention Plan.	Developer/Contractor	Planning condition
Monitoring of effects on freshwater ecology to be set out in an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality and river habitats) and implemented.	Developer/Contractor	Planning condition
OPERATION PHASE		
Water quality protection measures (e.g. adherence to SEPA PPGs).	Developer and ECoW	Planning condition
All maintenance working areas would be clearly defined.	Developer and ECoW	Planning condition
Pollution risk due to operational activities including servicing and maintenance to be minimised through operator risk assessments and appropriate preventative measures	Developer/Operator	CAR License
Monitoring of effects on freshwater ecology through an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality).	Developer	Planning condition
DECOMMISSIONING		
Preparation of a Restoration and Decommissioning Plan.	Developer	Planning condition
Watercourse exclusion zones (50m buffers) and restrictions on timing of works within these zones implemented through the CEMP.	Developer/Contractor	Planning condition

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Measures to control silt/sediment and pollution release and limit noise incorporated into the CEMP, Water Management Plan, Peat Management Plan and Pollution Prevention Plan	Developer/Contractor	Planning condition
Monitoring of effects on freshwater ecology through an Environmental Monitoring Plan (fish, freshwater invertebrates and water quality).	Developer/Contractor	Planning condition

9.23 References

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10. Telecommunications and Aviation

Non-Technical Summary

Infrastructure, telecommunications and aviation are not technically environmental issues, however for completeness, a chapter has been included in the **EIA**. It addresses the potential impact of the Proposed Development on telecommunications, infrastructure and aviation interests.

Consultation has been carried out with organisations that own or operate infrastructure on or close to the Development Site. The results have shown that there are some utility infrastructure and communications links within the Development Site (electricity, water, telecommunications) that could be affected by the Proposed Development. The design process undertaken for the Proposed Development has ensured that wherever possible, the proposed turbines are located in areas where there would be no effects on infrastructure or telecommunications interests. Where this has not been possible, mitigation measures would be implemented so that these services would not be affected by the Proposed Development.

Consultation has been carried out with organisations that own or operate communications infrastructure. NATS En-Route Ltd has indicated that the proposal would conflict with current safeguarding criteria. As a result, NATS En-Route Ltd is objecting to the Proposed Development due risk to operation of 2 links between Sandwick and Eitshal. Discussions are ongoing with NATS to mitigate the effects on the communications infrastructure. It is anticipated that there would be either no impact or negligible impact on links operated by JRC, Airwaves, BT, MBNL and Highlands and Islands Enterprise, however BT and Highlands and Islands Enterprise are seeking mircositing limitations in relation to their links.

The Ministry of Defence has not indicated that turbines would be visible to its Air Defence Radar infrastructure. Separate survey has confirmed that turbines would not be visible to Air Defence Radars in the region. The main safeguarding concern of the Ministry of Defence with respect to turbines is their potential to create a physical obstruction to air traffic movements and this can be satisfactorily resolved with the requirement for lighting in line with the UK Air Navigation Order and Regulations (2016) and Civil Aviation Authority Policy on aviation lighting. Highlands and Islands Airports Ltd has indicated that Proposed Development falls inside the safeguarded areas for Stornoway Airport and has advised that turbines would require to be lit with a single aviation light. An assessment of lighting is included in **EIA Appendix 6D Night time assessment** which is based on the worst case scenario (ie that required by UK Air Navigation Order and Regulations (2016).

In terms of the Met Office radar on the Isle of Lewis, an objection has been received regarding the effects on the existing radar, however this objection can be removed subject to the implementation of an agreed radar mitigation scheme.

10.1 Introduction and Overview

10.1.1 This chapter, which should be read with reference to the scheme description in **AI Chapter 4 Description of the Proposed Development**, considers the potential effects of the Proposed Development on infrastructure, telecommunications, and aviation issues. These matters have been investigated through consultation with the relevant system operators and accounted for in the iterative wind farm design process.

10.1.2 The design process is described in **AI Chapter 3 Scheme need, alternative and iterative design process**. **EIA Figure 3.1** (Constraints) and **EIA Figure 3.2** (design evolution), illustrates that wherever possible, turbines are located in areas where there would be no effects on existing infrastructure, telecommunications, and aviation interests. Where this is not possible, discussions

with relevant operators are on-going and an agreement would be reached for alternative arrangements to be made so that existing services would not be affected by the Proposed Development.

10.1.3 Following a summary of relevant policy and legislation, this Chapter describes the assessment methodology that has been adopted, the overall baseline conditions and how the design of the Proposed Development has evolved to reduce potential effects (embedded mitigation). The Chapter then provides a summary of the aviation bodies that have been consulted and their responses and provides a summary of environmental measures (additional mitigation) to avoid, minimise, mitigate or compensate for adverse effects. The Chapter concludes with a summary of residual effects following the incorporation of these environmental measures into the scheme.

10.1.4 The infrastructure and telecommunications element of the Chapter has been prepared by Wood, and the aviation aspects have been prepared by Osprey Consulting Services Ltd (Osprey). A list of relevant terminology and abbreviations used in the Chapter are presented in **EIA Appendix 1A Glossary.**

10.2 Methodology and Approach

Policy and Legislation

Scottish Planning Policy and Advice

10.2.1 The Scottish Government's Online Renewables Planning Advice: Onshore Wind (updated May 2014) states that: "*Wind turbines (in common with all electrical equipment) produce electro-magnetic radiation which can interfere with broadcast communications and signals. The Radiocommunications Agency (RA) register of all civil radio communications installations in the UK can identify any radio installations in the neighbourhood of a wind farm site, but will not identify their owners. Applicants should make direct contact with any authorities or bodies likely to have an interest, in particular, the local emergency services, local authority services departments, gas and electricity companies*".

10.2.2 In addition, the Online Renewables Planning Advice states that: "*depending on the wind turbine and anemometers' size, shape, construction materials and location, together with the amount of electromagnetic interference, there may be implications for airport radar and communications systems. Planning authorities should consult the MOD and NERL who have a statutory duty to safeguard certain communication, navigation and surveillance (CNS) sites (including radars) from interference to signals caused by wind turbines in the interests of national security, and the continued safe operation of passenger and military aviation*".

Planning Circular 2/2003 Safeguarding of Aerodromes, Technical Sites and Military Explosive Storage Areas

10.2.3 Planning Circular 2/2003 (revised) sets out criteria outlining how planning authorities must consult with aviation Consultees and which processes they must follow in order to ensure that Consultee responses to proposals are taken into account.

Outer Hebrides Local Development Plan

10.2.4 Details of the planning policy are set out in **EIA Chapter 5 Legislation and policy overview**. Adopted Local Plan Policy EI 8 relates to renewable energy, and makes provision for aviation, radar, telecommunications and infrastructure interests:

"Development proposals for all scales of onshore wind energy development will be assessed against the Supplementary Guidance for Wind Energy Development. The Comhairle supports the principle of

wind farm development in Areas with Potential for Wind Farms subject to a satisfactory assessment against other policies in this plan and the Supplementary Guidance. Many of these areas, particularly in the Uists, will however be constrained by MOD radar. The Supplementary Guidance will give further details of the radar constraints. The Comhairle will also consider wind farm development in Areas of Constraint, with potential in certain circumstances (Map 1)subject to a satisfactory assessment against other policies in this plan and the Supplementary Guidance……

….Proposals for all other renewable energy projects and oil and gas operations (including land based infrastructure associated with offshore projects) will be required to demonstrate all the following:

a. *appropriate location, siting and design including the technical rationale for the choice of site;*

b. *no significant adverse impact (including cumulative) on: landscape, townscape and visual aspects; natural, built and cultural heritage resources; the water environment; peatlands; aviation, defence and telecommunications transmitting and receiving systems, e.g., broadband; public health and safety, and amenity (including noise); neighbouring land uses, transport management and core paths;….."*

10.2.5 Additional guidance is provided for developers with regards to community amenity in the Outer Hebrides Local Development Plan Supplementary Guidance:

"Planning applications for wind farms must be accompanied by evidence that the proposals have been assessed and found to have no unacceptable significant adverse impact on community amenity in relation to the following:

- *Shadow flicker; noise (also see separate policy);*
- *Electromagnetic interference;*
- *Commissioning and decommissioning;*
- *Phasing;*
- *Ancillary developments and infrastructure;*
- *Public access;*
- *Cumulative impacts of the above, including noise, cumulative development assessment, and neighbouring development."*

10.2.6 Further guidance is provided for developers with regards to aviation and defence:

"All applications (in Uist in particular) pre-application discussion with the Comhairle Planning Service and the Ministry of Defence (MOD) is advised, to identify any potential aviation and/or defence constraint arising in relation to radar.

The impacts of developments on aviation and defence operations must be satisfactorily addressed and developers must demonstrate that aviation, defence and emergency services operations will not be compromised. This includes flight activity, navigation and surveillance systems and other air safety navigation, test or surveillance assets or systems.

Consultation with: Highlands & Islands Airports Limited; the Ministry of Defence; National Air Traffic Services; Maritime and Coastguard Agency and the Comhairle should take place at the relevant stages.

When designing and siting proposals Developers should pay particular regard to:

- *MOD Safeguarding Areas;*

- *Health & Safety Executive Safeguarding Zones;*
- *NATS (En Route) Plc (NERL) Safeguarding Maps;*
- *Department of Trade and Industry "Wind Energy and Aviation Interest – Interim Guidance";*
- *CAP 764 - CAA Policy and Guidelines on Wind Turbines - Civil Aviation Authority February 2016;*
- *CAP 393 – Air Navigation: The Order and the Regulations Civil Aviation Authority April 2015;*
- *CAP 670 – Air Traffic Services Safety Requirements Part B Gen 01 Wind Farms Civil Aviation Authority May 2014;*
- *Visibility to NATS, HIAL, and MOD radar and installations;*
- *The Ministry of Defence has provided the Comhairle with bespoke maps for wind turbine visibility to MOD radar in the Outer Hebrides (Maps 3a – e)."*

Civil Aviation Authority (CAA) Guidance

10.2.7 The CAA has produced/commissioned a series of publications referred to as CAPs and those of relevance to wind farms are summarised below in **Table 10.1**.

Table 10.1 Summary of CAPs Relevant to Wind Farms

Policy Reference	Policy Issue
CAP 168 – Licensing of Aerodromes	Chapter 4 – The Assessment and Treatment of Obstacles, Paragraph 1.1, states: "*The effective utilisation of an aerodrome may be considerably influenced by natural features and man-made constructions inside and outside its boundary. These may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken. For these reasons certain areas of the local airspace must be regarded as integral parts of the aerodrome environment. The degree of freedom from obstacles in these areas is as important to the granting and retention of an aerodrome license as the more obvious physical requirements of the runways and their associated runways strips*".
CAP 670 – Air Traffic Services Safety Requirements	Part B, Section 4, GEN 01, sub-section 3: "*Windfarms need to be considered as a safeguarding activity. The ATS [Air Traffic Service] Provider is responsible for ensuring, as far as is reasonably practicable, that such development does not impact on the safety of the ATS environment.* *The ATS Provider is responsible for deciding whether or not it can accept any degradation to the ATS environment. If the ATS Provider predicts that the degradation is unacceptable then it should make representations to the appropriate local Authority.* *The CAA does not have the power to veto Windfarm development (other than on the land actually owned by the CAA).* *The ATS provider is responsible for mitigating against any deterioration to the Air traffic Services caused by wind farms*".
CAP 738 – Safeguarding of Aerodromes	Chapter 1 – Safeguarding of Aerodromes, Paragraph 1.1, states: "*A process of consultation between a Local Planning Authority (LPA) and consultees, which is made obligatory by Statutory Direction, safeguards some aerodromes and aeronautical technical sites in the United Kingdom. This is called 'statutory' or 'official' safeguarding*".

Policy Reference	Policy Issue
CAP 764 – CAA Policy and Guidelines on Wind Turbines	Chapter 3 – Safeguarding Considerations, Paragraph 1a, states: *"Developers will be referred to the aerodrome licensee of aerodromes with a surveillance radar facility within 30km of the proposed wind turbine development or to the distance specified by the aerodrome or indicated on the aerodromes published wind turbine consultation map".*

Baseline Establishment

10.2.8 The infrastructure, aviation, and telecommunications assessment is largely based on consultation with the organisations known to have interests in the area of the Development Site.

Consultation

10.2.9 A series of consultation exercises to identify utility, infrastructure, aviation and telecommunications service providers in the area of the Development Site were carried out to inform the EIA for the Proposed Development. The result of these consultations are summarised as part of the baseline information presented in **Section 10.3**.

Methodology for Establishment of Effects and Evaluation Methodology

10.2.10 It is not intended to ascribe an evaluation methodology in relation to the issues described in this Chapter as the approach when considering telecommunications, infrastructure and aviation issues is to design a wind farm to avoid potential impacts on these interests wherever possible. Where relocation of turbines or associated wind farm infrastructure to avoid potential impacts is not possible, technical solutions to address these are then identified to ensure that there is no disruption to the operations of the service providers.

10.3 Baseline

Current Baseline

Infrastructure

10.3.1 Consultation commenced in January 2018 onwards, to build on the work undertaken as part of the Consented Development and responses received in relation to the Scoping Opinion for the Proposed Development. Infrastructure consultations are summarised in **Table 10.2**, and **AI Figure 10.1** shows all relevant infrastructure and applied buffers.

Table 10.2 Summary of Issues Raised during Consultation Regarding Infrastructure

Consultee/Data Provider	Response
LinesearchbeforeUdig (LSBUD)	Details of the Proposed Development were entered into http://www.linesearchbeforeudig.co.uk. SGN was identified as potentially having infrastructure in the vicinity of the Development Site.
Scottish and Southern Energy (trading as Scottish Hydro Electric Power Distribution (SHEPD) in Northern Scotland)	SHEPD online infrastructure search shows that there are a number of 11kV, 33kV and 132kV power lines running across or close to the Development Site. The majority of this infrastructure is located to the east / south east of the Development Site, generally running along the A858. Beinn Greidaig Wind Farm has a cable that runs through the centre of the Development Site along the minor road in the middle of the Development Site before running down towards the Marybank substation.
SGN	LSBUD identified SGN as potentially having assets in the vicinity of the site. SGN subsequently provided mapping showing there were no assets that would be affected by the Proposed Development.
Scottish Water (SW)	Scottish Water responded to scoping with the following statement: *"According to our records, the development proposals impact on existing Scottish Water assets.* *The applicant should be aware that any conflict with assets identified may be subject to restrictions on proximity of construction."* SW Asset maps were obtained that showed that the wind turbines would not affect Scottish Water infrastructure, but some of the access points to the Development Site would need to locate and protect the SW assets, if required, before construction takes place.

Telecommunications

10.3.2 Consultation relating to telecommunications commenced in April 2018 onwards, to build on the work undertaken as part of the Consented Development and responses received in relation to the Scoping Opinion for the Proposed Development. A summary of telecommunications scoping consultations is provided in **Table 10.3.** Consultation comments on the **EIA Report 2019** are set out in the Interim Response Report (see **AI Appendix 3A Interim Response Report**) at **Table 3.2**.

Table 10.3 Summary of Issues Raised during Scoping Consultation Regarding Telecommunications

Issue Raised	Consultee(s)	Response
Microwave Links	Ofcom	A number of microwave links were identified near to the Development Site; the operators identified are: • Highlands and Islands Enterprise; • BT; • EE Limited (MBNL); • Airwave Solutions Limited; • Vodafone. These operators were then contacted individually to obtain more detailed information.
Microwave Links	JRC	Objected to development due to three scanning telemetry and one microwave link crossing the Development Site. A coordination study was commissioned which looked at the Proposed Development in more detail and the linked locations were identified.

