# SITE DESCRIPTION AND DESIGN EVOLUTION 2

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## **INTRODUCTION**

- 2.1 This Chapter outlines the process undertaken in selecting the site as a potential location for a wind farm, provides a description of the site and surrounding area, and discusses the design evolution process.
- 2.2 The principles of the EIA process, that site selection and project design should be an iterative constraint-led process, have been followed as part of the proposed development. This has ensured that potential negative impacts, as a result of the proposed development, have been avoided or minimised as far as reasonably possible through the design process.
- 2.3 This Chapter draws on issues considered in more detail in the relevant technical chapters (Chapters 7 to 15). This Chapter does not pre-empt the conclusions of the latter chapters, but explains how potential environmental effects have informed the design of the proposed development.
- 2.4 The design for the proposed development is described in **Chapter 3: Description of Development** and is shown on **Figure 3.1**. This Chapter is supported by the **Design and Access Statement** (DAS) which is submitted separate from the EIA Report in support of the application.

## SITE SELECTION AND CONSIDERATION OF ALTERNATIVES

- 2.5 Regulation 5(2)(d) of the EIA Regulations 2017 requires that an EIA report should: "a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment.".
- 2.6 Alternative sites have not been considered in the case of the proposed development and so the matter is not considered further in the EIA Report. The rational for the selection of the Kirkton Energy Park site is set out in this Chapter.
- 2.7 The main alternatives including design, turbine specification, location, size and scale have been considered for the site. This Chapter explores these options and explains how the final design of the proposed development has evolved.

### **Site Selection**

- 2.8 The main site area (hereafter referred to as the 'site') is located approximately 2.1km to the south of the village of Melvich, wholly within The Highland Council (THC) area. The site is centred on NGR NC 87999, 59788 and is shown on **Figure 1.1**.
- 2.9 There are two abnormal load turning areas included in the proposed development, which are located along the A836, separate to the site. These turning areas are shown in **Figure 1.2**. Only one turning area would be required should consent for the proposed development be granted.
- 2.10 A number of factors were considered when selecting the site for wind energy development including:



- there being no planning policies which, in principle, preclude wind energy development. The site is located within an area which the Highland Wide Local Development Plan has identified as having potential for wind farm development (Spatial Framework shows a mix of Group 2 and Group 3 areas<sup>1</sup>, with the majority of Group 3 areas considered to be categorised as such due to the potential for carbon rich soils, deep peat and priority peatland habitat). Further information on this is provided in Chapter 4: Renewable Energy and Planning Policy;
- initial desk-based studies and wind monitoring on site suggest that there is a very good wind resource and the site is available for wind energy development;
- Good potential electrical grid connections (and therefore potentially lower connection costs), including the possibility to connect the proposed development from the onsite substation to the nearby Scottish and Southern Energy (SSE) Connagill substation at Strath Halladale approximately 1.6km east of the site;
- There is existing electricity transmission infrastructure in the immediate area, including electricity pylons and Connagill substation within Strath Halladale itself;
- it has opportunity for access from the public road network (A836) via the existing Kirkton Farm road (no need for a long and /or new site access track); and
- the site is over 2km away from the nearest settlement of Melvich (with the nearest turbine being just under 3km from Melvich).
- 2.11 SPP Paragraph 155 also states that "development plans should seek to ensure an area's full potential for electricity and heat from renewable sources is achieved, in line with national climate change targets." In response to these policy requirements THC has produced Onshore Wind Energy Supplementary Guidance (2016) to identify those areas which, in principle, have the capacity to accommodate wind turbines. THC has identified the site as being predominantly a Group 2 "area of significant protection" as set out in SPP Table 1, however some of the site is identified as Group 3 "areas with potential for wind farm development". The majority of the areas of the site that have been classified as Group 2 have been so due to the high level mapping of Carbon Rich Soils, deep peat and priority peatland habitat. Group 2 area classification does not exclude wind farm development and the issue of Carbon Rich Soils can be adequately addressed through site design, mitigation and compensation. The applicant took account of THC's Onshore Wind Energy Supplementary Guidance (2016) as part of the site selection process and considers that the outcome of that process accords with the supplementary guidance.



<sup>&</sup>lt;sup>1</sup> Scottish Planning Policy 2014 – Spatial Framework for Onshore Wind:

Group 2: Areas of significant protection - Recognising the need for significant protection, in these areas wind farms may be appropriate insome circumstances. 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.

Group 3: Areas with potential for wind farm development - Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.

### Technology, Size and Scale

- 2.12 In order to try to get the maximum energy yield from the site (for project viability and to aid progress towards renewable energy targets), wind turbines up to 180m to tip height were considered. Turbines up to 180m were considered potentially viable in terms of delivery of components to site.
- 2.13 During the period leading up to a consent and ultimately construction of the proposed development, it is expected that the design and manufacture of commercial wind turbines will evolve and result in a wider choice of turbines than is currently available. The ability to maximise the potential yield from the site through turbine choice at the point of procurement is important for the financial feasibility of the scheme in a time of increasing financial uncertainty. Without the ability to optimise the project in such circumstances, it may adversely affect the viability of the proposed development.
- 2.14 The supply of smaller turbines across Europe continues to reduce due to lack of demand as manufacturers are recognising that the world market is shifting to larger, more efficient machines and are focussing their development work on larger turbines which secure the highest yield.
- 2.15 It is clear, therefore, that larger turbines (tip heights and rotor diameters) need to be considered in order to ensure a schemes viability and constructability. As a result of this, turbines with tip heights ranging from 149.9m to 180m, have been considered for this site.
- 2.16 Despite the continuing move towards larger turbines on the grounds of economic viability and available technology, it is also important to consider the site and its surroundings in order to understand what size of turbine may be appropriate.
- 2.17 There were multiple elements of the site and its surroundings that were looked at when considering the size of wind turbine that may be appropriate, these included:
  - the proximity of nearby residential receptors (particularly in Strath Halladale and Melvich), and potential residential visual amenity and noise issues;
  - the proximity to areas categorised as 'Wild Land';
  - the proximity of the North Coast 500 tourist route (A836);
  - sensitivity to visible aviation lighting;
  - the ability to get wind turbine components to site;
  - the scale of the topography of Strath Halladale itself, as well as surrounding hills and landscapes;
  - the landscape character type (as defined in NatureScot's and THC's respective guidance); and
  - the sensitivity of the landscape to tall turbines (as detailed in THC's Onshore Wind Energy Supplementary Guidance).



