3 Proposed Development Description

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3 Proposed Development Description

3.1 Introduction

3.1.1 This chapter provides a description of the site and the geographical context. It presents a description of the Proposed Development for which consent is being sought, for the purposes of informing the identification and assessment of likely significant environmental effects. This includes the anticipated construction and operation activities connected with the Proposed Development.

3.2 Site Status and Context

Background and Site Description

3.2.1 The Proposed Development is located approximately 5 km east of Birsay on the Orkney Mainland (refer to **Figure 1.1**).

3.2.2 The site comprises an area of approximately 120 hectares (ha). The Site is predominantly grassland with gently sloping topography up to 106 m Above Ordnance Datum (AOD). The eastern boundary of the site borders the Loch of Swannay (refer to **Figure 1.2**).

Environmental Designations

3.2.3 **Figure 3.1** shows sites with environmental designations within 10 km of the Proposed Development. Full descriptions of these are provided in the relevant technical chapters of the EIA Report.

3.2.4 The following designations are located within the site boundary:

- Heart of Neolithic Orkney World Heritage Site Sensitive Area
- Three Scheduled Monuments
- Birsay Moors RSPB Reserve

3.2.5 The following designations are situated outwith the site boundary but within 5 km (distances below from the site boundary to the designation at its nearest point):

- Sites of Special Scientific Interest – West Mainland Moorlands (immediately southeast), Glims Moss and Durka Dale (~1.5 km south), Loch of Banks (~3.7 km southwest), Loch of Ibister and the Loons (~4.5 km southwest), and Eynhallow (~4.6 km east)
- Special Areas of Conservation – Loch of Ibister (4.5 km southwest)
- Important Bird Areas – Orkney Mainland Moors (~1.5 km south), North Mainland Coast (~2.2 km northwest), Loch of Ibister (3.8 km southwest), and Sounds around Wyre (~4 km east)
- Special Protection Areas – Orkney Mainland Moors (immediately southeast), Rousay (~4.3 km east), North Orkney (~4.3 km east)
- RSPB Reserves – The Loons and Loch of Banks (~3.8km southwest)
- Seal Haul Out Sites – Costa & Burgar (~2 km northeast) and Eynhallow & Westside (~4.5 km east)
- 40 Scheduled Monuments
- 11 Listed Buildings
- Eynhallow Rural Conservation Area (~4.7 km east)

Cumulative Developments

3.2.6 **Figure 3.2** shows the locations of other relevant onshore wind farm developments, including those that are operational, under construction, consented, in planning, or in scoping within 10 km of the Proposed Development at the time of writing (June 2022 - refer to Table 3.1). Potential cumulative effects with these developments have been assessed throughout the EIA Report, where there is sufficient information.

Table 3.1 - Cumulative Developments within 10km of the Proposed Development

Development	Status	Number of Turbines	Approximate distance to nearest turbine
Costa Head	Consented	4	2.3 km
Burgar Hill	Operational	6	2.9 km
Holodyke	Operational	1	5.4 km
Hammers Hill Extension	Consented	2	7.3 km
Hammers Hill	Operational	5	8.2 km

3.3 Description of the Development

3.3.1 The final Proposed Development layout is illustrated in **Figure 1.2** and would comprise four three-blade horizontal axis turbines with a blade tip height up to 180 m with an indicative installed capacity of up to 26.4 MW. In addition to the turbines, associated infrastructure will include:

- Turbine and turbine foundations;
- crane hardstandings;
- site access and tracks;
- on-site substation;
- underground cabling;
- expansion of existing borrow pit area; and
- two temporary construction compounds.

Micrositing

3.3.2 Whilst the location of the infrastructure described above has been determined through an iterative environmental based design process, there is the potential for these exact locations to be altered through micro-siting allowances prior to construction. A micro-siting allowance of up to 50 m in all directions is being sought in respect of T1, T2, T4 and associated site infrastructure in order to address any potential difficulties which may arise in the event that pre-construction surveys identify unsuitable ground conditions or unforeseen environmental constraints that could be avoided by relocation. A micro-siting allowance of up to 125 m in respect of T3 is being sought in order to mitigate potential adverse effects on the EE telecoms link (refer to **Chapter 15**).