Issue Raised	Consultee(s)	Response
Microwave Links	Airwave Solution	Objected to the Proposed Development due to two microwave links crossing the Development Site. A coordination study was commissioned which looked at the Proposed Development in more detail and the linked locations were identified.
Microwave Links	BT	Objected to the Proposed Development and provided details of the two BT microwave links crossing the Development Site.
Microwave Links	EE (MBNL)	MBNL provided details of the link that crosses the Development Site, along with its requested buffers.
Microwave Links	Vodafone	No response has been received from Vodafone.
Microwave Links	Highlands and Islands Enterprise	Provided details of the link that crosses the Development Site.
Microwave Links	NATS	Although not identified by Ofcom, NATS responded to a separate consultation request identifying two microwave links running across the Development Site (using the same path). NATS also identified a potential impact on air-ground communications but deemed it acceptable.
Telecommunications	TV Signal	A number of properties to the north and east of the Development Site are within 5km of the Proposed Development, and as such might have television reception affected. The nearest digital broadcast mast is Eitshal, located to the south west of the Development Site, and therefore parts of the Proposed Development lies between the broadcast tower and the population centre.

Aviation

10.3.3 A summary of Aviation consultations is provided in **Table 10.4.** Consultation comments on the **EIA Chapter 10** are set out in the Interim Response Report (see **AI Appendix 3A Interim Response Report**) at **Table 3.2**.

Table 10.4 Summary of Issues Raised during Scoping Consultation Regarding Aviation and Radar

Consultee	Response
Ministry of Defence (MOD)	The MOD has no objection to the Proposed Development. In the interests of aviation safety the MOD requests that the cardinal turbines (turbines 1, 8, 10, 16 and 20) are fitted with MOD accredited combination 25 candela omni-directional red lighting and infrared lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practical point. The remaining perimeter turbines should be fitted with 25 candela omni-directional lighting or infrared lighting to the same specification as previously stated. The principal concern of the MOD with respect of 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.
NATS En Route PLC (NATS)	Based on their preliminary technical findings, the Proposed Development was found to conflict with their safeguarding criteria. Accordingly, NATS objected to the proposal. Following further examination, technical and operational safeguarding teams deemed the potential impact on air-ground communications to be acceptable. However the risk to the operation of two microwave links was found to be sufficient for NATS to **object** to the Proposed Development.

Consultee	Response
Highlands and Islands Airports Ltd (HIAL)	The Proposed Development falls inside the safeguarded areas for Stornoway Airport. The turbines would present a significant infringement to the safeguarded area. The Civil Aviation Authority (CAA) expects HIAL to provide evidence that the safety of Air Traffic Service Provision would not be compromised or degraded by the development and a safety case / full assessment would need to be submitted to them. This process was undertaken for the previous consent to the windfarm. However, due to the change in layout and significant increase in turbine height, a separate safety case would be required. Due to the height of the Proposed Development, as a minimum, aviation warning lights of 2000 candela would be required at the hub height of all turbines. It should be noted that HIAL would work with the developer towards a resolution. However, HIAL would **object** to this proposal until a conclusion can be reached with the CAA.
Met Office	No Response.
Civil Aviation Authority (CAA)	No Response.

10.3.4 Following submission of the EIA Report 2019, a further consultation response was received from HIAL and comments were provided by the Met Office.

10.3.5 HIAL's updated response confirmed that, provided a steady red omnidirectional aviation warning light of 2000 candela is provided on the hub height of the turbines, they would not object to the Proposed Development.

10.3.6 The comments from the Met Office advised of their objection to the Proposed Development on the basis that the turbines will be within line of sight of the Met Office radar at the Druim-a-Starraig weather radar and are anticipated to cause significant shadowing, clutter and Doppler effects. The Met Office proposes a Radar Mitigation Scheme as a pre-condition of the erection of any turbines.

Predicted Future Baseline

10.3.7 On the basis of the consultation undertaken, there are no additional planned utility infrastructure, aviation or telecommunications developments in the vicinity of the Development Site. If the Proposed Development is consented and built, any future developments would be required to take account of the presence of the wind farm in the implementation.

Information Gaps

10.3.8 Vodafone have not responded to consultation and it is assumed that it has no links that could be affected by the Proposed Development.

10.3.9 Joint Radio Company (JRC) have been consulted on the layout as presented in **EIA Figure 4.1** and are currently modelling the application layout, but have not provided their response to date. In terms of JRC, the change to **AI Figure 4.1** would not result in any effects on JRC infrastructure as they only require changes to turbine location or dimensions.

10.3.10 On this basis, no information gaps that would affect the robustness of this assessment have been identified.

10.4 Design Evolution

10.4.1 As a general principle, wind farms are designed with due cognisance of telecommunication links and other elements of infrastructure that cross development sites, based on the consultation responses from relevant organisations. This iterative design process is set out in **AI Chapter 3** and **AI Figure 10.1** identifies the constraints that have been used to help inform the wind farm design.

Infrastructure

10.4.2 11kV, 33kV and 132kV pole mounted above ground electric power lines, operated by SHEPD, run along the A859 to the south east and east of the proposed turbine locations. The proposed turbines are a minimum of 900m from the power lines and no effects are anticipated as a result of the Proposed Development.

10.4.3 The SHEDP 33kV pole mounted power lines that runs north-south between the recycling plant and the SHEPD substation near Creed Bridge, and the 11kV, 33kV and 132kV lines that run parallel to the A859 could potentially be affected by track construction work. Any suitable protection works identified with the operator would therefore be put in place before any construction work begins.

10.4.4 Depending on the clearance under the power line, it is likely that some undergrounding of the SHEPD infrastructure would be required in order to allow abnormal load vehicles delivering turbines and other components to pass.

10.4.5 With regards to the underground electrical cables connecting Beinn Greidaig Wind Farm to the electrical network that could potentially be affected by track construction work, buried power line locations would be identified before any construction work begins, and any suitable protection works identified with the operator and put in place if required.

Telecommunications

10.4.6 JRC identified three scanning telemetry links, and one fixed microwave link running across the Development Site, and so objected initially to the Proposed Development (which is standard practice for JRC if any links are identified within 1km of a turbine location).

10.4.7 The Applicant subsequently commissioned a coordination study with JRC to establish the location of the links and the impact on its network. This study used the scoping layout, and JRC requested that a number of turbines be moved and/or micrositing be limited in a certain direction in order to establish acceptable impacts on its network. Working with these details, a suitable buffer distance was established and used in redesigning the Proposed Development under the design process described in **AI Chapter 3**.

10.4.8 One of the scanning telemetry links relates to the Pentland Road Wind Farm communication array. This link originates close to a number of the proposed turbine locations and runs through the location of turbine 21.

10.4.9 Due to the complex nature of scanning telemetry links, the Proposed Development was sent to JRC for final comment, but no response has been received to date.

10.4.10 Airwave Solutions identified two links running across the Development Site. A detailed study was commissioned to identify the locations and establish appropriate stand-off buffers, again using the scoping layout. Airwaves requested that 100m from the link centre point to the turbine centre point be used as a minimum buffer. Based on the layout of the Proposed Development (**AI Figure 4.1**), all turbines are in excess of 160m from the nearest link. The latest layout was sent to Airwaves to reassess impact on their links. No response has been received to date

10.4.11 BT identified two microwave links running across the site and also provided link details. An initial buffer of 100m from blade tip was requested as standard, although in the past BT have been able to accept a much smaller buffer of 25m from the edge of the 2nd Fresnel Zone to the blade tip of any turbine.

10.4.12 Based on the initial 100m from blade length buffer requested, a buffer of either 175m or 168m for turbine towers would be required (depending on the rotor diameter as outlined in **AI Chapter 4)**. One wind turbine (turbine 7) is located 150m from the centre of the link, all others are in excess of 195m from the link centre line. BT has subsequently confirmed that the position of turbine 7 is acceptable provided that micro-siting is restricted so there is no movement towards the affected link.

10.4.13 MBNL identified a single microwave link running across the Development Site and requested a buffer of 100m from the link centre line. All proposed turbine locations are in excess of 200m from the link centreline.

10.4.14 Highlands and Islands Enterprise identified a single microwave link running across the Development Site and requested a stand-off buffer based on *"the radius of the F2 Fresnel zone of the link (13GHz) at the 90 degrees intersection point with the turbine, plus the turbine blade radius, plus a 25m margin and any micro-siting margin"*. Based on the proposed turbine blade lengths, this would result in a buffer of either 104m or 111m, depending on turbine size. The closest turbine to this link is turbine 20, which is 140m from the centreline. Highlands and Islands Enterprise subsequently confirmed that this turbine location was acceptable, provided that micro-siting was limited to 20m in the direction of the link.

10.4.15 NATS provided details of a microwave link running across the Development Site as part of its response to the aviation consultation. This link runs within 20m of the proposed location of turbine 8 (as illustrated on AI Figure 10.1). Turbine 8 is in the same location as the contented turbine T34. It has not been possible to relocate Turbine 8. Further discussion with NATS will be undertaken and it is likely that mitigation set out for the Consented Development (requiring an air to ground communication mitigation scheme) would be proposed and considered acceptable. This mitigation scheme would be secured through a planning condition.

10.5 Scope of Assessment

Potential Receptors

10.5.1 The methodology used in this chapter includes evaluating:

- Potential effects on utility infrastructure;
- Potential effects on broadcast signals;
- Potential effects on telecommunications.; and
- Potential effects on aviation and radar.

10.5.2 With regards to potential infrastructure receptors, SHEPD and Scottish Water assets may be affected by the Proposed Development.

10.5.3 With regards to microwave links and fixed telecommunication, links operated by JRC, Airwaves, MBNL, BT, NATS and Highlands and Islands Enterprise have the potential to be affected by the Proposed Development.

10.5.4 Wind farms can also affect domestic television signals. The Proposed Development is located between Stornoway and the Eitshal transmitter, and therefore television reception could be adversely affected by the Proposed Development.

10.5.5 With regards to potential aviation interests, the safety of Air Traffic Service Provision has the potential to be affected by the Proposed Development and, due to the height of the proposed turbines, aviation lighting would be required.

10.6 Likely Significant Effects

Predicted Effects: Construction

Predicted Effects: Utilities and Infrastructure

10.6.1 With regards to potential infrastructure receptors, the access tracks that would be constructed have the potential to affect a SHEPD 33kV pole mounted power line, and the underground cable linking Beinn Greidaig Wind Farm to the SHEPD substation, should appropriate mitigation not be put in place.

10.6.2 Scottish Water pipework near the Development Site entrances on the A859 could also be affected should appropriate mitigation not be put in place.

Predicted Effects: Telecommunications

10.6.3 There would be no effects on microwave links during construction of the Proposed Development.

Predicted Effects: Television Reception

10.6.4 There would be no effects on television reception during construction of the Proposed Development.

Predicted Effects: Aviation

10.6.5 Article 222 of the UK Air Navigation Order (ANO) 2016 requires aviation warning lighting are fitted to cranes, which could be relevant to the construction period. It states: "*Away from the immediate vicinity of an aerodrome and where the maximum crane height is less than 150 meters aviation warning lighting is not a legal requirement. However, given the likelihood that such cranes will be amongst the tallest structures in any given location the CAA recommends that, in order to ensure that the crane operator fulfils his duty of care towards others, the crane user (contractor) considers using aviation warning lighting in line with the following: - Cranes that are between 90 meters and 150 meters (approximately 300 – 500 feet) high being equipped with medium intensity steady red lighting positioned at the highest point and both ends of the jib, such that the lighting will provide an indication of the height of the crane and the radius of the crane jib. Such lighting, which should be displayed at night, should be positioned so that when displayed it is visible from all directions. - Cranes that are 60 meters to 90 meters (approximately 200 – 300 feet) high being equipped with low intensity steady (generically 32 candela) red lighting positioned as close as possible to the highest point and, for tower cranes, to the top of the fixed structure. Such lighting, which should be displayed at night, should be positioned so that when displayed it is visible from all directions*."

10.6.6 CAP 738 Safeguarding of Aerodromes provides the following information for aviation stakeholders with regard to the use of cranes within their safeguarded areas. Should a crane be required on or in the vicinity of an aerodrome, the attention of the crane operator should be brought to the British Standard Institute Code of Practice for the safe use of Cranes, BS 7121, Part 1. In particular, paragraph 9.3.3 says that the appointed person should consult the aerodrome/airfield manager for permission to work if a crane is to be used within 6 km of the aerodrome/airfield and its height exceeds 10 m or that of the surrounding structures or trees.

10.6.7 Cranes associated with the construction of the Proposed Development may therefore carry aviation warning lights dependent upon their height and it has been assumed that up to two cranes would be present on site during the construction period. As discussed in **EIA Chapter 6 Landscape and Visual**, the visual effects of these lights would be Substantial / Moderate and significant, but limited to a more localised geographical area, extending out to approximately 2km from the light sources locations due to their lower light intensity and fewer number., The nature of these effects would be temporary, direct, cumulative and negative. During construction of the Proposed Development embedded mitigation practices will adequately provide information to aviation stakeholders (in this regard MOD and HIAL). The sensitivity of the stakeholder is medium and the magnitude of effect is low. The effect on aviation stakeholders during the construction phase is expected to be not significant, subject to the completion of standard notification to aviation authorities as detailed in **Section 10.6.5.**

Predicted Effects: Operation

Predicted Effects: Infrastructure

10.6.8 There would be no effects on infrastructure assets as a result of the operation of the Proposed Development.

Predicted Effects: Telecommunications

10.6.9 The Proposed Development could affect the operation of microwave and scanning telemetry links that run across the Development Site. The consultation exercise identified six operators that could be affected (JRC, Airwaves, MBNL, BT, NATS and Highlands and Islands Enterprise). Further consultation has subsequently been undertaken with all of these operators, and buffers established that seek to limit any effects on the microwave and scanning telemetry links.

10.6.10 MBNL and Highlands and Islands Enterprise have confirmed that there would be no impact on their network as a result of the Proposed Development. Airwaves are in the process of assessing the EIA Report 2019.

10.6.11 One turbine is within the 175m buffer requested by BT, but outside a smaller buffer of 130m based on an assessment using the 2nd fresnel zone of 30m, plus blade length and a 25m buffer, as initially proposed by BT. On this basis, there should be no interference with this link, although the turbine should not be micro-sited towards the link centreline.

10.6.12 Turbine 8 is located within 20m of the centre line of the NATS microwave link. This is in the same location as the Consented Development Turbine 34. A section 36 consent condition was required to mitigate effects of t34 on the NATS microwave link. It is anticipated that a similar worded condition would be imposed on the Proposed Development, should consent be granted. Discussions are ongoing with NATS to establish the most appropriate mitigation solution.

10.6.13 One of the JRC scanning telemetry links relates to the Pentland Road Wind Farm communication array. This link originates close to a number of proposed turbine locations and runs through the proposed location of turbine 21. As per the consented layout, it has not been possible to mitigate the effects on this link and so JRC have assumed that the link will require mitigation through relocating the link.

10.6.14 All turbines are in excess of 130m from the other JRC scanning telemetry links, and at least 160m from the JRC fixed link. Whilst it is believed that this is acceptable, the Applicant has requested confirmation of this from JRC but no response has been received to date.

Predicted Effects: Television Reception

10.6.15 Wind turbines have the potential to adversely affect terrestrial television reception up to a maximum distance of 5km (Ofcom, 2009) and there are a number of properties within this distance of turbines. However all transmitters in the UK are now fully switched over from analogue to digital signals, which reduces the likelihood of interference with the television signal.

10.6.16 When several turbines are sited in close proximity, the interactions of these interference mechanisms are complex and difficult to predict. There are, however, several ways that any potential problems can be mitigated.