2.18 Taking the above inputs and considering them alongside the desire to get the maximum energy yield from the site, it was concluded that the site could accommodate wind turbines up to 150m to tip height. Turbines over 150m were considered more likely to have an increased impact on residential visual amenity to properties in Strath Halladale, and the Wild Land Area to the east, due to their scale and the requirement for visible night time lighting.

## SITE LOCATION AND DESCRIPTION

- 2.19 The site, centred on NGR NC 87999, 59788, is located approximately 2.1km to the south of the settlement of Melvich, Sutherland, to the north of mainland Scotland and within THC administrative boundary. The site is located on moorland and grazing land and the site area measures approximately 419.38ha (including the two potential abnormal load turning areas). Access to the site is expected to be from the A836, taking the Kirkton Farm road (near Loch Mor) southward to Kirkton Farm and then continuing south to where the turbines would be located. For abnormal loads coming from the east (port of Scrabster) to access the Kirkton Farm road, it will be necessary for the vehicles to continue on the A836 past the Kirkton Farm road entrance, turn, and approach from the north / west. Therefore, two smaller areas (outwith the site) along the A836 are included as part of the proposed development, in order to facilitate access of abnormal loads to the site (see **Figure 3.2a** and **Figure 3.2b**). These two abnormal loads turning area options are located at NGR NC 85250, 65287 (Turning Area A (Western Turning Area), **Figure 3.2b**).
- 2.20 The site is characterised by sweeping moorland and flows, with a relatively small amount of coniferous woodland plantation to the north west of the site. A number of small tributaries run through the site and join the larger Halladale river to the east. Topography ranges from approximately 20m AOD to 160m AOD with the western extent of the proposed site forming the most elevated section.
- 2.21 The following statutory designated sites lie just within the north western extent of the site boundary (Figure 2.1):
  - West Halladale Site of Special Scientific Interest (SSSI);
  - Caithness and Sutherland Peatlands Ramsar;
  - Caithness and Sutherland Peatlands Special Area of Conservation (SAC); and
  - Caithness and Sutherland Peatlands Special Protection Area (SPA).

## **SURROUNDING AREA**

2.22 The surrounding area is rural in nature, with land predominantly used for grazing, agriculture and forestry. There are several settlements located in the vicinity of the proposed site, including Melvich approximately 2.1km to the north, Armadale approximately 8.6km to the north west and Reay approximately 7.9km to the north east. Strath Halladale contains several residential properties extending north to Melvich and south towards Forsinain.



- 2.23 Approximately 4.47km to the west of the site is the operational Strathy North Wind Farm, which comprises 33 wind turbines.
- 2.24 There is a sand and natural aggregate quarry located approximately 1.3km north of the site entrance, and a biofuel plant located approximately 800m to the south east of the site.
- 2.25 In addition to the designated sites listed in paragraph 2.20 (which are partially inside, but mainly outwith, the site), the following are the closest environmental designations that lie outside the site boundary (see **Figure 2.1**):
  - East Halladale Flows Wild Land 1.29km to the east;
  - East Halladale SSSI 1.50km to the east;
  - Red Point Coast SSSI 4.55km to the north east;
  - North Caithness Cliffs SPA 4.4km to the north east;
  - Farr Bay, Strathy and Portskerra SLA 3.16km to the north west; and
  - Strathy Coast SSSI 2.69km to the north and north west.

## **DESIGN CONCEPT AND APPROACH**

#### **Constraints Led**

- 2.26 In EIA, constraint identification should continue throughout the design process in order to take cognisance of new, more detailed surveys revealing additional limitations to development. This allows the findings of technical and environmental studies to inform the design of a development and achieve a 'best fit' within the environment of the proposed development site.
- 2.27 This approach has been adopted in respect of the proposed development; where potentially significant effects have been identified efforts have been made to avoid these by evolving the design of the proposed development. This is referred to within this EIA Report as mitigation embedded in the proposed development layout and design, or simply 'embedded mitigation'. Information on embedded mitigation is explained further within each technical chapter of this EIA Report as appropriate. Several design principles and environmental measures have also been incorporated into the proposed development as standard practice.
- 2.28 'Embedded mitigation' includes, but is not limited to:
  - considering the size and scale of the proposed development appropriate to the location;
  - design of the tracks to minimise cut and fill, reducing landscape and visual effects as well as costs;
  - sensitive siting of the proposed infrastructure incorporating appropriate buffer distances from environmental receptors (including nearby residential properties) to avoid or reduce effects;



- considering appearance, finish and colour of wind turbines and the control buildings in accordance with SNH Guidance 'Siting and Designing Wind Farms in the Landscape', V3a (SNH, 2017);
- inclusion and design of borrow pits to minimise the amount of the material required to be imported to site; and
- potential for up to 25m micrositing of infrastructure during construction to ensure the best possible location is chosen based on site investigations.