3.3.3 No micro-siting will be undertaken that results in an increase in the significance of adverse effects. It is proposed that the final positioning will be addressed through an appropriately worded planning condition.

3.3.4 The assessments within this EIA Report have included the considerations of this 50 m micro-siting and 125 m at turbine 3 only and it does not alter the conclusions formed as to worst case effects.

Turbines and Turbine Foundations

3.3.5 The Proposed Development will comprise four turbines up to 180 m blade tip height when vertical. The indicative combined generation capacity of the turbines is anticipated to be 26.4 MW. The specific turbine manufacturer and model has not yet been selected as this will be subject to a pre-commencement tendering exercise and will be confirmed post consent. Therefore, for the purposes of the EIA, maximum turbine dimensions and operational attributes have been established as the development scenario.

3.3.6 The turbine parameters for the Proposed Development will be four turbines with a maximum overall height (to blade tip) of 180 m and an indicative hub height of 102.5 m. The rotor diameter will be 155 m for all turbines.

3.3.7 These dimensions are indicative and final turbine dimensions will be determined based upon turbine availability and procurement prior to construction. The tip height of the chosen turbine will not exceed a blade tip height of 180 m.

3.3.8 The proposed final locations of the turbines have been defined in order to enable the EIA Report to describe fully the Proposed Development for which permission is being sought. The British National Grid coordinates denoting where each of the turbines are proposed to be located are listed in Table 3.2.

Table 3.2 - Wind Turbine Coordinates

Turbine	X-Coordinate	Y-Coordinate
T1	329811	1027366
T2	330312	1026900
T3	330757	1027409
T4	331058	1026885

3.3.9 Each of the turbines comprises the following components:

- Blades;
- Tower;
- Nacelle;
- Hub; and
- Transformer and switchgear.

3.3.10 Each wind turbine will have a nacelle mounted on a tapered tubular steel tower. The nacelle will contain the gearbox or direct drive, the generator, the transformer and other associated equipment. The hub, and rotor assembly, including three blades, will be attached to the nacelle. An elevation drawing of a typical turbine is illustrated in **Figure 3.3**. The turbines will be of a typical modern, three-blade, horizontal axis design in semi-matt white or light grey with no external advertising or lettering except for statutory notices.

3.3.11 A full ground investigation will be completed prior to construction; however, typical foundations would comprise concrete and steel reinforcement. For the purposes of the EIA Report, it has been assumed that all four turbines will have typical gravity base foundations with a typical diameter of approximately 22 m and 4 m in depth.

3.3.12 The area above the foundations is backfilled up to the turbine with topsoil and seeded, with a native seed mix to encourage re-vegetation.

3.3.13 An illustration of a typical turbine foundation is provided in **Figure 3.4.** The final foundation design will be specific to the turbine selected and the site conditions as verified during detailed site investigations undertaken before construction commences. In the unlikely event that ground conditions are unsuitable for the standard foundation design described above, a piled foundation design may be required, involving the installation of a series of concrete piles per turbine, with each pile being bored or driven until the underlying bedrock is reached.

Crane Hardstandings

3.3.14 To enable the construction of the turbines, a crane hardstanding area and turning area at each turbine location will be required to accommodate assembly cranes and construction vehicles. This will comprise a crushed stone hardstanding area measuring approximately 195 m long by 65 m wide. The actual dimensions will be subject to the specifications required by the selected turbine manufacturer and crane operator and following detailed site investigations prior to construction commencing.

3.3.15 The crane hardstandings will remain in place during the lifetime of the Proposed Development to facilitate maintenance work.

3.3.16 Indicative crane hardstandings are illustrated in **Figure 3.5**. Detailed construction drawings with final dimensions will be provided prior to commencement once the final turbine model has been selected.

Site Access Tracks and Site Tracks

3.3.17 The tracks will have a typical 5 m running width, wider on bends and at junctions. **Figure 3.6** shows indicative tracks.