10.6.17 Ofcom (2009) recommend that turbines should be sited at least 500m away from a viewer to help reduce the likelihood and severity of any interference. Design iteration has ensured that a maximum distance between turbines and residential dwellings was applied wherever possible and this has resulted in a minimum separation distance to properties of approximately 1,800m.

10.6.18 The nearest digital television transmitter is located at Eitshal, 3.9km to the south west of the Development Site, and 4.1km from the nearest turbine. The Development Site lies between the transmitter and Stornoway, and interference from the transmitter is therefore possible for receptors in Stornoway.

Predicted Effects: Aviation

10.6.19 A 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 (low flying) and Air Defence Radar (ADR) installations. A Line of Sight (LOS) assessment has been undertaken[1] for the Proposed Development which has concluded that there is no detectability of the Proposed Development by the ADR in the region due to the distance between the receptors, curvature of the earth and intervening terrain. There would therefore be no effect on ADR installations as a result of the operation of the Proposed Development; the MOD has no objection to the Proposed Development and therefore ADR effects are scoped out. However the MOD has identified that aviation lighting would be required. This is discussed below.

10.6.20 HIAL has indicated that the Proposed Development falls inside of the safeguarded areas for Stornoway Airport and that the proposed wind turbines would present a significant infringement to the safeguarded area and associated communications systems. The CAA expects HIAL to provide evidence that the safety of Air Traffic Provision would not be compromised or degraded by the Proposed Development and a safety case / full assessment would need to be submitted to them. A Safeguarding Assessment was undertaken for the Consented Development. HIAL have been consulted on the Proposed Development, and raise no objection, subject to the installation of an aviation warning light at each turbine. .

10.6.21 Based on preliminary technical findings, the Proposed Development was found to conflict with NATS safeguarding criteria. Further examination by their technical and operational safeguarding teams deemed the potential impact on air-ground communications to be acceptable. However, NATS is maintaining their objection to the Proposed Development due to the risk to operation of two microwave links. Turbine 8 of the Proposed Development is located in the same place as the Consented Turbine T34. It is anticipated that the condition requirements relating to the Consented

[1] Osprey undertook radar performance and propagation modelling to determine the theoretical detection of the proposed wind turbines by the region's radar (surveillance) infrastructure. This was carried out using the ATDI ICS LT 4.3.3 tool to model the terrain elevation profile between the identified PSR and ADR and the Development Site, to provide a graphical representation of the intervening terrain and theoretical direct Line of Sight (LOS), in order to determine the affected radar systems.

Development would also apply to the Proposed Development. Discussions are ongoing between the Applicant and NATS to establish the most appropriate mitigation solution.

10.6.22 Both HIAL and the MOD have requested that aviation lighting is fitted to the proposed turbines in the interests of aviation safety. HIAL requires one light to be fitted on each turbine. The MOD require lighting to be fitted in accordance with ANO (2016) requirements. Aviation warning lighting would be required on all 35 turbines of the Proposed Development, assuming these would be in excess of 150m in height to blade tip. The CAA policy statement *'Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground* Level', advises that that medium intensity (2000 candela), red, aviation warning lights are fitted as close as possible to the top of all fixed structures which have a total height of more than 150m above ground level.

10.6.23 The specific aviation warning light requirements for the Proposed Development are therefore as follows:

- Aviation warning lights fitted to each of the 35 turbines would comprise four lights as follows:
  - One medium intensity lighting unit (2000 candela) at hub height (105m and 88m AGL); and
  - Three low intensity lighting units (32 candela) at half hub height (52.5m and 44m AGL).
- It is assumed the lighting would be operated by an automatic control device which reliably allows the lighting to be activated when the ambient threshold falls below 500 LUX in accordance with the requirements of the CAA policy statement and Article 222 of the ANO (2016).

10.6.24 The above lighting specification has been used to model the effects of the aviation warning lights for a Night-time Assessment, which is included as **EIA Appendix 6D**. The Night-time Assessment concludes that significant visual effects would arise within 10km of the Proposed Development as a result of the required aviation warning lights.

Predicted Effects: Met Office Radar

10.6.25 The Met Office objected to the Proposed Development, however agree to withdraw their objection if a number of conditions are imposed on any consent granted. For the purposes of this Chapter it is assumed that the mitigation agreed under the Consented Development scheme, i.e. the re-location of the Met Office Radar, is sufficient to ensure the revised scheme would have no unacceptable effects on Met office operation on the Island.

Predicted Effects: Decommissioning

10.6.26 There would be no effects on infrastructure, telecommunication links, broadcast services during decommissioning, and these are not considered further in the assessment.

10.6.27 In line with Article 222 of the ANO) (2016), cranes associated with the decommissioning of the Proposed Development may be required to carry aviation warning lights dependent upon their height and it has been assumed that up to two cranes would be present on site during the decommissioning period. The visual effects of these lights during decommissioning would be the same but to a lesser degree as those encountered during construction, as discussed in **EIA Chapter 6** and summarised in in **Section 10.7.6** and would be significant.

Predicted Effects: Cumulative

10.6.28 All potential effects in respect of telecommunications, infrastructure and utilities can be or have been mitigated therefore no cumulative effects would arise.

10.6.29 It has been identified in **EIA Chapter 6** and **EIA Appendix 6D** that temporary, direct, cumulative and negative effects, which would be significant (in terms of landscape and visual amenity**)** would arise during the construction and decommissioning periods as the cranes associated with these phases would be required to carry aviation warning lights. The aviation warning light requirements for the Proposed Development are assessed in **EIA Chapter 6** and **EIA Appendix 6D**. The assessment concludes that long-term (reversible), direct, cumulative and negative effects, which would be Substantial / Moderate and significant would arise whilst the Proposed Development is operational.

10.6.30 Unmitigated, the impact that the Proposed Development would create to aviation operations is limited to specific procedures at Stornoway Airport and its immediate environs which would not be impacted by other windfarm developments and therefore cumulative effects are not significant.

10.7 Mitigation Measures

Infrastructure

10.7.1 SHEPD and Scottish Water would continue to be consulted if required to ensure that their infrastructure is not adversely affected during the construction of the Proposed Development.

10.7.2 All relevant H&S guidance would be adhered to during design and construction of the wind farm. This would be relevant to the proposed access track beneath the 132kV and 33kV SHEPD power lines. It is likely that these power lines would require undergrounding at certain points in order to avoid any abnormal load vehicles hitting the lines or effects of electricity jump as loads move in close proximity to the OHL. However, by following HSE guidance note GS6 and liaising with SHEPD in order for this remediation work to be undertaken, no adverse impact is anticipated on their infrastructure.

10.7.3 A micro-siting provision has been requested such that any turbine can be moved up to 50m taking into account known environmental and telecommunications constraints. It is intended that this provision would be used to respond to any additional unforeseen infrastructure constraints.

Telecommunications

10.7.4 Following the identification of appropriate buffer distances for nearly all the microwave links, it is anticipated that there would be either no impact or negligible impact on links operated by JRC, Airwaves, BT, MBNL and Highlands and Islands Enterprise. There should be no requirement for mitigation on these links, although Highlands and Islands Enterprise requested that turbine 20 be restricted to a micro-siting limit of 20m towards the link and, through further discussions with BT since submission of the EIA Report 2019, BT has confirmed that they would be prepared to accept the proposed position of turbine 7 subject to a micro-siting restriction so there is no movement towards the affected link. The micro-siting limits could be controlled by planning condition.

10.7.5 JRC are expected to request that micrositing of certain turbines (T1, 2, 3, 4, 7, 8, 9, 10, 11, 28 and 34) towards the relevant link to be restricted to avoid interference. A detailed response to the Proposed Development has yet to be received. Should limitations to micrositing be required by JRC, this could be controlled by planning condition.

10.7.6 One of the scanning telemetry links relates to the Pentland Road Wind Farm communication array. This link originates close to a number of proposed turbine locations and runs through the location of turbine 21. As per the consented layout, JRC has assumed that the link would require mitigation through its relocation. For the 2015 consented wind farm JRC stated the following:

"Dependant on location and timescales of the proposed cluster substation that will service both this and Pentland Rd windfarm; a non-radio mitigation solution may be required for the existing/new communications link to the windfarm(s). This cost should be covered by the developer."

10.7.7 The same condition would be required for The Proposed Development.

10.7.8 The NATS microwave link would require mitigation to avoid the Proposed Development affecting it. Discussions with NATS are ongoing, but given that the Consented Development turbine T34 is located in the same place as the Proposed turbine 8, it is assumed that the mitigation requirement identified in the Consented Development would be relevant to the Proposed Development. Should consent be granted for the Proposed Development, this mitigation would be controlled by condition. .

Television Reception

10.7.9 In the event of a reduction in television reception quality occurring in the surrounding area, it is most likely to be noticed when the Proposed Development becomes operational. To mitigate any problems with reception arising, the Applicant would accept a 'Requirement' to assess current television signals in advance of the construction of the Proposed Development and would mitigate post-development problems with television reception arising where effects are attributable to it.

10.7.10 The 'Requirement' would require the Applicant to meet the cost of investigating and effectively rectifying any problems should they arise and to implement solutions in a timely manner so as to minimise any inconvenience to residents. While a reduction in television reception quality is unlikely, it is expected that if any issues arise, these would occur within the first year of operation of the Proposed Development and any remedial work would therefore be limited to this period only.

10.7.11 Viewing quality can be improved by considering each or a combination of the following mitigation measures:

- Replace or upgrade the receiving aerials (e.g. with directional receiving aerials) for any affected households;
- Re-tune the television receivers at any affected households;
- Re-align the television aerial and re-tune the receiver at any affected households; and
- Provision of a bespoke 'self-help' solution (this could comprise a new low powered transmitter, a cable network, a satellite receiver or a combination of these measures).

10.7.12 By implementing these measures, it is anticipated that any television reception issues as a result of the Proposed Development would be fully mitigated.

Aviation

10.7.13 HIAL have been consulted on the Proposed Development, and raise no objection, subject to the installation of an aviation warning light at each turbine. This would be controlled by planning condition, should consent be granted.

10.7.14 The Night-time Assessment set out in **EIA Appendix 6D** has been based on a precautionary 'worst case' and the possibility for no lighting, or reduce intensity lighting (under Article 222, and CAA policy statement, clause 'g') has not been consulted on with the CAA at this stage. However should consent be granted, a condition requiring the submission of an Aviation Lighting Plan to be agreed by both HIAL and the MOD would mitigate the aviation effects. It is acknowledged that SNH has advised that it would prefer less intrusive lighting, and the Applicant will work with the consultees

to further minimise effects from nighttime lighting. However the Proposed Development has been assessed on a worst case scenario (see **EIA Appendix 6D**).

10.7.15 The Met office have responded to the EIA consultation, and have suggested a number of conditions that would make the Proposed Development acceptable. These conditions are similar in nature to those relating to the Consented Development.

10.8 Summary of Mitigation Measures

10.8.1 **Table 10.5** summarises the mitigation that has been identified to mitigate the potential effects of the Proposed Development on infrastructure, telecommunications and aviation as detailed in the preceding sections.

Table 10.5 Summary of Mitigation Measures

Receptor and Effect	Responsibility for Implementation	Compliance Mechanism
Infrastructure – interference with 132kV and 33kV Scottish Power electricity transmission line	Developer / Contractor	Power lines would be undergrounded and protected where required, following liaison with SHEPD.
Infrastructure – Beinn Greidaig 33kV underground cable	Developer / Contractor	Power lines would be located and additional protection put in place if required during track construction.
Telecommunications – NATS microwave link	Developer	A mitigation scheme would be submitted to mitigate effects on the telecommunications link.
Telecommunications – Highlands and Islands	Developer / Contractor	Restrict micrositing of Turbine 20 to 20m in the direction of the microwave link.
Telecommunications – JRC – Pentland Road Wind Farm Scanning Telemetry Link	Developer	A non-radio mitigation solution may be required for the existing/new communications link to the wind farm(s).
Telecommunications – JRC	Developer / Contractor	Restrict micrositing of a number of turbines in order to prevent the turbine moving closer to the identified link(s). JRC still to respond to application layout.
Telecommunications – BT	Developer / Contractor	Restrict micro-siting of Turbine 7 so there is no movement towards the affected link.
Television reception	Developer	A mixed solution would be required in the unlikely event that the Proposed Development turbines interfere with TV reception. This would include: - a preconstruction survey to establish a baseline for TV reception; Mitigation measures to ensure no loss in signal at any property within 12 months of the operation of the Proposed Development.
Aviation	Developer	Lighting requirement.

Receptor and Effect	Responsibility for Implementation	Compliance Mechanism
Aviation Lighting	Developer	Submission of an Aviation Lighting Plan setting out the number, intensity, type and location of lighting.
Met Office Radar	Developer	A mitigation scheme to be agreed with the Met office, likely to be the same as that of the Consented Development.

10.9 Evaluation of Impacts

10.9.1 This Chapter has demonstrated that impacts on infrastructure and telecommunications can be fully mitigated where required. As such, there would be no significant residual effects on the identified infrastructure and telecommunications interests.

10.9.2 Significant (long-term, reversible) effects have been identified as a result of the aviation lighting requirements in terms of landscape and visual effects.

10.10 References

BBC, Radio communications Agency and Independent Television Commission, 1999. The Impact of Large Buildings and Structure(s) on Terrestrial Television Reception.

Civil Aviation Authority (March 2016) The Air Navigation Order 2016. http://www.legislation.gov.uk/uksi/2016/765/contents/made

Civil Aviation Authority (June 2017) DAP Policy: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level. http://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=7967&filter=2

Energy Networks Association Engineering recommendation Issue 1 2012 Separation between Wind Turbines and Overhead Lines Principles of Good Practice. http://www.spenergynetworks.co.uk/userfiles/file/Energy_Networks_Association_Separation_Wind_Turbines_Overhead.pdf

LinesearchBeforeUDig website http://www.linesearchbeforeudig.co.uk

Ofcom, Tall structures and their impact on broadcast and other wireless services, August 2009.

Outer Hebrides Onshore Wind Energy Supplementary Planning Policy Guidance (November 2018).

Planning Circular 2/2003 Safeguarding of Aerodromes, Technical Sites and Military Explosive Storage Areas, updated 2016. https://www.gov.scot/publications/planning-circular-2-2003-scottish-planning-series-town-country-planning-0755923111/

Scottish Government Onshore Wind Turbines Information (First published February 14, 2011 updated February 14 & 25, 2011, August 5, 2011, January 27, 2012, March 14, 2012 , May 02, 2012, August 28, 2012, October 24, 2012, July 17, 2013, December 2013 and last updated May 28, 2014). http://www.scotland.gov.uk/Resource/0044/00440315.pdf

13. Traffic and Transport

Non-technical Summary

The likely significant effects of the Proposed Development with respect to traffic and transport have been assessed. The potential effects of changes in road traffic movements on the users of the road network (pedestrians, cyclists, equestrians and drivers) and those living close to it during the construction and operational periods of the Proposed Development have been considered.

The levels of traffic during the construction phase are greater than those associated with the operational phase and were compared against existing traffic volumes in order to determine their significance. Construction traffic associated with the Proposed Development would result in no significant effects in terms of severance, driver delay, pedestrian delay and amenity, fear and intimidation, and accidents and safety.

A Construction Traffic Management Plan would be prepared to manage the daily movements and routing of HGVs. This would ensure that vehicles access the Proposed Development via the most appropriate route and that their arrivals / departures and working hours are programmed to lessen the impact on the road network. Measures, such as temporary signage and traffic management, would also be put in place to ensure safe passage of all vehicles.