### Landscape and Visual

- 2.29 Throughout the design evolution of the proposed development layout, a key driver has been the consideration of potential landscape and visual effects on receptors and how the proposed development would relate to the existing landscape character. In particular, due attention was given to the scale and number of turbines proposed. The landscape and visual effects potentially caused by the proposed development have been considered extensively from key receptors. The resulting analysis has been an important input into the design evolution process of the proposed development and in particular to the layout design of proposed turbines and location of infrastructure on the site.
- 2.30 Siting and Designing Wind Farms in the Landscape (Version 3a) NatureScot states that:

"In a wind farm, turbines can be arranged in many different layouts. The layout should relate to the specific characteristics of the landscape – this means that the most suitable layout for every development will be different. For a small wind farm, this might comprise a single row of wind turbines along a ridge; while, for a larger development, a grid of wind turbines is often taken as a starting point, with turbines spaced at minimum technical separation distances."

- 2.31 The layout and design of the proposed development was considered as part of an iterative design process. An iterative design approach works in tandem with the EIA process and allows a receptive design process aimed at reducing the potential landscape and visual effects of the proposed development whilst taking into account other site constraints and commercial requirements.
- 2.32 It is considered that the design respects the form of the underlying landscape and its scale, using a single size of turbine across the site in order to reduce potentially negative visual effects.

### **Efficiency Modelling**

2.33 Throughout the constraints led design process, wind and yield analysis was undertaken to ensure changes made to layouts did not adversely affect the output of the proposed development. From initial revisions it was clear that 'wake' induced losses, where turbines negatively impact the wind resource for surrounding turbines, was improved by allowing turbines to be located closer north-south to other turbines, but further west-east. This reflects the predominantly south easterly winds experienced at the site. This has led to a site layout of a single row of turbines running north-south.

### **Stakeholder Consultation**

- 2.34 Statutory consultees were invited to become involved in and input to the design process for the proposed development. THC major applications pre-application advice was used for the proposed development. A pre-application meeting was held with THC, the Energy Consents Unit and NatureScot in January 2021. Feedback from this meeting was incorporated into the design evolution process, including avoidance of siting infrastructure on deep peat, minimising the potential effects on the East Halladale Flows Wild Land Area, and limiting the effects on 'gateway' views from Caithness into Sutherland.
- 2.35 Public consultation events were also undertaken in October 2021 and March 2022 which allowed members of the local community to comment on the design proposals. Feedback from the October 2021 consultation event was incorporated into the design evolution process. Further details of the public consultation process can be found in the **Pre-Application Consultation (PAC) Report** accompanying this application.
- 2.36 In addition, there were meetings in May 2021 between the applicant and representatives from the Melvich, Caithness West, Community Councils. to discuss the proposed development, including community shared ownership. Strathy and Armadale Community Council was contacted but Wind2 were advised that the community council was not currently active. Discussions with the community will continue throughout the post-submission period, construction and up to commissioning.

## **CONSTRAINTS AND IDENTIFICATION MAPPING**

- 2.37 The design of any wind farm is driven by the key objective of positioning turbines so that they capture the maximum energy possible within a suitable area, which is further informed by environmental and technical constraints.
- 2.38 The designations within the site and surrounding area were identified as the first part of the constraints mapping process. These are shown on **Figure 2.1**. The known environmental and technical constraints within the site were identified as part of this early stage constraints mapping. It is important to note that the identification of a constraint does not necessarily result in the exclusion of that area from the potential development envelope; rather it means that careful thought and attention was paid to the constraint and the design altered appropriately. The key constraints which were taken into account during the design process included:
  - Topography and ground conditions (including peat);
  - Environmental designations (including SSSI, SPA, SAC and SLA);
  - Proximity to East Halladale Flows Wild Land Area;
  - identified landscape and visual constraints;
  - proximity to residential receptors (with regards visual amenity, shadow flicker and noise);
  - presence of ornithology, protected habitats and species;



- presence of watercourses, private water supplies and related infrastructure;
- presence of cultural heritage features;
- Aviation and Radar constraints;
- Recreation resource (such as Core Paths);
- forestry; and
- fixed communications links.
- 2.39 The identification of constraints continued throughout the design evolution process as more detailed surveys refined the development envelope.
- 2.40 A description of how the various environmental and technical disciplines have contributed to the design through detailed assessment is described below. Information in respect of the survey work undertaken is provided in the technical chapters of this EIA Report.

#### Engineering

#### Topography and Ground Conditions

- 2.41 The steepest areas of the site (greater than 8° slope gradient) have been avoided for the siting of wind turbines.
- 2.42 Slope stability has been taken into consideration to understand whether infrastructure could be located within certain areas of the site. Where slope stability was identified as an issue, these areas were deemed to be unsuitable for infrastructure and have therefore been avoided due to the potential for slope instability and peat slide risk.