3.3.18 It is proposed that there will be a micro-siting allowance of 50 m in all directions for all access tracks to allow for potentially unsuitable ground conditions or unforeseen environmental constraints identified by pre-construction surveys. It is proposed that the final positioning will be addressed through an appropriately worded condition.

3.3.19 A Transport Assessment (**Appendix 11.1**) has been undertaken in support of the Application for the Proposed Development and this provides detail on access routes to the site for construction vehicles and provides an estimate of trip generation during construction. The Transport Assessment includes a review of the proposed route, construction traffic impacts, and an abnormal load route review. Traffic and transport effects are discussed further in **Chapter 11**.

3.3.20 Prior to construction, any required improvements to public roads will be undertaken and appropriate highway safety measures will be agreed with Orkney Islands Council (OIC) and Transport Scotland, with necessary signage or traffic control measures implemented throughout the construction phase on the agreed basis.

Temporary Construction Compounds

3.3.21 Two temporary construction compounds will be required during the construction period. The locations of the compounds are shown in **Figure 1.2**. The compound at the site entrance and will comprise an area of approximately 50 m by 50 m, and the compound located at the borrow pit will comprise an area of 25 m by 50m. An indicative layout of a typical construction compound is provided in **Figure 3.7**.

3.3.22 The main construction compound at the site entrance will house a temporary portable cabin structure to be used as the main site office and welfare facility, including toilets, clothes drying and kitchen, with the provision for sealed waste storage and removal. The compound will also be used for the storage and assembly of certain components, containerised storage for tools and small parts, and oil and fuel storage. Adequate parking will be provided for cars and light vehicles. A portable cabin controlling access to the main site with mandatory signing in and out procedures will be located at the entrance to the compounds.

3.3.23 The construction compound at the borrow pit will have additional site offices, storage areas and parking as shown in **Figure 3.8**.

3.3.24 The detailed location, size and engineering properties of the construction compounds will be confirmed prior to the start of construction. It is proposed that there will be a micro-siting allowance of 50 m in all directions for the construction compounds in order to allow operational flexibility. It is proposed that the final positioning will be addressed through an appropriately worded condition.

3.3.25 On completion of construction works, it is proposed that all temporary structures be removed and the compound areas be restored.

Substation and Underground Cabling

3.3.26 The electrical power produced by the individual turbines will be fed to an onsite substation via underground cables. The location of the proposed substation and is located at the entrance of the site as shown on **Figure 1.2**. The design of the substation and control room building is relatively flexible and where appropriate may be clad in local materials to match in with the surroundings.

3.3.27 The Proposed Development's connection to the wider electricity network is still under assessment.

3.3.28 Within the site boundary, all cables would be buried underground running in trenches along the access tracks from each of the turbines to the on-site substation, the trenches would typically be 0.5 m wide.

3.3.29 The substation compound will be approximately 50 m long by 25 m wide and have a building height of approximately 7 m, to incorporate a substation and control room building, and potentially some external electrical equipment (**Figure 3.9**). The building will accommodate all the equipment necessary for automatic remote control and monitoring of the Proposed Development in addition to the electrical switchgear, fault protection and metering equipment required to connect the Proposed Development to the local electricity network. Depending on the nature of the connection, there may be external electrical infrastructure adjacent to the control building.

Borrow Pit

3.3.30 To minimise the volume of imported material brought onto the site and any associated environmental impacts, the existing borrow pit located within the site boundary will be expanded and used to source stone for site infrastructure.

3.3.31 Detailed site investigations prior to construction will be carried out to further confirm the rock type, rock characteristics and suitability, as well as potential volumes to be extracted from the existing borrow pit area. The final borrow pit extent identified during the geotechnical evaluation will be defined within the Construction Environmental Management Plan (CEMP) (refer to **Appendix 3.1**). The pollution control measures to be implemented during usage of the borrow pit and its reinstatement will also be covered within this document.

3.3.32 The borrow pit will require the use of plant to both win and crush the resulting rock to the required grading. Noise associated with stone extraction is discussed further in **Chapter 10**.

3.3.33 The proposed location of the borrow pit was influenced by the location of the existing on-site borrow pit. The existing on-site borrow pit will be extended to a sufficient size. Following construction, the borrow pit will be restored and reinstated to agreed profiles.