13.1 Introduction

13.1.1 This chapter of the **AI** submission assesses the likely significant effects of the Proposed Development with respect to Traffic and Transport. The chapter should be read in conjunction with the development description provided in **AI Chapter 4 Project Description** and with respect to relevant parts of **EIA Chapter 12 Noise** where common receptors have been considered and where there is an overlap or relationship between the assessment of effects.

13.2 Limitations of this Assessment

13.2.1 There are no limitations relating to Traffic and Transport that affect the robustness of the assessment of the likely significant effects of the Proposed Development.

13.3 Relevant Legislation, Planning Policy, Technical Guidance

13.3.1 The general legislative and policy context for EIA is described in **EIA Chapter 5 Legislation and policy overview**.

Legislative Context

13.3.2 There is no specific legislation that needs to be considered when determining the scope of this assessment.

Planning Policy Context

13.3.3 A summary of transport-specific national, regional and local policies and plans is provided in **Table 13.1**. These policies and plans have been considered to help define the scope of the assessment.

Table 13.1 Planning Policy Issues Relevant to Traffic and Transport

Policy reference	Policy issue
National planning policies	
Scotland's Third National Planning Framework (NPF3)	NPF3 is the spatial expression of the Scottish Government's Economic Strategy, and of its plans for infrastructure investment. It is about the ambition to create great places that support sustainable economic growth across the country.
Scottish Planning Policy (SPP) June 2014	The purpose of the SPP is to set out national planning policies which reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land.
HITRANS Regional Transport Strategy April 2008	The overarching Strategy is the vision for the region, which is to enhance the region's viability, enhancing the region's place competitiveness and thereby attracting and retaining people in the region and making the Highlands and Islands a more attractive place in which to live, to work, to conduct business and to visit.
HITRANS Regional Transport Strategy (Draft) May 2017	The vision of the HITRANS Regional Transport Strategy is 'To deliver connectivity across the region which enables sustainable economic growth and helps communities to actively participate in economic and social activities'. Within this overall vision there are four key transport objectives, as follows: • Reduce journey times and improve reliability and resilience; • Improve safety of transport and travel; • Tackle capacity constraints; and • Improve the quality, accessibility and integration of travel.
The Scottish Energy Strategy: The Future of Energy in Scotland (2017)	The Strategy sets out the Scottish Government's vision for the future national energy system to 2050. It describes the priorities for an integrated approach that considers both the use and supply of energy for heat, power and transport.
Onshore Wind Policy Statement (2017)	The Statement was published alongside the draft Energy Strategy. The Statement continues the Scottish Government's existing onshore wind policy set out in previous publications, highlighting the benefits on onshore wind including low costs technology, opportunities associated with island projects, and supply chain.
Regional planning policies	
Outer Hebrides Local Development Plan (Adopted Plan) November 2018	This document sets out the vision and spatial strategy for the development of land in the Outer Hebrides over the next 10-20 years and the following Policy is of relevance to the Proposed Development: • Policy EI: Energy and Heat Resources: Development proposals for all scales of onshore wind energy development will be assessed against the Supplementary Guidance for Wind Energy Development;

Policy reference	Policy issue
	• Policy EI 9: Transport Infrastructure: The priority areas for the upgrading and development of the transport infrastructure within, and serving the Outer Hebrides, are: A) the spinal and inter island routes; B) the airports at Barra, Balivanich and Stornoway; C); ports and harbours, including ferry facilities for mainland and inter island connections. Development proposals associated with new of improved transport infrastructure and traffic management measures will be required to meet all the following: 1) fit with the character of the area in relation to the Development Strategy and the immediate surrounding area and include a landscaping plan; 2) utilise a sustainable drainage system (SuDS) to deal with surface water; 3) accommodate pedestrians (within settlements) and cyclists, and secure improved road safety related to the proposal, in particular around schools, community or leisure facilities. The Comhairle will support the provision of electric car charging points in new development (subject to appropriate design and layout).

Technical Guidance

13.3.4 The assessment has been conducted with reference to guidance contained in *Guidance Notes No.1: Guidelines for the Environmental Assessment of Road Traffic* (GEART) (Institute of Environmental Assessment, 1993) and the 2002 Scottish Executive publication on *Guide to Transport Assessment for Development Proposals in Scotland*, and the June 2012 *Transport Assessment Guidanc*e.

13.4 Data Gathering Methodology

Study Area

13.4.1 The study area used for this assessment, agreed with CnES during the scoping process, is the transport network that may be affected by the Proposed Development. This includes the following roads on the local road network:

- A859;
- Pentland Road; and
- Arnish Point access road.

Desk Study

13.4.2 The sources of information used for the traffic and transport assessment are listed below in **Table 13.2.**

Table 13.2 Sources of Information used for the Traffic and Transport Assessment

Source	Data
Google Earth/Google Maps	Online mapping
Crashmap	Personal Injury Accidents (PIAs)
Department for Transport	Traffic Counts (A859)

Survey Work

13.4.3 No transport survey work was considered to be required for the purposes of this assessment in light of available published data.

13.5 Overall Baseline

Current Baseline

Site Context

13.5.1 The Proposed Development is located to the west of Stornoway on the Western Isles of Scotland, the extent of which is shown in **AI Figure 13.1**. It predominantly consists open moorland, with areas of woodland a large number of streams and lochs, parts of which are crofting grazing grounds for sheep or cattle. Surrounding areas are of a generally similar nature.

13.5.2 As identified in **AI Figure 13.1**, two points of access to the Proposed Development are proposed off the A859. Two secondary accesses are proposed on Pentland Road which intersects the Proposed Development and these would provide a crossing point between the central and northern turbine sections (between turbine 20 and 21). This crossing point would be used to access the 15 turbines located in the northern section of the Proposed Development.

Local Road Network

A859

13.5.3 The A859 Spinal Route links the settlement of Stornoway, located in North Lewis, to Leverburgh on the Isle of Harris and beyond to Lochboisdale in South Uist. It is the main land transport route in the Western Isles.

13.5.4 It is a two-way, single carriageway road that is predominately rural in its nature and sided by open moorland used for sheep, deer grazing and domestic peat cutting. The A859 is subject to a 60mph speed limit; however, this reduces to 40mph upon entering Stornoway and as it routes past Marybank Quarry.

Pentland Road

13.5.5 Pentland Road is a two-way, single track road which intersects through the Proposed Development (east-west) and then forms part of its western boundary. No centre line road markings are present, probably due to its history as a single track road and the limited width of the road which measures between 2.75m - 3.40m in width. The majority of the road is sided by grass verge or drainage and passing bays are located at regular intervals.

Arnish Point Access Road

13.5.6 The Arnish Point Access Road routes between the Arnish Point Dock, which includes the Arnish Fabrication Facility, and the A859. The access road routes across undulating topography.

13.5.7 Arnish Point Access Road is a two-way, single track road measuring approximately 3.30m - 3.80m in width with a number of passing bays measuring approximately 2.80m wide.

Baseline Traffic Flows

13.5.8 In accordance with GEART, traffic flows for the A859 have been obtained from the DfT. Flows were obtained from Count id 88082 (2017) situated close to Creed Park (Grid Reference: NB 39676 31360). This is the most recent traffic count available at the time of writing. The traffic flows are presented in **Table 13.3**.

13.5.9 DfT data is provided as an Annual Average Daily Traffic (AADT) flow. A factor has been applied to this count to reduce the AADT flow (24-hour) to a 12-hr traffic flow to coincide with the typical 12-hr working days which are anticipated during the construction phase of the Proposed Development and to make the assessment more robust. The factor has been derived from Table TRA0307 *'Motor Vehicle Traffic Distribution by time of day and day of the week on all roads, Great Britain: 2017'*.

Table 13.3 2017 Traffic Flows – Count id 88082 (A859)

Highway Link	HGVs	Total Traffic
A859 (close to Creed Park) – AADT	109	3,684
A859 (close to Creed Park) – 12-hour	85	2,887

Personal Injury Accidents (PIAs)

13.5.10 Records of the personal injury accidents (PIAs) have been obtained from the CrashMap database (https://www.crashmap.co.uk/) which uses information collected from the Police. This data is approved by the National Statistics Authority and reported on by the Department for Transport (DfT) each year.

13.5.11 Records have been obtained over a five-year period between January 2013 and December 2017. Further investigation will be undertaken if more than 5 accidents are recorded in the five year period.

13.5.12 The impact of casualties differs according to the severity of the injuries sustained. Three groups are usually differentiated as follows:

- **Fatal:** any death that occurs within 30 days from causes arising out of an accident;
- **Serious:** records casualties who require hospital treatment and have lasting injuries, but who do not die within 30 days of an accident; and
- **Slight:** where casualties have injuries that do not require hospital treatment, or, if they do, the effects of the injuries quickly subside.

13.5.13 A review of PIAs on the local highway network in the vicinity of the Proposed Development has been undertaken at the following junctions and links:

- The link along the A859 between the junction with the B897 to the south, and with the Pentland Road to the north; and
- The junction with the A859 / Pentland Road.

13.5.14 A summary of the PIAs recorded at the above locations is presented in **Table 13.4.**

Table 13.4 Summary of Recorded PIAs in Proximity to the Proposed Development

	Severity			
Description	**Slight**	**Serious**	**Fatal**	**Total**
A859 link between the junction with the B897 and the B858	4	0	0	4
Junction with the A859 / A858	1	0	0	1

Construction Traffic Route Options

Route Option for HGVs

13.5.15 There are two potential options for the sourcing of aggregate for the Proposed Development.

- Option 1 – Source the stone off-site from existing quarries on Lewis; and
- Option 2 – Source the stone from on-site borrow pits (five borrow pits have been identified).

13.5.16 For the purposes of this assessment, it is assumed that, as a worst-case, all concrete would be sourced off-site from the local batching plant at Marybank Quarry.

13.5.17 Construction HGV traffic is proposed to route to the Proposed Development from Arnish Point Dock or from one of the existing on-island quarries, which would ultimately require it all to route on the A859. The majority of construction HGV movements would occur within the Proposed Development using purpose built on-site tracks.

13.5.18 As illustrated in **AI Figure 13.1**, it is anticipated that there would be two site accesses on the A859; one close to the Creed Enterprise Park, and one utilising an existing junction approximately 300m south of the existing access to Breedon Marybank Quarry.

13.5.19 A vehicle crossing point is proposed on Pentland Road between turbine numbers 20 and 21. This crossing point would be used for the delivery of turbine components and construction HGVs to the northern section of the Proposed Development. It is not anticipated that this crossing would be used as a direct entrance for HGV traffic from Pentland Road.

13.5.20 A Construction Traffic Management Plan (CTMP) is expected to be submitted pursuant to the deemed planning permission prior to the use of any of the site accesses.

Route for Abnormal Loads

13.5.21 Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public roads that would provide access to the Proposed Development to ensure they are suitable, and to identify any modifications required to facilitate access for delivery vehicles. A preliminary access study was undertaken in 2010, and this has been updated with the larger turbine components currently proposed. Route Analysis has been conducted for the turbine delivery route to site (see **EIA Appendix 13A)**.

13.5.22 It is assumed that the turbine components would be shipped to the Arnish Point Dock. Arnish Point offers a deep water quay with unrestricted access to the Atlantic Ocean and North Channel. Arnish Point has previously used for shipment of materials and completed fabricated components. The Highlands and Islands Enterprise would be consulted to ensure that there is sufficient storage space

for wind turbine components prior to construction. This would be carried out pre construction, after a contractor appointment.

13.5.23 Abnormal loads would route along the Arnish Point Access Road for approximately 3.2km before reaching the priority junction with the A859. The junction is situated approximately 190m south of Creed Bridge. Details of the abnormal loads route and any section of road improvement or other works is set out in **EIA Appendix 13A Swept path analysis report**.

13.5.24 Upgrades to the Arnish Point Access Road may occur in the future. However, any alterations to the Arnish Point Access Road would be the subject of a separate planning application and are not part of this application.

13.6 Future Baseline

13.6.1 The Department for Transport (DfT) provide traffic growth projections to help inform future baseline. Background traffic is predicted to increase even if development does not proceed. Background traffic has been factored to the year of construction in order to undertake an assessment of effects.

13.6.2 To assess the future year construction scenario assumed to be 2021, growth rates have been applied to the base traffic data (2017) using TEMPro Version 7.2, which is the industry standard means of forecasting future traffic flows. The TEMPro growth factors used the following geographical areas of Comhairle nan Eilean Siar 1, Comhairle nan Eilean Siar 2 and Comhairle nan Eilean Siar 3 and the forecast 2021 traffic flow for the A859 is presented in **Table 13.5**.

Table 13.5 2021 Future Baseline Traffic Flows – Count id 88082 (A859)

Highway Link	HGVs	Total Traffic
A859 (close to Creed Park) – 12-hr	87	2,959
A859 (close to Creed Park) – AADT	112	3,774

13.7 Consultation

13.7.1 A scoping request was made to the Scottish Ministers through the Energy Consents Unit in July 2018 (**EIA Appendix 2A Scoping Request**), and a response ('scoping opinion') was received on 27 September 2018 (**EIA Appendix 2B Scoping Opinion**).

13.7.2 In relation to the Traffic and Transport, the response from Transport Scotland confirmed:

"Given the location of the revised development and its remoteness from the trunk road network, Transport Scotland accepts that the development will not give rise to any significant traffic or related environmental impacts on the Trunk Road Network"

13.7.3 The roads department at CnES were consulted in November 2018 to seek personal injury accident data, scope the study area and roads for inclusion within the assessment and request traffic survey data on the A859. Available traffic and accident data from CnES was superseded by available data from the DfT and the online resource Crashmap for person injury accident data.

13.8 Scope of the Assessment

Highway Links

13.8.1 This chapter considers the potential effects of changes in road traffic movements on receptors, i.e. the users of this road network (pedestrians, cyclists, equestrians and drivers) and those living close to it.

13.8.2 The A858 is located on a route that development traffic would use. These highways provide comprehensive coverage of the routes surrounding the Proposed Development. Beyond this road, traffic from the Proposed Development would access the wider road network where its effects would be diluted by existing traffic on these or would distribute to a point where the effects from traffic would be negligible.

13.8.3 Receptors along A858 have been identified within the scope of assessment in relation to the potentially significant traffic-related effects.

Temporal Scope

13.8.4 The temporal scope of the assessment of Traffic and Transport Proposed Development covers the construction and operational periods for the Proposed Development. Effects from decommissioning are considered to be similar to, or less than those associated with construction (since most below ground elements such as turbine foundations be left in situ). Given the unknown conditions of the highway following the lifecycle of the wind farm, a detailed assessment is not considered necessary.

Potential Receptors

13.8.5 Receptors are the users of highway network assets and facilities such as pedestrians, cyclists, equestrians and drivers who travel within the vicinity of the Proposed Development.

13.8.6 GEART identifies the following groups and special interest groups that may be affected:

- People at home;
- People at work;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations such as hospitals, churches, schools and historical buildings;
- Pedestrians;
- Cyclists;
- Open spaces, recreational areas and shopping areas;
- Sites of ecological and nature conservation value; and
- Sites of tourist/visitor attractions.

Likely Significant Effects Scoped In

13.8.7 The environmental effects that can occur as a result of traffic associated with the Proposed Development, and which are subject to further assessment in this chapter, are as follows:

- Severance: the separation of people from places and other people and places or impede pedestrian access to essential facilities;
- Driver Delay: traffic delays to non-development traffic;
- Pedestrian Amenity: the effect on the relative pleasantness of a pedestrian journey as a result of changes in traffic flow, traffic composition and pavement width / separation from traffic;
- Pedestrian Delay: the ability of people to cross roads as a result of changes in traffic volume, composition and speed, the level of pedestrian activity, visibility and general physical conditions of the Proposed Development;
- Fear and intimidation: these may be experienced by people as a result of an increase in traffic volume and its HGV composition, its proximity or the lack of protection caused by such factors as narrow pavement widths;
- Accidents and Safety: the risk of accidents occurring where the Proposed Development is expected to produce a change in the character of traffic.