### Landscape and Visual

#### Landscape Character and Visual Amenity

- 2.43 No international or national landscape designations occur within the site. However, within the 40km study area there is one national designation: Kyle of Tongue National Scenic Area (NSA) 16.24km west;
- 2.44 There are also a number of National non-statutory landscape designations and local landscape designations within the 40km study area, such as Wild Land Areas (WLA) and Special Landscape Areas (SLA). These designations have been considered during the design process and include:
  - Farr Bay, Strathy and Portskerra SLA, approximately 3.16km to the north west;
  - Bens Griam and Loch nan Clar SLA, approximately 15.52km to the south;
  - Flow Country SLA, approximately 21.86km south east;



- Loch Eriboll SLA, approximately 28.86km west;
- Dunnet Head SLA, approximately 30.76km to the north east;
- Ben Klibreck SLA, approximately 32.33km south west;
- Glen Loth SLA, approximately 39.23km south; and
- East Halladale Flows WLA, approximately 1.29km to the east.
- 2.45 Other WLAs which lie at a greater distance from the site (16km-40km) include Causeymire-Knockfin Flows WLA; Ben Klibreck-Armine Forest WLA; Ben Hope – Ben Loyal WLA; and Foinavon-Ben Hee WLA. These have been scoped out of the EIA due to distance from the proposed development.
- 2.46 Potential landscape and visual effects have been considered throughout the design evolution process. Several layouts were considered during the design process, with the layout evolving to respond to landscape and visual constraints such as views from the A836, Melvich and from various locations along the A897.
- 2.47 The final layout has been optimised with regards to landscape and visual as far as possible using the agreed viewpoints for the Landscape and Visual Impact Assessment (see **Chapter 7** for further information). The design process concentrated on the viewpoints (VPs) that are closest to the proposed turbines: VP1; VP2, VP3, VP4, VP5, VP6 and VP7. In addition, consideration was also given to the views obtained from properties included in the residential visual amenity assessment (RVAA).
- 2.48 Where possible, proposed excavation for access tracks and other infrastructure has been minimised. The location of the substation compound and temporary construction compound have been given particular consideration in relation to reducing potential landscape and visual effects. These have been located on lower ground within the northern part of the site where landform and vegetation help to reduce the potential prominence of the structures. In addition, placing them closer to the floor of Strath Halladale links better with the existing built development.

### **Ecology and Ornithology**

- 2.49 Atmos Consulting Limited carried out ecology surveys across the site from 2019-2021, in order to identify broad areas of constraint to the proposed development. Constraints mapping included the identification of sensitive ecological features, including habitats present within the site and species which use the site. Buffers were then placed around these sensitive features and the design of the site was amended accordingly.
- 2.50 Areas with the potential to be Groundwater Dependent Terrestrial Ecosystems (GWDTEs) were found to be limited in extent within the site. The design of the proposed development sought to minimise any effects on potential GWDTEs through taking account of NVC information, along with other site constraints, in layout iterations.
- 2.51 A distance of at least 50m between turbine blade tip and the nearest woodland has been established as per current bat guidance (SNH, 2019).



2.52 The presence and spatial spread of target species Common Scoter (*Melanitta nigra*) was confirmed by means of accessing local breeding records, compiling a literature review on species behaviour and modelling flight routes. Underlying topography and landform was a key input parameter in the model, and results allowed for a high level review of how the species move through and utilise the area. The data collected will also be used to inform the Habitats Regulations Appraisal HRA for the Caithness and Sutherland Peatlands Special Protection Area SPA.

### **Geology and Soils**

#### Peat Depth

- 2.53 As defined on NatureScot's Carbon and Peatland 2016 Map (SNH, 2016), the majority of the site is shown to be Class 1 and Class 2 Priority Peatland Habitat. These classes are within Group 2 ('areas of significant protection'). Site visits have confirmed the presence of peat, of variable condition and depth across the site, with deeper peat more likely to occur in the low lying areas with shallow slopes.
- 2.54 Peat probing was undertaken in May 2021 and January 2022. A review of this data in conjunction with slope gradients allowed areas of deep peat (typically greater than 1.5m) to be avoided for development at an early stage. The peat data is discussed in **Technical Appendix 10.1: Peat Landslide and Hazard Risk Assessment** and shown on **Figure 10.1.5** and **Figure 10.1.6**. Where possible, proposed turbines and infrastructure would be located on areas of peat less than 1m deep.
- 2.55 Detailed constraints advice was provided to the project team during the iterative layout design process for the turbines and associated infrastructure features. At various stages during the determination of the design, fieldwork was undertaken to provide feedback to the team. This approach identified site constraints in order to minimise a number of potential effects (such as minimising development infrastructure close to or crossing water features and undertaking initial peat depth and stability studies to avoid deeper peat areas).
- 2.56 All turbine locations, access tracks, the substation compound, the temporary construction compound and borrow pits have been designed to avoid any areas which may be subject to peat slide risk. The ground condition constraints that were taken into account in the design of the proposed development were:
  - identification of peat depths in excess of 1.5m to minimise incursion, protect from physical damage, minimise excavation and transportation of peat, reduce potential for peat instability and minimise potential soil carbon loss;
  - identification of slope angles greater than 8° to minimise soil loss and potential instability; and
  - avoidance of areas where initial peat stability concern was identified (factor of safety values less than 1.4) where possible – to avoid areas with possible instability issues and associated indirect effects on surface water.