3.4 Construction

3.4.1 The Proposed Development will be constructed over a period of approximately 12 months and anticipated to commence 2025. Construction would include the principal activities listed within the indicative construction programme as provided in Table 3.3.

Table 3.3 - Indicative Construction Programme

Task	Month Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation												
Access & Site Tracks												
Foundations												
On-Site Cabling												
Substation Construction												
Crane Hardstanding												
Turbine Erection												
Site Reinstatement & Commissioning												

3.4.2 Normal construction hours will be between 07:00 and 19:00 Monday to Friday and 09:00 and 13:00 on Saturdays. These times have been chosen to minimise disturbance to local residents. It must, however, be noted that out of necessity due to weather conditions and health and safety requirements, some generally quiet activities, for example abnormal load deliveries (which are controlled by Police Scotland) and the lifting of the turbine components, may occur outside the specified hours stated. Any construction out with these hours, will be in line with the noise limits as assessed in **Chapter 10** and advance warning of any works out with the agreed working hours will be provided to OIC and local residents.

Summary of Development Area

3.4.3 Table 3.4 below summarises the approximate areas for which aggregate material will be required for each of the main infrastructure elements described in Section 3.3. The Transport Assessment in **Chapter 11** has been prepared on a "worst-case" basis that all construction aggregate will be imported to site. However, if base materials (at least) are won on site this would result in a reduction in delivery volumes / traffic. Further detail on traffic volumes associated with the importation of construction materials is provided in **Chapter 11**.

Table 3.4 - Proposed Development Areas

Infrastructure	Area (m^2)
Site Tracks	19,200
Crane Hardstanding	27,000
Construction Compounds	3,750
Substation Compound	1,250

Construction Materials

3.4.4 The main materials likely to be required in part or total for the construction of the track, turbine and substation foundations, and hardstanding areas are described below:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete;
- Steel reinforcement;
- Electrical cable; and
- Timber – plus other material for a substation/control building.

3.4.5 Necessary excavations will be made, initially by stripping back the soil from the area to be excavated. This soil will typically be stored separately either in a mound adjacent to the excavation area for backfill, if required, or stored at a designated area on site for further use or reinstatement of temporary works areas. The handling of soils will be undertaken in accordance with best practice techniques.

3.4.6 Should surface water run-off or groundwater enter the excavation during construction of the turbine foundations, appropriate pumping measures away from watercourses will be implemented to ensure the works are safely carried out and the excavation is sufficiently dry to allow concrete placement. Once the concrete is cast, the excavated material will be used for backfill and compacted to the required design density. Once this backfill is completed, the crane hardstanding areas will be constructed.

3.4.7 The proposed method for constructing the turbines is as follows. The turbines will be erected using a large mobile crane or crawler crane, positioned on the hardstanding adjacent to the turbine base. A smaller tail crane will be positioned adjacent to the delivery position of the turbine components. The two cranes will lift the tower sections and blades into their assembly positions, and the main crane will lift the tower sections, nacelle and blades into their operational positions.

3.4.8 As soon as practical, once installation is complete, the immediate construction area will be restored to its original profile, although the crane hardstandings will be retained for future maintenance. The soils will be replaced and reseeded where appropriate and as advised by an on-site Environmental Clerk of Works (ECoW). Any surplus soils will be used to restore track edges after construction. This progressive reinstatement has been found to assist with re-establishment of the local habitats as it minimises the time soils are in storage.

3.5 Environmental Management

Construction Environmental Management Plan (CEMP)

3.5.1 As part of the construction contract, the contractor responsible for undertaking the construction and/or decommissioning works (the Contractor) shall sign up to produce, and adhere to, a CEMP. The CEMP shall be developed in accordance with 'Good Practice During Wind Farm Construction' (Scottish Government et al., 2019).

3.5.2 The CEMP shall describe how the Applicant will ensure suitable management of, but not limited to, the following environmental issues during construction of the Proposed Development:

- noise and vibration;
- dust and air pollution;

- surface and ground water;
- ecology (including protection of habitats and species);
- agriculture (including protection of livestock and land);
- cultural heritage;
- waste (construction and domestic);
- pollution incidence response (for both land and water); and
- site operations (including maintenance of the construction compounds, working hours and safety of the public).