Effects Scoped Out of the Assessment

13.8.8 Approximately 8 HGV movements per hour (4 in, 4 out) are predicted to cross Pentland Road to route to/from the north section of the Proposed Development in the peak construction month. Accesses here are not to be used directly for deliveries (main accesses are located on the A859). The crossing is proposed to be managed from temporary traffic lights or banksmen, when required. Onsite observations identified that Pentland Road is lightly trafficked, given its rural location and any delay caused would be kept to a minimum and managed by the CTMP. An assessment of effects on Pentland Road has been scoped out of the assessment for both construction and operation phases.

13.8.9 The anticipated volume of traffic generated during the operation of the Proposed Development is expected to be considerably less than that during the construction phase, likely to consist of mainly light vehicles associated with ad-hoc maintenance and weekly monitoring visits. Potential effects on users of the road network and adjacent land uses as a result of operation traffic are therefore not likely to be significant and therefore are scoped out of the detailed assessment.

13.8.10 The Proposed Development is not expected to generate or attract any hazardous loads and this topic has therefore been scoped out of the detailed assessment for both construction and operation phases.

13.8.11 The following potential traffic and transport related effects are not considered in this chapter as they are addressed in other chapters within this EIA Report:

- Visual Effects (**EIA Chapter 6 Landscape and visual Impact**);
- Historic Environment Effects (**EIA Chapter 7 Cultural Heritage**);
- Ecological Effects (**AI Chapter 9 Ecology**); and
- Noise (**EIA Chapter 12 Noise**).

13.9 Environmental Measures Embedded into the Development Proposals

13.9.1 The CTMP would be developed recognising the need to manage the traffic impact as a part of the Proposed Development. The following section describes the potential effects and the rationale for

incorporating embedded mitigation into the Proposed Development to help avoid effects occurring, or to reduce the magnitude of any changes associated with it. The following measures would be incorporated:

- A CTMP to manage the daily delivery profiles and control movements and routing of HGVs through the following measures:
  - Traffic routing strategy – ensuring vehicles access the Proposed Development via the most appropriate route and avoid unnecessary conflict with sensitive areas;
  - Traffic timing strategy – programme vehicles arrivals / departures and working hours to lessen the impact on the highway network;
  - Temporary signage – in accordance with Department for Transport (DfT) *Traffic Signs Manual, Chapter 8* to inform local road users of construction access points and the presence of HGVs;
  - Traffic Marshals – to marshal access points and Core Path crossings whilst deliveries are taking place;
  - Temporary traffic management – provided on approaches to accesses in the form of traffic warning signs, possible reductions in speed limit signs to ensure safe passage of vehicles. All signage in accordance with DfTs *Traffic Signs Manual, Chapter 8*;
  - Site accesses designed in accordance with Design Manual for Roads and Bridges (DMRB); and
  - Staff Travel Plan – would provide details of how staff should travel to the Proposed Development in an effort to reduce single occupancy vehicle journeys.

13.10 Assessment Methodology

Methodology for the Prediction of Effects

13.10.1 The project description is set out in **AI Chapter 4**. Whilst this has informed the approach that has been used in this Traffic and Transport assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this Traffic and Transport assessment.

13.10.2 The guidance that is followed when assessing the potential significance of road traffic effects is summarised in GEART (IEA, 1993), which states that:

"The detailed assessment of impacts is…likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur." (Paragraph 3.10).

13.10.3 To assess the impact at its peak, the likely percentage increase in traffic is determined by comparing estimates of traffic generated by the Proposed Development with future predicted baseline traffic flows (in 2021 – year of construction) on the road links in the vicinity of the Proposed Development.

13.10.4 GEART provides two rules that are used to establish whether an environmental assessment of traffic effects should be carried out on receptors:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and

- Rule 2: Include sensitive areas where traffic flows are predicted to increase by 10% or more.

13.10.5 It should be noted that, according to GEART, predicted traffic flow increases below 10% are generally not considered to be significant as daily variations in background traffic flow may fluctuate by this amount. Changes in traffic flows below this level are, therefore, assumed not to result in significant environmental effects and have therefore not been assessed further as part of this study.

13.10.6 No difficulties technical deficiencies or lack of technical information was encountered during the preparation of this assessment.

Receptor Sensitivity

13.10.7 The sensitivity of each highway link included in the assessment has been assigned a sensitivity in accordance with GEART. This is based on the proximity of sensitive receptors to the highway link and the highway environment. **Table 13.6** summarises the rationale used to determine the sensitivity against the corresponding receptors as part of the assessment as contained in GEART. Professional judgement is also used to determine the sensitivity of the receptor.

Table 13.6 Receptor Sensitivity

Sensitivity	Description / Reason	Receptor
High	Receptors of greatest sensitivity to traffic flows: schools, colleges, playgrounds, accident blackspots, retirement homes and urban/residential homes without footways that are used by pedestrians and cyclists	Residents/workers travelling to and from work or home on foot and by bicycle, school children, leisure walkers and equestrians
Medium	Traffic flow sensitive receptors including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycle ways, community centres, parks, recreation facilities	Residents/workers travelling to and from work or home on foot and by bicycle, people visiting these land uses
Low	Receptors with some sensitivity to traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist/visitor attractions and residential areas with adequate footway provision	Residents/workers travelling to and from work or home on foot or bicycle and people visiting these land uses
Negligible	Receptors with low sensitivity to traffic flows: Motorway and Dual Carriageways and/or land uses sufficiently distant from affected routes and junctions	Residents/workers travelling by foot or by bicycle

13.10.8 Sensitivity judged as High or Medium results in Rule 2 (sensitive areas where traffic flows are predicted to increase by 10% or more) being considered for that highway link. Sensitivity judged as Low or Negligible results in Rule 1 being considered for that highway link (where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%)).

13.10.9 Given the potential receptors described, **Table 13.7** identifies the sensitivity of highway link and the GEART Rule that applies.

Table 13.7 Locations Sensitive to Changes in Traffic Flows

Highway Link	Rationale	Receptor Sensitivity	Assessment (Rule 1/2)
A859 (between Breedon Marybank Quarry and Creed Park)	Wide carriageway. No footways. No sensitive land uses fronting the carriageway. Several bus stops identified but only one provides a shelter – others remain unmarked.	Negligible	Rule 1

Magnitude of Change

13.10.10 **Table 13.8** provides a summary of the magnitude of Change for each transport effect, with the thresholds used to determine this being based on guidance within GEART.

Table 13.8 Magnitude of Change

	Magnitude of Impact			
Transport Effect	**High**	**Medium**	**Low**	**Negligible**
Severance	Change in total traffic or HGV flows over 91%	Change in total traffic or HGV flows of 61-90%	Change in total traffic or HGV flows of 31-60%	Change in total traffic or HGV flows of less than 30%
Driver Delay	Change in total traffic or HGV flows over 91%	Change in total traffic or HGV flows of 61-90%	Change in total traffic or HGV flows of 31-60%	Change in total traffic or HGV flows of less than 30%
Pedestrian Amenity and Delay	Change in total traffic or HGV flows over 91%	Change in total traffic or HGV flows of 61-90%	Change in total traffic or HGV flows of 31-60%	Change in total traffic or HGV flows of less than 30%
Accident and Safety	Informed by a review of existing collision patterns and trends based upon the existing personal injury accident records and the forecast increase in traffic.			

Significance Criteria

13.10.11 The classification of a likely traffic and transport effect is derived by considering the sensitivity of the receptor (derived from **Table 13.7**) against the magnitude of change (derived from **Table 13.8**) as defined in **Table 13.9** below. The shading indicates those significance ratings that are deemed to be 'significant' effects.

Table 13.9 Significance Matrix

		Magnitude of Change			
		High	**Medium**	**Low**	**Negligible**
Receptor Sensitivity	**High**	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

13.10.12 Major and Moderate adverse change represent effects considered to be significant in terms of the EIA guideline, whilst Minor and Negligible significance are considered neutral/not significant.

Methodology for Assessing Environmental Effects

GEART Criteria

13.10.13 In relation to traffic and transport, the significance of each effect identified in **Section 13.7** has been considered against the criteria within GEART, where possible. However, GEART states that:

'For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.' (Paragraph 4.5, IEA, 1993).

Severance

13.10.14 There are no predictive formulae which give simple relationships between traffic factors and levels of severance. GEART states that changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance. In general, marginal (slight) changes in traffic flow are, by themselves, unlikely to create or remove severance.

Driver Delay

13.10.15 GEART states that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. The capacity of a road or a particular junction can be determined by establishing the ratio of flow to capacity (RFC).

13.10.16 For this assessment, criteria from GEART has been used to assess the effects on traffic levels and driver delay, which states the need for assessment where changes in traffic flows exceed 30%.

Pedestrian Delay

13.10.17 Given the range of local factors and conditions which can influence pedestrian delay, GEART does not recommend that thresholds be used as a means to establish the significance of pedestrian delay but recommend that reasoned judgements be made instead. However, GEART suggests a lower threshold of 10 seconds delay and upper threshold of 40 seconds delay which, for a link with no crossing facilities, equates to the lower threshold of a two-way flow of 1,400 vehicles per hour. For this assessment, the significance of the effects of construction traffic on pedestrian delay would be based on professional judgement and interpretation.

Pedestrian Amenity

13.10.18 GEART notes that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter a negative effect.

Fear and Intimidation

13.10.19 There are no commonly agreed thresholds by which to determine the significance of this effect. GEART notes that special consideration should be given to areas where there are likely to be particular problems, such as high-speed sections of road, locations of turning points and accesses.

Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

Accidents and Safety

13.10.20 This is informed by a review of existing collision patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic.

13.10.21 For this assessment, the significance of the effects of construction traffic on accidents and safety would be based on professional judgement and interpretation.

13.11 Assessment of Traffic and Transport Effects

13.11.1 This section provides an assessment of the effects arising from traffic generated by the Proposed Development.

Construction Programme

13.11.2 Where possible, construction operations would be carried out concurrently, thus minimising the overall length of the construction programme. The Proposed Development would be phased such that civil engineering works would continue whilst wind turbines are erected elsewhere on the Proposed Development. Site restoration would be programmed and carried out to allow restoration of disturbed areas as to begin as early as possible in a progressive manner. On this basis, an indicative 30-month construction programme (commencing in 2021) has been assumed for the purposes of this assessment.

13.11.3 As mentioned in **Section 13.5.15**, there are two potential options to consider for the construction of the Proposed Development; Option 1 accounts for stone being sourced off-site, with Option 2 assuming all stone is won from on-site borrow pits.

13.11.4 A summary of predicted traffic generation for the Option 1 is shown in **Table 13.10**, with a detailed table showing the full construction period provided in **AI Appendix 13B Vehicle numbers** for both option 1 and option 2.

Table 13.10 Predicted Traffic Generation during Construction Phase – Option 1 (Aggregate Sourced Off-Site)

Activity	Total Loads	Total Trips (two way)
Delivery of Plant and Equipment	30	60
Delivery of Road Stone for Access Tracks	12,954	25,908
Delivery of Road Stone for Areas of Crane Operation	3,308	6,616
Delivery of Fibre Optic Cabling	11	22
Delivery of Concrete for Control Building Base	37	74
Delivery of Road Stone for Construction Compound	648	1,296
Delivery of Back fill Stone for Turbines	2,205	4,410
Delivery of Road Stone for substation	800	1,600
Delivery of Culvert and Bridge Materials	210	420

Activity	Total Loads	Total Trips (two way)
Delivery of Geogrid	56	112
Delivery of Sand for Cable Trench	366	732
Delivery of Compound General Equipment	90	180
Delivery of Electrical Equipment	60	120
Delivery of External Transformers	12	24
Delivery of Cabling	27	54
Delivery of Concrete for Turbines	1,455	2,910
Concrete for Transformer Foundations	32	64
Delivery of HV Plinth Concrete	15	30
Delivery of Base Rings	18	36
Delivery of Shuttering	35	70
Delivery of Form work and reinforcing steel	44	88
Delivery and Removal of Mobile Crane	22	44
Delivery of Turbines	350	700
Removal of Plant and Equipment	30	60
Total	**22,815**	**45,630**

13.11.5 For Option two, the aggregate/stone elements noted in **Table 13.10** would not be required and this would result in a requirement of 2,896 total loads and 5,792 total trips (two-way). This equates to an 87.3% reduction in traffic movements.

13.11.6 Option 1 scenario results in a peak construction movement of 222 two-way HGVs (111 arrive, 111 depart) which are predicted to occur during month 5 of the 30-month construction programme.

13.11.7 Option 2 scenario results in a peak construction movement of 34 two-way HGVs (17 arrive, 17 depart) which are predicted to occur during months 5-7 of the 24-month construction programme.

13.11.8 A construction route would be submitted to CnES as part of the CTMP pursuant to a condition of the deemed planning permission. Wherever possible construction traffic would be scheduled to avoid peak hour travel to ensure minimal disruption.

13.11.9 **Table 13.11** shows the percentage change in traffic flows in 2021, with construction traffic on the local road network for both Option 1 and Option 2 stone sourcing scenarios. The GEART screening exercise is also presented within this table. Percentage increases that exceed the relevant GEART threshold of assessment rule would be subject to further assessment. Any increase that is below the GEART threshold would not be taken forward for assessment.

Table 13.11 Forecast Baseline Traffic for 2021 with Predicted Construction Traffic

Highway Link	GEART Rule Screening	2021 Base		Construction Traffic	2021 Base + Construction		% change	
		HGVs	Total	HGVs	HGVs	Total	HGVs	Total Traffic
Option 1 – Aggregate Sourced Off-site								
A859	Rule 1	87	2,959	222	309	3,181	255.2%	7.5%
Option 2 – Aggregate Sourced from Borrow Pits								
A859	Rule 1	87	2,959	34	121	2,993	39.1%	1.1%

13.11.10 Given the potential receptors described in **Table 13.7**, **Table 13.11** identifies that the A859 highway link should be taken forward for assessment based on the percentage impact on this link exceeding the 30% threshold in HGVs (Rule 1). The assessment of environmental effects on the A859 has been undertaken based on these percentage impact results.

13.12 Predicted Effects and their Significance: Construction Phase

13.12.1 The GEART threshold is exceeded by 225.3% in HGV flows if Option 1 scenario is progressed [worst-case]. This level of percentage increase is exacerbated due to particularly low baseline volumes of HGV traffic which can be expected given the location and setting of the Proposed Development and road network serving the Isle of Lewis.

13.12.2 The GEART threshold is exceeded by 9.1% in HGVs flows if Option 2 is progressed (it being the intention of the developer to utilise up to five borrow pits to source aggregate on-site).

13.12.3 It should be noted that increases in total traffic are only 7.5% and 1.1% during Option 1 and 2 respectively.

Severance

13.12.4 There are no pedestrian facilities along the A859 between Breedon Marybank Quarry and the proposed accesses on the A859. The only section that could be impacted by construction traffic would be in the vicinity of the access to Creed Park, where pedestrians are likely to cross the carriageway to access the bus stop on the western side of this road. Visibility for crossing in either direction on the A859 is very good.

13.12.5 Given that the highway link has a Negligible receptor sensitivity (**Table 13.7**) and increases in HGVs over 91% [Option 1 – worst case] result in High magnitude of change (**Table 13.8**), the level of effect is considered to be of Negligible significance overall (**Table 13.9**). This is considered to be not significant in terms of the EIA Regulations.