### Hydrology and Hydrogeology

- 2.57 A 50m buffer zone has been applied around the primary watercourses which traverse the site, the Allt na h-Eaglaise and Allt nan Gall, and a buffer of 500m was applied around specified lochs outwith the site boundary associated with these watercourses. These buffers were used to ensure that turbines and infrastructure, other than tracks, were not located in close proximity to hydrological features in accordance with wind farm construction best practice guidelines (GPP 5, 2018). This reduces the risk of run off and water pollution into existing watercourses. The only exceptions are the proposed substation compound, which is located on elevated ground above the nearest watercourse, and the temporary construction compound, which would be restored following construction of the proposed development. In some cases, the use of existing tracks, which are already less than 50m to a watercourse, have been identified as the best option for design, thereby minimising the need for new tracks.
- 2.58 Watercourse crossings have been minimised as much as possible and, where necessary, existing crossings would be used. Existing culverts would be upgraded or replaced as required.
- 2.59 Data on private water supplies (PWS) was obtained from THC and supplemented with data from a PWS surveys conducted onsite in October 2021.

### Archaeology and Cultural Heritage

#### Cultural Heritage Features

- 2.60 There are no designated heritage assets of regional or national importance within the site. Within 1km of the site there are two regionally important designated heritage assets: two Category B listed buildings (LB12915 Smigel Bridge, LB7141 Smigel Mill).
- 2.61 There are 17 heritage assets of national importance within 10km of the site.
- 2.62 There are 38 non-designated heritage assets within 10km of the site.
- 2.63 There are 16 undated features / structures within the site itself, and a further five within 1km of the site.
- 2.64 The above cultural heritage assets have been considered during the design of the proposed development. This includes avoiding siting wind turbines and other infrastructure on cultural heritage features within the site where possible, and also designing the wind turbine layout with cognisance of views from cultural heritage assets located within 10km of the site.

#### Noise

#### Noise Sensitive Receptors

2.65 For the purposes of early constraints mapping, avoidance buffers of 1km were applied to residential properties in the vicinity of the site. These buffers were further refined during the design process based on expert noise advice.



- 2.66 Noise modelling was undertaken for the proposed turbine layout at various stages of the design process, to predict the likely sound level which would result from the proposed development at nearby residential properties. The difference between measured background noise levels and predicted noise levels needs to be compliant with ETSU-R-97: 'The Assessment and Rating of Noise from Wind Farms' (Department for Trade and Industry (DTI), 1996) to avoid a significant impact. Applying design criteria in accordance with ETSU guidance, therefore, ensures that no exceedances of acceptable noise levels would occur for the proposed development.
- 2.67 During operation, the closest properties to the proposed development would be 27 Upper Bighouse at approximately 1.1km south east of Turbine no.11 and Ar Dachaidh at approximately 1.22km to the north east of Turbine no.1. During refinement and finalisation of the design, the maximum distances possible were employed between these properties and the proposed turbines.

### Shadow Flicker

2.68 Shadow flicker has the potential to be an issue for properties which are closer to a wind turbine than a distance of eleven times the diameter of the turbines blade length. Potential shadow flicker effects were a consideration during the constraints mapping process. Shadow Flicker is considered further in **Chapter 15: Other Issues**.

### **Aviation**

- 2.69 The potential aviation constraints on wind turbines at the site were identified during the EIA. These are as follows:
  - Military Low Flying; and
  - Safeguarding Criteria in relation to Wick Airport.
- 2.70 The proposed development is not assessed as having any significant effects on Military low flying (see **Chapter 15: Other Issues** for details).
- 2.71 Highlands and Islands Airport Limited confirmed (at Scoping stage) that the proposed development would not impinge the safeguarding criteria for Wick Airport (Highlands and Islands Airport Limited).
- 2.72 No other potential aviation constraints on wind turbines at the Kirkton site were identified during the EIA.

### Socio-Economics, Tourism and Land Use

#### Recreation

2.73 There are no 'core paths' within the site boundary. A single 'core path' runs north-south, along the eastern edge of the site, through Strath Halladale, starting from Upper Bighouse and ending near the Old Kirkton Burial Ground. The effects of the proposed development on this and other recreation infrastructure is considered in **Chapter 14: Socio-economics and Land Use**.



2.74 The proposed development would create an informal circular walking route by linking up existing farm track and the nearby core path to the proposed access tracks. The applicant has confirmed they are willing to explore the potential for formalising this as a walking route.

### Forestry

- 2.75 The commercial forestry located in the north of the site has been considered in the design of the proposed development, and has subsequently been discounted for turbine siting (primarily due to landscape and visual reasons). However, it is proposed to fell this area of forestry in order to facilitate habitat improvement and restore the land as peat bog habitat.
- 2.76 In order to provide compensation for the priority habitat that would be lost as a result of the proposed development and due to the poor quality of some of the planted trees in the northern conifer forestry block, it is proposed that all of the northern conifer block would be felled (87.75ha with net area of 70.75ha bearing trees) and not replanted. This would allow for peat habitat improvements across the full 87.75ha area felled (a compensation ratio of approximately 5.74 when compared to the anticipated habitat loss as a result of the proposed development). **Technical Appendix 3.2: Forestry**, provides further detail with regards to this proposed felling and requirements for compensatory planting.
- 2.77 In addition to the two areas of conifer plantation within the site, there are also eight blocks of native woodland plantation located within (or partially within) the site. The infrastructure included as part of the proposed development has avoided these native woodland plantations, with the exception of Turbines 1 and 2 and their associated access track. As a result of Turbines 1 and 2, and their associated track, approximately 3.58ha of native woodland will require to be felled. The native woodland plantations and the requirement for compensatory planting are considered further in **Technical Appendix 3.2: Forestry**.

### **Telecommunications**

2.78 Consultation with Ofcom identified three fixed telecommunication links which run north-south through the centre of the site and could potentially be affected by the proposed development. Subsequently, the license holders for the links: MBNL, Telefonica and Vodafone, were consulted as part of the Telecommunications Impact Assessment for the site. These consultations resulted in agreement with regards to appropriate separation distances between the proposed wind turbines and the fixed communications links. The design and layout of the site therefore takes account of the constraints imposed by the operational fixed communications links. More detail is provided in **Chapter 15: Other Issues**.