Pollution Prevention & Health & Safety

3.5.3 Prior to commencement of construction activities, a pollution prevention strategy, contained within a CEMP, will be agreed with the Scottish Environment Protection Agency (SEPA) to ensure that appropriate measures are put in place to protect watercourses and the surrounding environment.

3.5.4 As with any development, during the construction stage there is the potential for threats to the quality of the water environment in waterbodies, watercourses and local ditches. These mostly arise from poor site practice so careful attention will be paid to the appropriate guidance and policies to reduce the potential for these to occur.

3.5.5 Any fuel or oil held on-site will only be of an amount sufficient for the plant required. This will be stored in a bunded area to prevent pollution in the event of a spillage. There will be no long-term storage of lubricants or petrochemical products on-site at the Proposed Development.

3.5.6 High standards of health and safety will be established and maintained. At all times, all activities will be undertaken in a manner compliant with applicable health and safety legislation and with relevant good practice, as defined under applicable statutory approved codes of practice and guidance.

3.5.7 Further details of site-specific storage and management of fuel and oil and protection of watercourses during construction are presented in **Chapter 12** of this EIA Report.

Traffic & Transportation

3.5.8 A detailed Transport Assessment has been undertaken which provides details regarding transport and access to the site (refer to **Chapter 11**).

3.5.9 Traffic associated with the construction and maintenance of the Proposed Development falls into two main categories, namely Abnormal Indivisible Loads (AIL) and Construction/Maintenance Loads. The abnormal loads are those that will require an escort, either by private contractor or by police escort. Construction/maintenance loads are those that do not require any special escort or permissions and are only influenced by normal traffic regulations.

3.5.10 The Applicant will ensure that the vehicles will be routed as agreed with OIC, Transport Scotland and Police Scotland, to minimise disruption and disturbance to local residents and road users. Further details regarding transport and access can be found in **Chapter 11** of this EIA Report.

Pre-construction Surveys

3.5.11 Detailed surveys have informed the design process of the Proposed Development. However, certain design elements are dependent on turbine model and manufacturer, therefore detailed construction details will be decided once the turbine has been selected.

3.5.12 Pre-construction surveys will be undertaken to update the ecological and ornithological baseline and to perform detailed geotechnical ground surveys, further details of these are provided in the relevant technical chapters.

3.5.13 The Applicant will engage an Environmental Clerk of Works (ECoW) and Archaeological Clerk of Works (ACoW) onsite during the construction phase. The ECoW and ACoW be responsible for pre-construction surveys and will monitor the construction process on site to provide advice and ensure that the measures within the CEMP are followed.

3.6 Operation & Maintenance

3.6.1 The lifetime of the Proposed Development is envisaged to be 40 years from the final commissioning to commencement of decommissioning.

3.6.2 The Proposed Development would be maintained throughout its operational life by a service team. The service team would comprise of operation management, operations technicians and support functions undertaking the scheduled and unscheduled maintenance throughout the year. This team would either be employed directly by the developer or by the turbine manufacturer. Management of the wind farm would typically include turbine maintenance, health and safety inspections and civil maintenance of tracks, drainage and buildings. Turbine maintenance includes the following:

- Civil maintenance of tracks and drainage;
- Scheduled routine maintenance and servicing;
- Unplanned maintenance or call outs;
- HV and electrical maintenance; and
- Blade inspections.

3.6.3 In the unlikely event that a major turbine component requires replacement, vehicles will use the new access tracks and crane pads, which will be retained during the operational phase to allow access.

3.6.4 Health and safety will be controlled as set out in the construction phase.

Aviation Lighting

3.6.5 As structures over 150 m high, there is a statutory requirement for aviation lighting on the Proposed Development. Proposed lighting has been agreed with the Civil Aviation Authority (CAA) and Ministry of Defence (MOD), but will need final approval again with the CAA, prior to construction. The specification of the lighting is detailed in full in **Chapter 13**.