13.12.6 If borrow pits are used to source aggregate on-site (Option 2), effects remain negligible. It should be noted that daily HGV movements will reduce in this scenario from 222 to 34.

Driver Delay

13.12.7 Given that the highway link has a Negligible receptor sensitivity (**Table 13.7**) and increases in HGVs over 91% [Option 1 – worst case] result in High magnitude of change (**Table 13.8**), the level of effect is considered to be of Negligible significance overall (**Table 13.9**). Any delay experienced

would be mitigated further through the application of a CTMP to ensure HGV traffic avoids peak hours where reasonably possible. This effect considered to be not significant in terms of the EIA Regulations.

13.12.8 If borrow pits are used to source aggregate on-site (Option 2), effects remain negligible. It should be noted that daily HGV movements will reduce in this scenario from 222 to 34.

Pedestrian Delay & Amenity

13.12.9 There are no pedestrian facilities along the A859 between Breedon Marybank Quarry and the proposed accesses on the A859. The only section that could be impacted by construction traffic would be in the vicinity of the access to Creed Park, where pedestrians are likely to cross the carriageway to access the bus stop on the western side of this road.

13.12.10 Existing pedestrian patronage from Creed Park is assumed to be low in volume and infrequent. Furthermore, visibility for crossing in either direction on the A859 is very good.

13.12.11 Given that the highway link has a Negligible receptor sensitivity (**Table 13.7**) and increases in HGVs over 91% [Option 1 – worst case] result in High magnitude of change (**Table 13.8**), the level of effect is considered to be of Negligible significance overall (**Table 13.9**). This is considered to be not significant in terms of the EIA Regulations.

13.12.12 If borrow pits are used to source aggregate on-site (Option 2), effects remain negligible. It should be noted that daily HGV movements will reduce in this scenario from 222 to 34.

Fear and Intimidation

13.12.13 There are no pedestrian or cyclist facilities along the A859 between Breedon Marybank Quarry and the proposed accesses on this road and pedestrian/cyclist volumes and frequency are therefore expected to be low and infrequent. Only three cyclist movements were recorded by the DfT in 2017.

13.12.14 It is therefore considered that the scale of fear and intimidation likely to be experienced by pedestrians as a result of changes in traffic flows is not significant.

13.12.15 If borrow pits are used to source aggregate on-site (Option 2), effects remain negligible. It should be noted that daily HGV movements will reduce in this scenario from 222 to 34.

Accidents and Safety

13.12.16 Analysis of recorded PIAs at key locations on the local road network showed no fatalities occurred during the last five years, and none were caused as a result of existing road / junction design. All of the recorded accidents were slight in severity.

13.12.17 There is nothing to suggest that the construction of the Proposed Development would increase the likelihood of accidents and reduce safety, particularly with the CTMP in place. No significant effects in respect of accidents and safety are therefore anticipated.

13.12.18 A summary of the results of the assessment is provided in **Table 13.12**.

Table 13.12 Summary of Significance of Adverse Effects – A859

Receptor and summary of predicted effects		Sensitivity	Significance[3]	Summary rationale
Severance	The separation of people from places and other people	Negligible	Not significant	Given no pedestrian facilities on the A859 and low and infrequent pedestrian movements combined with negligible receptor sensitivity, the changes in traffic flow would not result in the separation of people from other people and places or impede pedestrian access to essential facilities.
Driver Delay	Traffic delays as a result of construction traffic	Negligible	Not significant	Whilst changes in traffic flow exceed 91%, the negligible receptor sensitivity of the A859 means that the level of effect is considered to be of Negligible significance overall. A CTMP would be employed to help mitigate any delays experienced.
Pedestrian Delay & Amenity	The ability to people to cross roads and the effect on the relative pleasantness of a pedestrian journey	Negligible	Not significant	Given no pedestrian facilities on the A859 and low and infrequent pedestrian movements combined with negligible receptor sensitivity, the changes in traffic flow would not result in pedestrian delay.
Fear and Intimidation	The levels experienced by pedestrians and cyclists, its proximity to people or the lack of protection caused by such factors as narrow pavement widths.	Negligible	Not significant	Given no pedestrian facilities on the A859 and low and infrequent pedestrian movements combined with negligible receptor sensitivity, the changes in traffic flow would not result in increased fear and intimidation experienced.
Accidents and Safety	The risk of accidents occurring where development is expected to produce a change in the character of traffic	Negligible	Not significant	Changes in traffic flows would not elevate the risk of accident and safety issues occurring on the local road network.

13.13 Assessment of Cumulative Effects

13.13.1 Consideration has been given as to whether any of the receptors that have been taken forward for assessment in this chapter are likely to be subject to cumulative effects because of the Traffic and Transport effects generated by other developments.

13.13.2 A review of online planning application maps shows that there are three consented wind farm developments in the area close the Proposed Development. These are:

- Muaitheabhal Beinn Mhor;
- Muaitheabhal Beinn East Extension; and
- Muaitheabhal Beinn South Extension.

13.13.3 The above schemes are situated approximately 20km south of the Proposed Development near Eishken. It is understood that the three schemes have similar construction programmes as the Proposed Development (start Q2 2021 – end Q4 2023). As with the Proposed Development, it is the intention of the developer of these projects to source aggregate for tracks, turbine bases and hardstandings from borrow pits. However, it may be necessary to import some aggregate for use as capping material for access tracks and hardstandings.

13.13.4 A dedicated berthing facility for the direct delivery of wind turbine components associated with the Muaitheabhal Wind Farm schemes achieved consent however, this expired in August 2018. The facility is proposed to be situated on the north shore of Loch Sealg, close to the properties at Eishken. Should consent be regained for this development, all turbine components and abnormal loads associated with the Muaitheabhal Wind Farm would be shipped to this facility and not Arnish Point.

13.13.5 Despite the concurrent construction programme between the Proposed Development and the three Muaitheabhal Wind farm schemes [and assuming that Arnish Point Dock is used for delivery of the Muaitheabhal components], it is understood that any overlapping activities resulting in high volumes of HGVs would be minimised where reasonably possible. A daily maximum of 51 two-way HGVs per day have been identified to route south on the A859. No cumulative assessment was undertaken as part of the Muaitheabhal Wind farm assessments.

13.13.6 Furthermore, the development of a CTMP for each scheme is anticipated to reduce any cumulative effects experienced on the road network, namely the A859. Should borrow pits provide the source of aggregate, this would minimise cumulative effects further. Typical measures included in a CTMP are provided in **Section 13.9**.

13.13.7 On this basis, it is considered that significant cumulative effects are unlikely.

13.14 Consideration of Optional Additional Mitigation or Compensation

13.14.1 No additional mitigation measures are proposed to further reduce the Traffic and Transport effects that are identified in this EIA Report. This is because all relevant and implementable measures have been embedded into the development proposals and are assessed in this chapter. These measures are considered to be effective and deliverable and no likely significant effects have been identified.

13.15 Conclusions of Significance Evaluation

13.15.1 As summarised in **Table 13.12**, construction traffic associated with the Proposed Development would result in no significant effects in terms of severance, driver delay, pedestrian delay and amenity, fear and intimidation, and accidents and safety.

13.16 Implementation of Environmental Measures

13.16.1 **Table 13.13** describes the environmental measures embedded within the Proposed Development and the means by which they would be implemented.

Table 13.13 Summary of Environmental Measures to be Implemented – Traffic and Transport

Environmental Measure	Responsibility for Implementation	Compliance Mechanism	EIA Report Section Reference
Construction Traffic Management Plan (CTMP)	*Developer*	*By planning condition*	*Section 13.9*

16. Summary of Mitigation Measures

16.1.1 This chapter provides a summary of the mitigation and enhancement measures proposed for the construction works and for the operation of the Proposed Development as set out in each of the technical chapters. Decommissioning associated with the Proposed Development would be the subject of a planning condition should consent be granted.

16.1.2 **Table 16.1** summarises the environmental measures that form part of the Proposed Development, as well as the mechanisms which would be used to ensure that these measures are implemented as part of the Proposed Development. Greater detail on these measures can be found in each of the technical assessment chapters.

Table 16.1 Summary of Environmental Measures to be Implemented

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
General Construction			
A Construction Environmental Management Plan (CEMP) would be provided prior to construction. It would be the master document for consolidating all environmental requirements and undertakings that emerge from any individual management plans which may be produced for the project, such as a Habitat Management Plan, Waste Management Plan, Peat Management Plan, etc and would clearly outline what should be implemented, where, and by whom. The CEMP would be the main document used by the Environmental Clerk of Works (ECoW) when carrying out audits of planning and environmental compliance. It would be made available to the appointed civil engineers and construction company. General provisions include: ● The application of good practice; ● Completion and implementation of a Construction Method Statement (CMS); ● Completion and implementation of a detailed Site Waste Management Plan (SWMP); ● Completion of a Transport Management Plan (TMP) presenting a strategy for communication with local residents and businesses, detailed traffic management strategies; road traffic signage arrangements; road condition survey pre and post construction, etc.; ● Completion and implementation of a Water Management Plan (WMP) (specific mitigation measures set out in **EIA Chapter 11**); ● Completion and implementation of a detailed Peat Management Plan (PMP) (**AI Appendix 9H**); ● Completion and implementation of a Habitat Management Plan (**AI Appendix 9I**); ● Completion and implementation of a Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) and ● Environmental measures to be implemented to control dust emissions during construction.	Developer / Contractor	Planning condition / contract requirement	AI Section 4.7
The construction works would require an overall CMS to set out overriding construction principles, programme and health and safety requirements etc. The overall CMS would be agreed with CnES in advance of commencement of development. Additional CMSs corresponding to individual construction activities would also be prepared. The key measures that would be implemented, as part of the CMS and the supporting CEMP, in order to avoid or reduce potential construction effects, include:	Developer / Contractor	Planning Condition	AI Section 4.4 EIA Section 6.5

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• The selective and sensitive location of temporary storage areas for materials, plant and security fencing; • Use of designated routes around the site for construction vehicles and operation of construction plant. Avoiding the creation of any 'wheel ruts' or related damage to land and vegetation, and subsequent clear up or repair of these; • Implementation and monitoring of site management procedures, such as regular litter sweeps to ensure the removal of all litter arising from the construction activities; and • Reinstatement of all temporary construction compounds, site offices, areas of former hardstanding, parking areas and any related temporary construction facilities.			
Road widening works would be carried out along the abnormal load delivery route. Details of which are set out in **AI Appendix 13A**.			AI Section 4.3 AI Appendix 13A
Further Geotechnical Investigation (GI) would be undertaken to determine detailed ground conditions along tracks and at construction compound and wind farm substations locations. This information would inform the detailed track design, the turbine foundation design and identify any micro-siting requirements.	Development / Contractor	Contract requirement	AI Section 4.4
An Environmental Clerk of Works (ECoW) would be appointed prior to construction and employed for the duration of construction related works (including post construction restoration). The role of the EcoW would be to manage the effects of construction works on the environment, make sure that the mitigation measures required as part of the EIA are implemented in accordance with the documents. The ECoW may change depending on technical requirements (i.e., a hydrologist would be used to confirm compliance with the PPP, an ecologist would be used to give tool box talks regarding otter mitigation, or an archaeologist used to define the areas to be fenced off to protect heritage features.	Developer / Contractor	Planning Condition / Contract requirement	AI Section 4.4
Following completion of construction, borrow pits would be restored to ensure that the ground is stable, safe and improve their visual appearance. A detailed plan for the restoration of each borrow pit would be developed and agreed with CnES, drawing upon the advice of a landscape architect and an ecologist, to the proposed reinstatement materials and techniques are suitable. It is anticipated that steep faces would be graded out to fit with the surrounding topography and disturbed surfaces covered with soil and re-seeded or re-turfed.	Developer / Contractor	Planning Condition	AI Section 4.5 EIA Section 6.6
Micro-siting of up to 50m for wind turbines and 100m for internal wind farm tracks and other infrastructure such as substations and compound to avoid environmental, geotechnical and health and safety sensitivities.	Developer / Contractor	Planning Condition	AI Section 4.5

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
This mitigation may be restricted further in terms of specific locational hard constraints such as not micrositing closer to water course if within 50m of a water course or not encroaching beyond the agreed Fresnel zone of microwave link.			
Rock anchor foundation systems would be implemented where possible to minimise peat removal and significantly reduce concrete use. Where this is not possible, the traditional, gravity foundation design, would be implemented.	Developer / Contractor	CEMP	AI Section 4.5
Internal wind farm tracks would be floated (using either option A or option B) normally where the peat depth is greater than 1m, otherwise the tracks would be excavated and backfilled. Submerged drainage pipes would be installed across excavated tracks where hydrological sensitivities are present. The floating tracks would be constructed in line with the good practice guidance. and would include the use of geogrids.	Developer / Contractor	Planning Condition	AI Section 4.5
Two main types of watercourse crossing are proposed for the development: bridges and culverts. The use of each of these types of structures would be determined individually to minimise potential effects based on a site-specific assessment, which would account of topographic, hydrological and ecological attributes at each proposed crossing point. All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings and, where culverts are required, they will be design in accordance with the CIRIA Culvert Design and Operation Guide. All river crossings would be designed to convey a 1 in 200-year return period flood event, and individually sized and designed to suit the specific requirements and constraints of its location.	Developer / Contractor	Planning Condition	AI Section 4.5 AI Section 9.8
The constructions compounds would be lit with security lighting, which would face inwards to minimise light pollution.	Developer / Contractor	Planning Condition	AI Section 4.5
The construction compounds may be enclosed within a security fence around the perimeter and the access to substations and electrical compounds would be via a locked access gate.	Developer / Contractor	Planning Condition	AI Section 4.5
The operation of the Proposed Development would cover a period of up to 25 years.	Developer	Planning Condition	AI Section 4.6 EIA Section 6.5

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
A comprehensive plan for the decommissioning (including environmental management practices) of the Proposed Development and restoration plan of the Development Site on completion of decommissioning works would be prepared for agreement with CnES. The decommissioning plan would be prepared near the end of the operational life of the Proposed Development to decommission the Development Site and restore the landform after removal of the above ground infrastructure. As part of the decommissioning of the wind farm, all visible, above ground structures (turbines, transformers, main and secondary substations) would be removed and any disturbed areas reinstated. Some wind farm tracks may remain in perpetuity, for use by landowners and walkers, creating an enhancement opportunity.	Developer	Planning Condition	AI Section 4.6 EIA Section 6.6
Landscape and Visual			
Wind turbines would 3-bladed and painted in a neutral colour (colour specification, light grey RAL 7035) with a semi-matt finish with no logos so as to minimise the visual intrusion. Redundant hardstanding areas would be reinstated post construction.	Developer	Planning Condition	AI Section 4.5 EIA Section 6.5
All turbines of 150m or greater in height to blade tip would be lit at the highest point on the nacelle or hub and on three sides of the tower at half the hub height to ensure aviation safety.	Developer / Contractor	Planning Condition	EIA Section 6.5
At the earliest opportunity on completion of erection of turbines, the edges of wind farm tracks would be re-turfed with peat and encouraged to re-generate to reduce local visual impact during the operational period.	Developer / Contractor	Planning Condition	EIA Section 6.5
The operation of the Proposed Development would cover a period of up to 25 years and include site management to ensure the adequate maintenance of site facilities and landscape features such as access tracks, field boundaries, gates and signage.	Developer / Contractor	Planning Condition	EIA Section 6.5
In order to maintain the amenity and simplicity of the Boggy Moorland, the colour of the control buildings (including battery and switchgear containers) would be co-ordinated with the colour selected to have a low contrast with the surrounding moorland. The development would be enclosed by a 2.7m high perimeter fence with a low visibility style and colour.	Developer / Contractor	Planning Condition	EIA Section 6.6
The proposed areas identified in **AI Figure 9I 4.1** (On-site habitat management proposals) would be planted with native species which would enhance the landscape character of the Boggy Moorland or provide additional habitat for hen harrier. This would be subject to agreement with SNH.	Developer / Contractor	Planning Condition	EIA Section 6.6
Historic Environment			