## **DESIGN EVOLUTION**

### Landscape and Visual Design Iterations

2.79 The proposed development would be located in the 'Sweeping Moorland and Flows' Landscape Character Type (LCT 134) area as defined in NatureScot digital map based Landscape Character Assessment (2019). The key characteristics of this LCT are described in the NatureScot document as follows:



- *"Gently sloping or undulating landform which lies generally below 350 metres.*
- Occasional isolated hills of limited height form local landmark features.
- Lochs and mature, meandering rivers.
- Very distinct flora, dominated by sphagnum mosses, produced by the wetness and infertility of the flows.
- Areas of peat cuttings and hagging.
- Pockets of improved grazing, mainly within the outer fringes of sweeping moorland.
- Coniferous forest forming a dominant characteristic within some parts of this landscape character type.
- Ribbons of broadleaf woodland occasionally run along the water courses and loch edges.
- Very sparsely settled with dispersed crofts, farms and estate buildings largely found on the outer edges of this landscape or near a strath.
- Vehicular tracks within parts of the landscape.
- Wind farms, transmission lines, the A9 and a network of minor roads are key features within the more modified outer fringes within Caithness.
- Long, low and largely uninterrupted skylines offering extensive views across this landscape and result in a feeling of huge space.
- Consistent views to the distant Lone Mountains and Rugged Mountain Massif Caithness & Sutherland.
- Great sense of exposure on areas of flat peatland on upland plateau.
- A strong sense of remoteness is associated within the largely uninhabited, inaccessible core flows and moorlands of this landscape."
- 2.80 The Highland Council Onshore Wind Energy Supplementary Guidance (2016) shows the proposed development within Landscape Character Area CT4 'Central Caithness'. The Onshore Wind Energy Supplementary Guidance outlines the following with regards the landscape sensitivity of Landscape Character Area CT4:

"Gently sloping or undulating landform with strong horizontal composition, which whilst expansive and large in scale entails that any vertical features are highly prominent. Simplicity of composition comprising dominant land:sky horizon, which Landscape Sensitivity can be interrupted by vertical elements. Long, low and largely interrupted skylines offer extensive views. Lone Mountains punctuate the horizon and are important landmarks to the immediate south such as Scaraben, and further west at a greater distance are Ben Loyal and Ben Hope. There is a strong sense of remoteness and wildness within the core of the Flows and Moorlands as they are largely uninhabited and



difficult to access and have an overriding natural character. To the south, large commercial forestry blocks appear as dark bands. Pylon lines punctuate CT4, running parallel to the A9T. The expansion of the substation south of Spittal is visually prominent. To the west the relatively abrupt transition from the more rugged Sutherland landscape character to the open flatter landform of Caithness provides a key gateway and is highly sensitive to windfarm development in the immediate and wider landscape (given wide open views) that would erode the clarity of this transition and interrupt experience of moving from one regional landscape to another."

- 2.81 On a scale of 1-4 (1 being most susceptible to change), the Onshore Wind Energy Supplementary Guidance rates Landscape Character Area CT4 as '3' for sensitivity of accommodating 'Large Scale Wind Farms'. The Guidance included criteria specific to landscape and visual considerations and these have influenced the design of the proposed development.
- 2.82 As a result of the above identified site characteristics and sensitivities, the following design objectives were established:
  - Reduce the extent of the proposed development visible and consider the appearance of the turbines from the SLAs along the northern coastline, particularly Farr Bay, Strathy and Portskerra SLA;
  - Reduce the potential effects on the Wild Land Area 39 as far as possible through consideration of the design/layout of the turbines and ancillary infrastructure, including avoiding the need for visible aviation lighting;
  - Ensure an organised and well balanced layout from views along the A836 (heading west), transitioning from Caithness into Sutherland;
  - Reduce the potential effects on views from within Strath Halladale, particularly for residential receptors and people travelling along the A897, by creating an organised and well balanced layout; and
  - Minimise the extent of the proposed development visible from the more populated areas of Melvich and Portskerra.
- 2.83 GIS constraints mapping was used to identify the areas within the site which may be suitable for wind turbines and associated infrastructure. The design optimisation process was iterative, involving review of multiple layouts and related wirelines from key landscape and visual receptor locations in the study area, and adjustment to turbine locations to reduce potentially adverse landscape and visual impacts insofar as possible, whilst also taking into consideration the energy generation, particularly seeking to maintain wake loss expectations, other environmental, technical and economic considerations.
- 2.84 Five of the key design iterations, from a landscape perspective, are shown on **Figure 2.2** and comprise the initial Maximum site layout (Layout A), the Pre-Application Advice layout (Layout B), the Scoping Layout (Layout C), the Scoping Addendum Layout (Layout D) and the Design Freeze Layout (Layout E: the proposed development).
- 2.85 The factors that were considered as part of the design evolution process to achieve the final layout are described in the following paragraphs.