Operation Environmental Management Plan (OEMP)

3.6.6 The Applicant will implement an Operation Environmental Management Plan (OEMP). Similar to the CEMP, the OEMP will set out the mitigation measures proposed in the EIA Report and how the Applicant will manage and monitor environmental effects throughout the operation of the Proposed Development. The OEMP will also be developed in consultation with OIC, SEPA, NatureScot and Historic Environment Scotland (HES) where relevant.

3.7 Decommissioning

3.7.1 At the end of the Proposed Development's operational lifespan of 40 years, it will be decommissioned, unless further consents are sought. It is expected that decommissioning will take approximately 12 months. The environmental effects of decommissioning are considered to be similar to those during construction, excluding the loss of habitat which will have already occurred under construction.

3.7.2 Prior to decommissioning, a Decommissioning Environmental Management Plan (DEMP) will be produced to reflect the current legislation and policy and will be agreed with the relevant statutory authorities.

3.7.3 During decommissioning vehicles will access the site by the same route used for delivery and construction of the Proposed Development.

3.7.4 It is anticipated that certain components of the turbines will be dismantled and removed from site for disposal and/or recycling as appropriate and in accordance with regulations in place at the time. It is proposed to leave the buried portion of the foundations of the turbines in situ on decommissioning. This is considered to have less impact on the hydrological system which will have established itself during the lifetime of the wind farm than complete removal of the foundations.

3.8 Climate Change & Carbon Considerations

3.8.1 Increasing atmospheric concentrations of greenhouse gases (GHGs), including carbon dioxide (CO2) (also referred to as carbon emissions) are resulting in climate change. A major contributor to this increase in GHG emissions is the burning of fossil fuels. With concern growing over climate change, reducing its cause is of utmost importance. The replacement of traditional fossil fuel power generation with renewable energy sources provides high potential for the reduction of GHG emissions. This is reflected in UK and Scottish Government climate change and renewable energy policy and commitments. The relevant aspects of such policies are summarised in **Chapter 5.**

Energy Generation

3.8.2 Whilst the Proposed Development will reduce carbon emissions by replacing the need to burn fossil fuels for power, carbon emissions will result from the component manufacturing, transportation and installation processes associated with the Proposed Development. There is also the potential for carbon fixers and sinks to be lost through the clearing of vegetation during construction. There must, therefore, be a sufficient balance between the carbon reduction associated with renewable energy development and that which is produced through construction/ fabrication processes and lost through site preparation.

3.8.3 The combined electrical installed capacity from the wind turbine generators within the Proposed Development is currently estimated to be approximately 26.4 MW, with the exact capacity depending on the model and type of turbine selected. Taking account of as estimated 3% downtime, it would be expected that the site would generate around 89.7 GWh per year[1] (depending on the turbine selected).

3.8.4 Based on the average electricity consumption per UK household in 2020 of 3.748 MWh/year (BEIS, 2021) and assuming generation of 89.7 GWh annually, the Proposed Development would generate enough power to supply approximately 23,500 average UK households.

3.8.5 Although future wind yields cannot be guaranteed, if the Proposed Development continued to generate, on average, at this load factor over its proposed 40 year lifespan, it is expected that a total of approximately 3,550 GWh of renewable energy could be generated.

3.8.6 Wind farms can make carbon emission savings when compared with a fossil fuel source grid mix. Further information on the carbon savings resulting from the Proposed Development can be found in **Chapter 15**.

3.9 Socio-economic Benefit

3.9.1 Based on a total installed capacity of 26.4 MW and a community benefit contribution of £5,000 per MW of installed capacity, the Proposed Development could generate up to £132,000 per annum (£5.28 m over the project's lifetime) to support local groups and projects on the Orkney Islands. Further information on the Proposed Development's socio-economic benefits can be found in **Chapter 14.**

3.10 Summary

3.10.1 This chapter has provided a description of the site and the surrounding area, alongside details of the Proposed Development and a summary of the associated infrastructure. A description of the likely activities to occur during the construction, operation and decommissioning phases is also provided.

[1] Calculated from 26.4 x 8760 (number of hours per year) x 0.40 (Expected UK onshore wind load factor for Orkney).

3.11 References

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