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
Mitigation of adverse direct effects would be provided by the agreement of a written scheme of archaeological works with the CnES Archaeologist. This scheme would allow for the identification and recording of archaeological features and deposits of geoarchaeological and paleoenvironmental interest within the Development Site which would otherwise be affected by the Proposed Development.	Developer / Contractor	Planning Condition	EIA Section 7.13
Ornithology			
The following measures would be incorporated into the Proposed Development in order to minimise construction and decommissioning effects to breeding or roosting bird species: • As part of an overarching CEMP, a Bird Protection Plan (BPP) would be developed in consultation with the relevant consultees in advance of construction works commencing. Construction Method Statements (CMSs) would be developed to detail the mitigation approach for all bird receptors. These would cover the site and receptor specific requirements of the embedded mitigation as outlined in **AI Section 8.8;** • Site supervision would be provided by a suitable experienced ECoW, who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice; • Pre-construction verification check surveys would be undertaken for all protected bird species where potential significant effects or legal breaches could occur otherwise; • Maintain species specific buffers detailed in the BPPs from nests during the breeding or roosting season until young fledge or method statements would be developed outlining the method to allow works to continue within buffer areas where appropriate. For example, in some cases, there may be a requirement to install screening around working areas to allow it to continue within a buffer area. An ornithologist may be required to monitor the nesting birds during the working phase in certain areas and halt any significantly disturbing activities in consultation with the ECoW; • An emergency procedure would be implemented by site workers if a nest of a breeding bird is encountered. All works within 100m would cease as soon as it is safe to do so, and the ECoW would inspect the site and define appropriate measures (if required); • When construction activities are taking place at more than one location at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on breeding bird activity;	Developer / Contractor	Planning Condition	AI Section 8.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• A Habitat Management Plan (HMP) would also be implemented with the aim of ensuring continued growth of the hen harrier population within and outside of the Development Site. A key objective would be to minimise the extent of tree removal from within the Development Site during the construction works (embedded mitigation), and then manage the remaining trees on site during operation. The HMP would be developed in consultation with SNH, and require to be approved, prior to the start of construction.			
Mitigation to minimise the effects of operational disturbance would be expected to be of a similar nature to construction where impacts and thus effects occur, but proportionally reduced in scale.	Developer / Contractor	Planning Condition	AI Section 8.8
A construction area stand-off of at least 50m has been applied to all watercourses and water bodies (except for watercourse crossings). All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings (2010) and, where culverts are required, have been designed in accordance with the CIRIA Culvert Design and Operation Guide (2010).	Developer / Contractor	Planning Condition	AI Section 8.8
A Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) would be prepared and subject to consultation with SEPA and SNH in advance of any construction activities and implemented as part of the overall CEMP. The PPP would set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs).	Developer / Contractor	Planning Condition	AI Section 4.7 AI Section 8.8 AI Section 9.8
Ecology			
Tight construction footprints would be adhered to in order to minimise damage to sensitive habitats. Foundations of all turbines would be excavated to bedrock (using either rock anchor, rock cage or excavation methods) and all access tracks on peat depths exceeding 1m would be of floating design (either option A or Option B), to minimise effects on peat.	Developer / Contractor	CEMP CMS EMP PMP	AI Section 9.8
The following measures would be incorporated in order to minimise construction effects to sensitive blanket bog habitats: • As part of an overarching Construction Environmental Management Plan (CEMP), a Peat Management Plan (PMP) would be developed and agreed (based on **AI Appendix 9H**), in consultation with the Project Ecologist and the relevant consultees, in advance of construction works commencing. This would include the method of removal and storage for vegetated turves and peat together with best practice reinstatement and restoration measures for the re-use of excavated peat within the Development Site;	Developer / Contractor	Planning Condition	AI Section 9.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• Site supervision would be provided by a suitably experienced Environmental Clerk of Works (ECoW), who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention (see below), monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice; • Pre-construction surveys of all works areas over blanket bog would be undertaken by a suitably qualified ECoW in order to identify locations of any rare bog species (notably *Sphagnum Austinii*) and propose suitable avoidance buffers; • A Habitat Management Plan (HMP) would also be implemented with the aim of ensuring successful restoration and reinstatement of affected blanket bog and wet heath within the Development Site. The HMP would be developed in consultation with SNH and SEPA, and require to be approved by both, prior to the start of construction.			
The following measures would be incorporated in order to minimise the risk of pollution and to ensure that impacts on watercourses are either avoided or reduced: • A Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) would be agreed with relevant bodies in advance of any construction activities and implemented as part of the overall CEMP. This would set out site management and working practices and draw heavily upon SEPA's Pollution Prevention and Control Guidelines (PPGs); • All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings and, where culverts are required, have been designed in accordance with the CIRIA Culvert Design and Operation Guide; • Bridge construction would be undertaken by vehicles operating from the bankside rather than in the watercourse; and • A construction area stand-off of at least 50m has been applied to all watercourses (except for watercourse crossing.	Developer / Contractor	Planning Condition	AI Section 4.5 AI Section 8.9 AI Section 9.8
The following measures would be incorporated to minimise both the obstruction of migration and associated adverse effect on fish spawning and recruitment and the risk of harm to fish during works at watercourse crossings: • Watercourse crossing designs/construction would be informed by SEPA Good Practice Guide for the Construction of River Crossings (SEPA 2010b) and CIRIA Culvert Design and Operation Guide (CIRIA 2010). Bridged watercourse crossings would be used where feasible/practicable.	Developer / Contractor	Planning Condition	AI Section 9.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
Where this is impracticable, bottomless culverts will be used, having the benefit over more conventional culverts of maintaining the existing channel bed, substrate and hydromorphology; • Culverts/bridges would be installed (and decommissioned) from the bank, in low flows, outside the period October to May inclusive and where possible during the period July to September inclusive. This timing restriction would apply to any construction/excavation work within 30m of watercourses; • Any damming/over-pumping during work on watercourse crossings would be accompanied by a fish rescue scheme under the supervision of an ECoW; • Culverts would be subject to a programme of inspection throughout the construction and operation of the Proposed Development; • An integrated fish, freshwater invertebrate and water quality and river habitat monitoring plan would be prepared and implemented by an experienced ecologist to monitor the effects of the construction and decommissioning of the Proposed Development on freshwater ecology.			
Watercourse crossing would be micro-sited to avoid unconsolidated gravel and pebble substrates and riffle habitats. Culverts would be a single pipe structure i.e. not comprising multiple pipes. Culverts would be full pipes where the base would be covered with a natural bed. Culvert construction would be supervised by the ECoW, with culverts transferred to watercourse crossings intact, avoiding mixing concrete near to watercourse crossings. With the exception of work at watercourse crossings a buffer/exclusion zone (50m radius) around watercourses would be implemented. This would be required to minimise the loss / severance of, or damage to, watercourse habitat at watercourse crossings, including associated adverse effects on fish spawning and recruitment.	Development / Contractor	Planning Condition	AI Section 4.5 AI Section 9.8
With the exception of work at watercourse crossings, a buffer/exclusion zone (50m radius) around the watercourse network would be implemented. Additional measures to minimise the risk of pollution sediment release to watercourses are set out in detail in **EIA Chapter 11**. These include for example: avoiding construction activity and temporary or permanent infrastructure in flood zones, steeper gradients and areas at risk of peat slide. Drainage designs and a Peat Management Plan and Water Management Plan would avoid silt-laden run-off entering watercourses, directing drainage away from watercourses. Dewatering designs would allow collection and settlement of suspended sediment (silt traps, fences, straw bales or where necessary swales and settlement lagoons). A PPP and PIRP would be implemented as part of the CEMP. The ECoW would inspect all dewatering regularly and get any identified defects fixed within a day.	Developer / Contractor	Planning Condition	AI Section 9.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
This would be required to minimise silt / sediment and pollutant release, damaging fish habitats (including spawning habitat), potentially harming fish and associated adverse effects on fish populations.			
With exception of watercourse crossing (construction and operation), a buffer/exclusion zone (50m radius) around the watercourse network would be implemented, which would minimise noise/vibration effects on fish. Culverts would be installed (and decommissioned) from the bank, in low flows, outside the period October to May inclusive and where possible during the period July to September inclusive to avoid sensitive periods for fish. This timing restriction would also apply to any construction/ excavation work within 30m of watercourses. Construction of watercourse crossings would be completed over a period of short duration and taking care to minimise noise/vibration, such as avoiding impacts between plant and riverbed/bank substrate and carefully lowering culverts into place. Other measures to be implemented as part of good site working practice to restrict noise emissions are detailed in **EIA Chapter 12: Noise**. This would be required to minimised noise and vibration associated harm to fish.	Developer / Contractor	Planning Condition	AI Section 9.8
Each watercourse crossing would be inspected for freshwater pearl mussels in advance of construction, extending 50m upstream and downstream. In the unlikely event that freshwater pearl mussel is recorded, the crossing would be micro-sited to avoid this species in consultation with SNH. The measures set out above to minimise effects on fish would also minimise effects of changes in downstream water quality on freshwater invertebrates. This would be required to minimise disturbance / harm to freshwater pearl mussel and other freshwater invertebrates due to habitat degradation and disturbance.	Developer / Contractor	Planning Condition	AI Section 9.8
A Species Protection Plan (SPP) for otter would be prepared to ensure compliance with legislation. It would include details of pre-construction surveys to check on the presence of otters and the following suite of embedded measures that would be implemented across the Development Site to avoid causing harm to, or disturbing this species: • During normal working hours throughout the construction period the ECoW would be onsite to ensure that all environmental measures relevant to otter are delivered and ensure compliance with legislation; • No working or artificial lighting within 50m of watercourses/ waterbodies during the hours of darkness, taken to be 30 minutes before sunset to 30 minutes after sunrise, unless specifically agreed with SNH;	Developer / Contractor	Planning Condition	AI Section 9.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• All works in proximity to waterbodies / watercourses would follow measures outlined in the CEMP to ensure their complete protection against pollution, silting and erosion as further outlined in the PPP and PIRP; • Culverts would be fitted with mammal ledges and a suitably textured ramp extending to the level of the road; • Strict speed limits would be followed on access tracks during all phases of development, and 'otter crossing' signs would be placed on the access tracks at all water crossings; • Trenches, holes and pits would be kept covered at night or provide a means of escape for otters (and other fauna) that may become entrapped. Gates to compound areas would be designed sensitively to prevent mammals from gaining access and would be closed at night. Any temporarily exposed pipes would be capped when contractors are off site to prevent otter from gaining access; • Any lighting used to accommodate such works must be positioned to minimise light spill onto watercourses/ waterbodies and would be subject to ECoW approval. The ECoW would monitor otter activity upstream and downstream of the works using camera traps and may stop site activities at any time should they consider that the works are having a detrimental affect on otter; • An emergency procedure would be implemented by site workers if otter are encountered. All works within 30m would cease as soon as it is safe to do so, and the ECoW would inspect the site and define appropriate measures (if required); and Should construction activities take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity. This includes any works taking place within 50m of the watercourse. **European Protected Species (EPS) licence-specific measures to prevent disturbance to otters at resting sites within 30m of proposed works [Couch TN5 and Holt TN10]:** • An ECoW would provide supervision during the works and would set up a 10m exclusion zone around the resting site in advance of works commencing; • A tool-box talk would be provided to all site construction workers to raise awareness of potential disturbance effects to otters; • Construction works on the access track and water crossings would be limited to daytime hours (avoiding early morning and early evening; and • Surveys would be undertaken prior to, during and following works to assess the status of the resting site.			

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
The wind farm operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Storage, use and disposal of oils would be in accordance with Best Practice and SEPA guidance.	Developer / Operator	Planning Condition	AI Section 9.8
Cabling along access tracks would be over 50m from the watercourse network and buried. In a limited number of instances where cables cross watercourses these would be installed on the bridge.	Developer / Contractor	Planning Condition	AI Section 9.8
All operational and maintenance work requirements would be undertaken within working areas clearly defined in advance of works, and the storage of materials would be restricted to areas of hardstanding e.g. permanent tracks, crane pads or substation and control building, and associated infrastructure. Any access required to areas outside of defined working areas, i.e. foot access for tag lines on adjacent peat land, would be agreed in advance with the EcOW.	Developer / Contractor	Planning Condition	AI Section 9.8
During the decommissioning of the Proposed Development, potential effects on ecological features are expected to be similar to those encountered during the construction phase and therefore similar environmental measures would be required. Any new legislation or guidelines published prior to decommissioning would be adhered to and incorporated into an EMP prior to decommissioning taking place.	Developer / Contractor	Planning Condition	AI Section 9.8
Woodland/Forestry			
If Consent is granted a Compensatory Planting Plan to replace all felled trees within the Development Site could be requested by condition, The Compensatory Planting Plan would include: I. Assessment of existing Forestry on the Development Site – type, yields class etc. II. Appraisal of Areas of Forestry to be lost as a result of the Proposed Development to ascertain type and amount of Forestry to be replaced. III. Replacement of up to 40.6ha of woodland on the Development Site, comprising the following: ● Appropriate areas of the site(expected to be along the eastern boundary of the Development Site,) would be planted with native broadleaf / conifer species. The areas selected for native planting would consist of primarily Downy Birch, Rowan, areas of Alder, Willow and Scots Pine - all species preferred to be from local provenances where available and wold be planted in the most suitable site conditions i.e. willow in the wetter areas, birch / Scots pine on the drier knolls, etc. ● Wetter parts of the Development Site, (on land considered as less suitable for conventional restocking) would be planted as peatland edge woodland (PEW) which will consist of primarily Birch, Rowan, Alder and Scots Pine. The areas of PEW will contain a low density woodland which would help avoid net carbon loss that would result from conventional restocking on the poorer ground.	Developer/Contractor	Planning Condition	Appendix 9J