### Wind Turbines

#### Layout A (Initial Maximum Layout)

- 2.86 This initial layout was developed prior to commencement of the EIA and was the output from a Landscape and Visual feasibility study commissioned by Wind2 in 2020. This feasibility study focused on maximising the number of turbines within the site area, taking into account only the following non landscape and visual related constraints: watercourses, slope, fixed telecoms links and the SSSI / SPA that extends into the western part of the site. Landscape and visual effects, as well as other environmental concerns e.g. peat depth, were not considered at this stage.
- 2.87 This layout had 15 turbines at a height of up to 149.9m to tip height. Wirelines of this initial layout are shown on **Figure 2.3a** and **Figure 2.3b**.
- 2.88 As a result of the initial EIA landscape and visual assessment work, this layout was deemed to be too visible from the settlements of Malevich, Portskerra and Strathy, as well as along a large stretch of the coastline and A836.

#### Layout B (Pre Application Advice Layout)

- 2.89 As a result of Layout A being deemed too visible from various receptors / locations to the north of the site (Melvich and Portskerra, and westbound travellers on the A836), three turbines that were located in the conifer plantation at the north of the site were dropped. These turbines were the most prominent from receptors / locations to the north of the site and so this was deemed a notable improvement from a landscape and visual perspective.
- 2.90 Other relatively minor turbine movements were implemented from the previous (Layout A) layout, predominantly to accommodate other non landscape related constraints e.g. peat depth.
- 2.91 This layout had 12 turbines at a height of up to 149.9m to tip height and was presented at the Pre-Application Advice meeting between the applicant, THC, NatureScot and the ECU. Wirelines of this layout (Layout B) are shown on **Figure 2.3a**, **Figure 2.3b**, **Figure 2.4a** and **Figure 2.4b**.

#### Layout C (Scoping Layout)

- 2.92 The layout that was submitted as part of the Scoping Request for the proposed development was again a 12 turbine scheme, with tip heights of up to 149.9m.
- 2.93 The turbine locations were altered from Layout B in order to refine the scheme from a landscape and visual perspective (reduced stacking from VPs to the north), as well as avoiding deeper areas of peat. The proximity of turbines to steeper slopes and the predicted wake loss also contributed to the moving of the turbine locations. The turbine movements were all relatively small (less than 100m) from the 'Pre Application Advice layout'.
- 2.94 Wirelines of this layout (Layout C) are shown on Figure 2.4a, Figure 2.4b, Figure 2.5a and Figure 2.5b.



#### Layout D (Scoping Addendum Layout)

- 2.95 Shortly prior to receiving the Scoping Opinion from the ECU, the applicant reached agreement on an option area for land immediately to the south of the site boundary presented in the March 2021 Scoping Report. As a result of this, the site boundary was extended southward, increasing the site area by approximately 45.46ha from 414.5ha to approximately 459.96ha.
- 2.96 The 12 turbine 'Scoping Layout' was updated with a further two turbines located on the additional land at the southern end of the site. This layout was therefore 14 turbines at a height of up to 149.9m to tip height.
- 2.97 From a landscape and visual perspective, the addition of these two turbines at the south of the site did not fundamentally alter how the proposed development would be seen or perceived from key views within Strath Halladale and for westbound travellers along the A836. This layout was the subject of the public exhibition held in Strathy in October 2022.
- 2.98 Wirelines of this layout (Layout D) are shown on Figure 2.5a, Figure 2.5b, Figure 2.6a and Figure 2.6b.

#### Layout E (Design Freeze – The Proposed Development)

- 2.99 Following on from the Scoping Addendum layout there was considerable refinement of the design from a landscape and visual perspective (in addition to other environmental considerations). This was primarily as a result of consultee feedback during Scoping, feedback from the public during the first public exhibition, and ongoing site assessment work.
- 2.100 The eastern most turbines in the Scoping Addendum layout (Turbines 3, 5, 7, 9 and 11 in particular) were considered too close to several properties along the A897, which were also orientated towards the site. Further to this, due to the (roughly) two parallel north-south rows of turbines which characterised the Scoping Addendum layout, there was considerable stacking and overlapping of turbines from several key views, including westbound travellers along the A836 and locations within Strath Halladale.
- 2.101 As a result of these landscape and visual considerations, Turbines 3, 5, 7, 9 and 11 were removed. The remaining turbines were moved as far west as possible, whilst maintaining an appropriate separation distance with the nearby SPA/SSSI/SAC designations, and positioned in a single, slightly arcing, north-south orientated row. Through curving the northern part of the single row of turbines east, two turbines were able to be added back into the layout without compromising separation distances or leading to turbine stacking from key views.
- 2.102 Adopting this approach to the layout simplified the form and appearance of the proposed turbines. The elevation of the turbines was kept as consistent as possible along the line. Similarly the spacing was kept as consistent as possible. There are relatively few locations where the turbines would be seen from the north and south, where the turbines would be seen stacked or overlapping. However, the turbines would seen in direct and oblique views from locations in the surrounding context, with key considerations being receptors in Strath Halladale to the east and along the coastline to the north. The arrangement of the turbines in a single line follows the pattern of the local landform, and the north – south orientation of Strath Halladale. The consistent spacing and elevation of the turbines simplifies the appearance of the proposed development and avoids the



clustering and stacking of turbines associated with earlier design iterations. Where possible the turbines have also been positioned away from the slopes and landform adjacent to the eastern side of Strath Halladale to provide more separation from the valley landform.