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
The sole purpose of the PEW and Native plantations are for biodiversity benefits of woodland on peatland. The objective of the PEW area is to achieve at least a 20% canopy cover and planting will comprise of 50% planted and 50% open ground; i.e. 550 stems per hectare. An element of non-native natural regeneration will be tolerated within the PEW areas as long as it does not compromise the growth of the native species. • Retain significant areas of open ground (of which a component relates to ground managed) for environmental objectives including bog restoration.			
Telecommunications and Aviation			
Wherever possible, turbines are located in areas where there would be no effects on existing infrastructure, telecommunications and aviation interests. Where this is not possible, discussions with relevant operators are on-going and an agreement would be reached for alternative arrangements to be made so that existing services would not be affected by the Proposed Development.	Developer	Planning Condition	AI Section 10.7
A micro-siting provision has been requested such that any turbine can be moved up to 50m taking into account known environmental and telecommunications constraints. It is intended that this provision would be used to respond to any additional unforeseen infrastructure constraint.	Developer / Contractor	Planning Condition	AI Section 10.7
To mitigate any problems with television reception arising when the Proposed Development becomes operational, the Applicant would accept a 'Requirement' to assess current television signals in advance of the construction of the Proposed Development and would mitigate post-development problems with television reception arising where effects are attributable to it.	Developer	Planning Condition	AI Section 10.7
To minimise interference with the 132kV and 33kV Scottish Power electricity transmission line, power lines would be undergrounded and protected where required, following liaison with SHEPD.	Developer / Contractor	Planning Condition CMS	AI Section 10.8
To minimise effects on the Beinn Greidaig 33kv underground cable, power lines would be located, and additional protection put in place if required during track construction.	Developer / Contractor	Planning Condition CMS	AI Section 10.8
To minimise effects on NATS microwave link, it may require to be re-routed using a new transmitter.	Developer	Planning Condition	AI Section 10.8
To minimise effects on the Highlands and Islands Enterprise microwave link, mircositing of Turbine 20 may require to be restricted to 20m in the direction of the link.	Developer / Contractor	Planning Condition	AI Section 10.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
To minimise effects on the Pentland Road Wind Farm Scanning Telemetry Link, a non-radio mitigation solution may be required for the existing / new communications link to the wind farm(s)	Developer	Planning Condition	AI Section 10.8
The mircositing of certain turbines (T1, 2, 3, 4, 7, 8, 9, 10, 11, 28 and 34) will be restricted to avoid interference with existing telecommunications and infrastructure.	Developer / Contractor	Planning Condition	AI Section 10.8
In the interest of aviation safety, the proposed turbines are required to be fitted with aviation lighting as follows: • Aviation warning lights fitted to each of the 35 turbines would comprise of four lights as follows: ▸ One medium intensity lighting unity (2000 candela) at hub height (105m and 88m AGL); and ▸ Three low intensity units (32 candela) at half hub height (52.2m and 44m AGL). • It is assumed that lighting would be operated by an automatic control device which reliably allows the lighting to be activated when the ambient threshold falls below 500 LUX in accordance with the requirements of the CAA policy statement and Article 222 of the UK Air Navigation Order (2016). This lighting specification has been used to model the effects of the aviation warning lights for a Night-time Assessment, which is included as **EIA Appendix 6D**. A lighting mitigation scheme would be submitted to address the requirements of the MOD and HIAL.	Developer / Contractor	Planning Condition	AI Section 10.7
In terms of the Met Office radar on the Isle of Lewis, a mitigation solution is likely to be agreed with Met Office.	Developer	Planning Condition	AI Section 10.7
Geology, Hydrology and Hydrogeology			
All infrastructure associated with the Proposed Development, other than at certain proposed access track crossings, is located outside of the 1 in 200 year flood zones.	Developer	Planning Condition	EIA Section 11.8
A construction area stand-off of at least 50m has been applied to all watercourses (except for watercourse crossing.	Developer / Contractor	Planning Condition	EIA Section 11.8
Parts of the Development Site where steep slopes at or greater than 7° were mapped (**EIA Figure 11.4**) and identified as a significant constraint due to potential peat slide risks and enhanced runoff. These areas, along with other areas identified as having potential historic peat slides, have been avoided for construction of turbines, as well as for other infrastructure and access tracks.	Developer / Contractor	Contract requirement	EIA Section 11.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
Incursions into SEPA 100m (shallow excavation, <1m deep) and 250m (deep excavation, >1m deep) buffer areas around the high and moderate GWDTEs have been minimised as far as possible.	Developer / Contractor	Planning Condition	EIA Section 11.8
Prior to the commencement of construction activities, a CEMP would therefore be produced that would follow Best Practice guidance, as well as incorporating specific recommendations made in this EIA Report, and would therefore account for potential risks and minimise potential effects on the site hydrology and hydrogeology during construction. No works would be undertaken unless agreed in the CEMP. The CEMP would include or be accompanied by a Water Management Plan (WMP), a Pollution Prevention Plan (PPP) and a Pollution Incident Response Plan (PIRP) for construction activities at the site. The WMP would set out the specific details of surface water drainage, management of dewatered groundwater from excavations and watercourse crossings. The PPP would set out specific measures to protect water environment receptors from pollution arising from construction activities and a programme for inspection and monitoring to ensure the effectiveness of these measures. The PIRP would describe the response plan for pollution incidents, should accidental spillages occur despite the control measures in place.	Developer / Contractor	Planning Condition	EIA Section 11.8
On areas of peat depths greater than 1m (i.e. covering the majority of the Development Site), floating roads are proposed (using either option A or option B). Floating roads would be constructed in line with the good practice guidance and would include the use of geogrids and geotextiles. The geotextile would be selected to maintain load distribution, ensure separation of aggregate and peat, and prevent peat rutting, erosion and drainage. Aggregate choice would be sensitive to peat geochemistry and would be of sufficient grade to allow infiltration through to the geotextile.	Developer / Contractor	Planning Condition	AI Section 4.5 EIA Section 11.8
The track layout has been designed to minimise the total track length, and to avoid, where possible, intersecting catchment areas in a manner that could significantly interrupt flow paths. Cross-drainage would be provided in areas where access tracks unavoidably intersect dominant flow pathways.	Developer / Contractor	Planning Condition	EIA Section 11.8
The use of cut tracks may be required on areas of steeper gradient or where there are concerns about slope stability. Cut tracks would need to cut all the way through the peat, thereby potentially increasing disturbance of the local hydrology. The extent of these access tracks would be minimised.	Developer / Contractor	Planning Condition	EIA Section 11.8
The need for drainage on the access track network would be considered for all parts of the track network: • In flat areas, drainage of floating roads is not required as it can be assumed that rainfall on to the access track would infiltrate to the ground beneath the access track or along the verges.	Developer / Contractor	Planning Condition	EIA Section 11.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
Track-side drainage would be avoided where possible, to prevent any local reductions in the water table or influences on the access track structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression); • Where access tracks are to be placed on slopes, lateral drainage would be required on the upslope side of the access track. The length of drains would be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid run-off could occur. Regular cross-drains would be required to allow flow to pass across the access track (as recommended in SEPA's guidance on Good Practice During Windfarm Construction), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network; • Check dams may be implemented in drainage ditches where necessary to reduce flow velocities to aid in the sedimentation of silt from suspension and to also direct water into the cross drains so that natural flow paths are maintained as far as possible. The ditch design would be considered in line with the recommendations of the FCS and SNH (2010) guidance, including the use of flat-bottomed ditches to reduce the depth of disturbance. • Cross-drainage may be by culverts or pipes beneath the access track, again in line with the FCS and SNH (2010) guidance. Drainage would be installed before or during access track construction, rather than afterwards, to ensure that the access track design is not compromised. The cross drainage would flow out into shallow drainage, which would allow diffuse re-infiltration to the peat on the downslope side. The cross drains would flow out at ground level and not be hanging culverts. The avoidance of steep gradients for the access tracks would also reduce the risk of erosion occurring at cross-drain outflows; • In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control measures including sediment settlement would be undertaken before the water is discharged into surface water systems. The discharges would be small and collected from only a limited area, rather than draining a large area to the same location. Sufficient attenuation storage would also be incorporated into site drainage systems to ensure that discharge rates to watercourses do not adversely affect the hydrology at the site; • Areas of hardstanding would be minimised through careful design of construction compounds and minimising the size of crane pads at each turbine location to reduce the need for drainage;			

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• The details of proposed site drainage measures would be set out in the WMP for the Development Site, which would accompany the CEMP. As the area of the Development Site considerably exceeds 4 ha, discharges from construction phase site surface water drainage systems would be subject a CAR Complex Licence from SEPA. The WMP would be subject to approval by SEPA through the CAR licence application process.			
Cables would be run alongside access tracks wherever possible, except where attached to the bridge to connect the southern and northern parts of the Proposed Development. Cable trenches alongside access tracks would be installed at the minimal depth practical, although this may reach 0.5-1m deep. Trenches would be dug and left open for the minimum time possible to ensure that they do not create open drainage routes. The trench would be backfilled as far as possible with excavated peat, to minimise the change to flow paths. Where other material is used to backfill the trenches, clay cut-off barriers would be installed across the trenches to prevent them creating preferential flow paths. Cable laying methods that do not require a dug trench would be considered.	Developer / Contractor	Planning Condition	EIA Section 11.8
The number of watercourse crossings has been minimised as far as possible. Adherence to the SEPA Good Practice Guide for the Construction of River Crossings and WAT-SG-21 and CIRIA Culvert Design and Operation Guide (C689) would help minimise potential hydrological (including morphological) effects. All watercourse crossings would be designed to convey a 1 in 200 year return period flood event,	Developer / Contractor	Planning Condition	EIA Section 11.8
Where possible, excavations required to facilitate the construction of foundations for turbines, service trenches and each crane base would be designed so that they can freely drain by gravity (see AI Section 4.5). Cut-off drains would be installed around the excavation areas to prevent surface run-off entering the excavations.	Developer / Contractor	Planning Condition	EIA Section 11.8
Measures based on Best Practice guidelines from SEPA would be adopted during construction to prevent pollution, with all contractors advised of a pre-planned pollution incident response procedure, as detailed in PPG21.	Developer / Contractor	Planning Condition CMS PPP PIRP	AI Section 4.7 EIA Section 11.8
Turbine construction would need to adopt mitigation measures to prevent contaminants entering the shallow groundwater system. To minimise the potential of concrete leaching and alkaline pollution of groundwater, suitable sulphate-resistant concrete would be used. The foundation design would be checked with SEPA.	Developer / Contractor	Planning Condition	EIA Section 11.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
Should ground conditions occur during excavation where gravity drainage is not possible (i.e. where low permeability rock or superficial deposits are present) the excavations would be dammed and drained by pumping. These dewatering activities would be undertaken in accordance with Best Practice (including WAT-SG-29 on Temporary Construction Methods), which would be detailed in the CEMP to be agreed by SEPA and the ECoW. The design for the dewatering would ensure collection and settling of suspended sediment (i.e. use of silt traps, fences, straw bales or lagoons). Any water removed from the excavation would be treated and pumped to a bunded and vegetated settlement and infiltration swale, downgradient of the excavation and away from watercourses, and there would be no discharge of water directly into a watercourse. The potential for infiltration would need to be carefully assessed during the detailed design should consent be granted for the Proposed Development due to the prevalence of saturated conditions across the Development Site. These activities would be design and implemented in consultation with SEPA on a foundation-specific basis following completion of detailed ground investigations and micro-siting prior to construction. The locations of swales or settlement lagoons, where required, would be on stable areas of shallow slope, to reduce the risk of failure. The size of the settlement lagoons would be appropriate to the amount of dewatering, but if large quantities of dewatering are anticipated, the potential for more than one lagoon or the use of portable silt trap devices would be considered on a foundation-by-foundation basis. If any discharge to surface watercourses is required, the water would be treated beforehand and the need for any consent from SEPA obtained (it is expected that in most cases the activities would be covered by GBR3 and/or GBR15).			
A total of up to five borrow pits have been proposed to provide a supply of crushed aggregate and rock during the construction phase. The excavation of these borrow pits would require dewatering during their operation to enable the rock to be removed, although based on the status of the aquifer (low permeability) it is anticipated that the volumes of water and impacts to groundwater resources would be limited. Similar controls to those detailed above would be employed to prevent contamination of surface waters with suspended sediment.	Developer / Contractor	Planning Condition	EIA Section 11.8
Good practice measures would be implemented to ensure that peat is appropriately stored. The peat storage areas would be located at a distance from any watercourses (outwith the 50m watercourse buffers) and would be contained to prevent sediment or nutrient run-off from eventually reaching downstream watercourses.	Developer / Contractor	Planning Condition	EIA Section 11.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
The storage of peat during construction would minimise slumping and maintain stratification, where possible using water derived from dewatering activities to keep the peat adequately saturated to prevent desiccation and degradation. It is anticipated that all excavated peat can be re-used on site (see **AI Appendix 9H**). The upper levels of the peat and turf excavated for the turbine bases can be used for resurfacing following construction (in non-hardstanding areas), thus maintaining the hydrological and biological characteristics of the location. This resurfacing would aim to restore a flat surface around the turbine, preventing mounding. This would help to re-establish hydraulic continuity of the replaced peat and turf with surrounding saturation levels, thereby reducing the possibility of peat drainage and desiccation.			
Site activities during construction and operation have been identified to have potential effects on the water environment. These can be controlled by the implementation of pollution prevention and control measures and Best Practice including: ● A PPP and PIRP would be prepared for the Proposed Development, the latter in line with GPP 21, and all contractors would be briefed on these plans; ● Equipment to contain and absorb spills would be readily available; ● Fuel would be stored in either a bunded area or self-bunded above-ground storage tank (AST) on site during the course of the construction phase in accordance with the Water Environment (Oil Storage) (Scotland) Regulations 2006 and other SEPA Pollution Prevention Guidelines, and GBR9. The bunded area would have a capacity of 100% of the fuel tank. All stores would be located at least 20m from any watercourses; ● In areas where there is a potential for hydrocarbon residues from run-off / isolated leakages, surface water drainage would be directed to a hydrocarbon interceptor prior to discharge; ● Plant and machinery used during the construction phase would be maintained to minimise the risks or oil leaks or similar. Maintenance and refuelling of machinery would be undertaken off-site or within designated areas of temporary hardstanding. In these designated areas, contingency plans would be implemented to ensure that the risk of spillages is minimised. Placing a drip tray beneath plant and machinery during refuelling and maintenance would contain small spillages; ● To prevent ingress of salt into the Development Site from the Marybank salt store at the site entrance, bunding would be installed and maintained downgradient of the salt store, with periodic removal of the retained waters; ● During operation, the potential risk to the environment from performing maintenance activities would be identified by the operator prior to serving being undertaken.	Developer / Contractor	Planning Condition CMS PMP PIRP	EIA Section 11.8

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
The operator would be required to ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. However, as a pre-requisite the storage, use and disposal of oils would be done in accordance with good practice and SEPA guidance (GPP 8).			
During operation, ongoing maintenance would be carried out, for example, to maintain drainage and settlement ponds.	Developer	Planning Condition	EIA Section 11.8
Noise			
To minimise disturbance, the construction process would have regard to general guidance for controlling construction noise that is given in British Standard BS5228-1:2009+A1: 2014 *'Noise and Vibration on Construction and Open Sites. Part 1: Noise'*.	Developer / Contractor	Planning Condition	EIA Section 12.8
Blasting from the borrow pits would be managed with a Blasting Management Plan. Part of this plan would be to minimise noise, air overpressure and groundborne vibration.	Developer / Contractor	Planning Condition	EIA Section 12.8
The aim of the wind farm noise assessment is to achieve a design from which noise emissions meet limits derived following the approach given in ETSU-R-97 and/or relevant local guidelines. Consequently, the design of the scheme is such that necessary operational noise limits are met and no further environmental mitigation measures are required. The operator would be required to ensure that sound power level limits are not exceeded during operation.	Developer	Planning Condition	EIA Section 12.8
Traffic and Transport			
A Construction Traffic Management Plan (CTMP) would be developed to manage the traffic impact on the Development Site. The CTMP would manage daily delivery profiles and control movements and routing of HGVs through the following measures: • Traffic routing strategy – ensuring vehicles access the Development Site via the most appropriate route and avoid unnecessary conflict with sensitive areas; • Traffic timing strategy – programme vehicles arrivals / departures and working hours to lessen the impact on the highway network; • Temporary signage – in accordance with Department for Transport (Dft) *Traffic Signs Manual, Chapter 8* to inform local road users of construction access points and the presence of HGVs; • Traffic manuals – to marshal access point and Core Path crossings whilst deliveries are taking place;	Developer / Contractor	Planning Condition	AI Section 13.9

Environmental Measure and Rationale	Responsibility for Implementation	Compliance Mechanism	EIA Section Reference
• Temporary traffic management – provided on approaches to accesses in the form of traffic warning signs, possible reductions in speed limit signs to ensure safe passage of vehicles. All signage in accordance with DfTs *Traffic Signs Manual, Chapter 8*; • Site access designed in accordance with Design Manual for Roads and Bridges (DMRB); and • Staff Travel Plan – would provide details of how staff should travel to the Development Site in an effort to reduce single occupancy vehicle journeys.			