2.103 Wirelines of this layout (Layout E) are shown on Figure 2.6a and Figure 2.6b.

### **Other Site Infrastructure**

#### Site Access

- 2.104 Access to the site would be afforded from the A836, taking the Kirkton Farm road (near Loch Mor) southward to Kirkton Farm, and continuing south onto the site.
- 2.105 For abnormal loads coming from the east (port of Scrabster) to access the Kirkton Farm road, it will be necessary for the vehicles to continue on the A836 past the Kirkton Farm road entrance, turn, and approach from the north / west. As a result of this, two potential turning areas (only one would be developed) have been designed and are included in the proposed development. These two abnormal loads turning area options are located at NGR NC 85250, 65287 (Turning Area A (Western Turning Area), Figure 3.2a) and NGR NC 87786, 64983 (Turning Area B (Eastern Turning Area), Figure 3.2b). An annotated aerial image of Turning Area B, the eastern turning area which is located within Melvich, is provided in Figure 2.7.
- 2.106 The proposed turning area at Melvich presents an opportunity to provide a direct benefit to the local community. Melvich Community SCIO are progressing a project to replace the old Melvich Village Hall (now demolished) with a new community hub building, however availability of car parking spaces has been flagged as a significant issue in the early stages of their feasibility study (RIBA Stage 1). The proposed turning circle could act as overspill car parking for the proposed new Melvich Community Hub, which is planned to be located directly opposite on the western side of the A836, and as a result remove a potential planning issue for the new community asset. This turning area would have the potential to be a long term addition to the NC500, such as through the hosting of Electric Vehicle charging facilities, and could also be used for the location of a multi-use games area (MUGA), which the Melvich Community SCIO have expressed an interest in developing. The applicant has been in discussions with Melvich Community SCIO in this regard and the two organisations have agreed to continue to liaise as their respective plans and applications develop.

#### Site Tracks

- 2.107 The onsite access tracks have been designed to use existing tracks as far as possible, whilst minimising cut and fill requirements in order to reduce the amount of ground disturbance, amount of material required for construction, loss of sensitive habitats and landscape and visual effects, particularly during construction.
- 2.108 Access tracks have been designed to follow routes which, in the main, do not exceed gradients of 12°. This gradient is specified by a number of turbine manufacturers in their technical specifications to permit safe delivery of turbine components and associated parts.
- 2.109 To the east of Turbines 5 and 6 there are four relatively short sections of floated track included as part of the proposed development. Consideration was given to alternative routing options in order to avoid needing to propose floated track, however due to site topography (slope steepness) it was



considered that the track could not turn and traverse from the east to the west side of the site at a point north enough to avoid the area of deep peat in the centre of the site. Running the onsite track from turbine 4, south to turbine 5 was also considered, however due to the size of the intervening valley and watercourse this would have required a large and complex bridge structure, which would have been visible from Strath Halladale and the A836.

#### **Borrow Pits**

- 2.110 Up to two borrow pits would be required as a source of rock to be used in the construction of the tracks, hardstandings and foundations. On site borrow pits have been sought in order to reduce the need to transport large quantities of aggregate to the site. There is a sand and natural aggregate quarry located by the site entrance from which aggregate material could be utilised for initial construction of site tracks, laydown areas and required earthworks or cut and fill.
- 2.111 Search area locations for the borrow pits have been identified based upon a review of geological mapping and site reconnaissance by a geological specialist. The location of each was considered with respect to the site infrastructure and environmental constraints, including landscape and visual impacts. **Figure 2.8** shows a cumulative ZTV for both borrow pit search areas.
- 2.112 Further intrusive geotechnical investigations would be carried out to identify which of the two borrow pits would yield the required quality of rock for each aspect of the infrastructure. It is not anticipated that any more than two borrow pits would be needed.

#### Temporary Construction Compound

- 2.113 The temporary construction compound would be located at the north of the site, near to the site entrance at NGR NC 88486 61060. This location is considered appropriate as it:
  - has appropriate topography;
  - is located in an area of shallow peat and low peat slide risk; and
  - avoids sensitive habitat areas.

#### Substation and Battery Storage Compound

- 2.114 The proposed substation compound would be located to the north of the site at NGR NC 88717 61157. The location is considered appropriate as it:
  - has appropriate topography (slope);
  - is located in an area of shallow peat and low peat slide risk;
  - avoids sensitive habitat areas;
  - is lower down in the landscape than the wind turbines and as such less visible;
  - is adjacent to existing electricity infrastructure (overhead lines); and



- is screened from views from the north due to established and newly planted woodland.
- 2.115 The control building and battery storage, within the substation compound, would be located greater than topple distance from the proposed turbines. The internal site grid connection cables would be undergrounded within the site from each turbine to control the building, therefore avoiding visual impact. **Figure 2.9** shows a ZTV for the proposed substation compound (the equipment/ buildings within the substation compound have varying heights, so for the purposes of the ZTV an indicative height of 5m has been used).

## MICROSITING

2.116 In order to be able to address any localised environmental sensitivities, unexpected ground conditions or technical issues that are found during detailed intrusive site investigations and construction, it is sought that the consent includes provision for a 25m micrositing allowance around wind turbine infrastructure. The technical assessments (presented in **Chapters 7** to **15**) have considered the potential for horizontal micrositing and it is considered that the proposed infrastructure could be microsited within 25m (except within watercourse buffers) without resulting in potential significant effects, except where notable deep peat is identified. During construction, the need for any micrositing would be assessed and agreed with the onsite Environmental Clerk of Works.

## CONCLUSION

- 2.117 The design process has been an iterative one, so that constraints identified throughout the EIA and layout design process could be avoided, and potential impacts from the proposed development avoided or reduced.
- 2.118 The final layout of the proposed development is described in detail in **Chapter 3: Description of Development** and shown on **Figure 3.1**.
- 2.119 The assessment of potential impacts of the resulting layout is addressed in **Chapters 7** to **15** of the EIA Report.



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