

**CLOICH FOREST WIND FARM**  
**EIA Report – Volume 1 – EIA Report Text**

**Chapter 2**  
**Site Selection and Design**



## 2 SITE SELECTION AND DESIGN

### 2.1 INTRODUCTION

1. This Chapter of the Environmental Impact Assessment Report ('the EIA Report') contains a description of the land within the site boundary ('the Site'), the consideration of alternatives and site selection process, and the design process and scheme evolution that led to the final design of the Cloich Forest Wind Farm ('the Development').
2. The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017<sup>1</sup> ('the EIA Regulations') state in Schedule 4 paragraph 2 that an EIA report must include:  
*'A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.'*
3. This Chapter explains why the Site has been selected and summarises the layout options that were considered by the Applicant during the evolution of the Development.
4. This Chapter of the EIA Report is supported by the following figures provided in Volume 2a Figures excluding LVIA:
  - Figure 2.1: Ecological Designations;
  - Figure 2.2: Main On-Site Constraints; and
  - Figure 2.3a-b: Site Design Evolution.

### 2.2 SITE DESCRIPTION

#### 2.2.1 Location

5. The Development represents a re-design of the consented Cloich Forest Wind Farm ('the Consented Scheme'), which was granted S36 consent and deemed planning permission following a Public Local Inquiry (PLI), on 8 July 2016 (Planning and Environmental Appeals Division (DPEA) Reference: WIN-140-1).
6. As a redesigned wind farm development, the Site Boundary remains largely the same as the Consented Scheme, and is shown on Figure 1.1 of **Chapter 1: Introduction**; slight amendments to the widen the Site Boundary were made along the access road. The Site, which covers an area of 1,080 hectares (ha), is located approximately 5.5 kilometres (km) north-west of Peebles in the Scottish Borders, centred on National Grid Reference (NGR) 320648, 647881. The Site lies wholly within the administrative boundary of Scottish Borders Council ('the Council').
7. The topography of the Site, and the immediate vicinity, is complex, with elevation ranging from approximately 280 metres (m) Above Ordnance Datum (AOD) in the north-east part of the Site to approximately 476 m AOD at the peak of Crailzie Hill in the south. There are several other hill tops within the Site which make up the Cloich Hills, these include: White Rig (approx. 325 m AOD); Peat Hill (approx. 466 m AOD); Whaup Law (approx. 460 m AOD); and Ewe Hill (approx. 462 m AOD).

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<sup>1</sup> The Electricity Works (Environmental Impact Assessment ) (Scotland) Regulations 2017 [Online] Available at: <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 22/06/2021)

8. The hills within the Site are dissected by several watercourses including:
  - Middle Burn;
  - Early Burn;
  - Flemington Burn;
  - Martyr's Dean;
  - Gibb's Cloich;
  - Courhope Burn;
  - Courhope Glen; and
  - Harehope Burn.
9. Access to the Site is currently afforded from the A703 public road to the east of the Site, along the 'D17 Whim – Shiplaw' and 'D18 Cloich' public roads which connect to the proposed main access tracks, and existing forestry tracks.
10. There are several settlements surrounding the Site, including (but not limited to):
  - Eddleston, located approx. 3.2 km east of the nearest turbine (T5);
  - Romannobridge, located approx. 3.7 km west of the nearest turbine (T1);
  - Damside, located approx. 3.7 km west of the nearest turbine (T11)
  - West Linton, located approx. 5.8 km north-west of the nearest turbine (T12); and
  - Peebles, located approx. 6.4 km south-east of the nearest turbine (T3).
11. Additionally, there are several larger settlements greater than 10 km away from the nearest turbines, including (but not limited to):
  - Penicuik (located north of the Site);
  - Galashiels (located south-east of the Site);
  - Livingston (located north-west of the Site); and
  - Edinburgh (located north of the Site).
12. A number of scattered individual dwellings lie within 3 km of the Site Boundary. Residential properties include Cloich Farm, which stands alone and is located approximately 1.2 km north-east of the nearest turbine (T10) and Upper Stewarton which lies approximately 0.9 km south-east of T4.
13. The Cross Borders Drove Road (a Waymarked Trail) is located within the southern portion of the Site, passing approximately 180 m north of the nearest turbine (T3) at its closest point. The Cross Borders Drove Road enters the Site in the west at approximately NGR 318926 646104 and exits the Site in the east at approximately NGR 321597 646128.
14. There are other public rights of way and Council 'Promoted Paths' within the Site; however, there are no other Core Paths within the Site. A full list, and assessment, of recreational routes is provided within **Chapter 15: Socio-Economic, Land Use, Recreation and Tourism** of this EIA Report.

### 2.2.2 Land Use

15. Active felling operations are taking place throughout the Site, which comprises predominantly of commercial coniferous plantation at varying degrees of maturity, including substantial areas of clear felling. This is owned and managed by Forestry and Land Scotland (FLS).
16. There are a number of existing forestry tracks used for the commercial woodland management. The Site is currently accessible on foot to the public for walking and recreation, though there are health and safety restrictions in place during periods of harvesting and other forestry operations which means the network of paths and tracks is not always fully accessible to the public. Additionally, there is currently one active quarry on Site, located at approximate NGR 320456, 649061 which is utilised periodically by FLS

to obtain rock to maintain the forestry tracks, and is otherwise not in use. Public access is not permitted within the quarry at any time.

### 2.2.3 Designations

17. There are no ecological designations within the Site; however, at the access junction from the A703 connecting to the 'D17 Whim – Shiplaw' public road there is a well-established bridge crossing the Eddleston Water, part of the River Tweed Special Area of Conservation (SAC), as noted on Figure 2.1. No works are proposed to the bridge crossing the River Tweed SAC.
18. In addition, there are a number of ecological designations located within 10 km of the Site Boundary, as detailed in Table 2.1 below. Figure 2.1 illustrates all ecological designations identified within 10 km of the Site Boundary.
19. Where appropriate, **Chapter 7: Ecology** and **Chapter 8: Ornithology** of this EIA Report discuss the ecological designations which are of relevance to the Development.

**Table 2.1: Further Ecological Designations within 10 km of the Site Boundary**

Designation	Designation Title	Approximate Distance from the Site Boundary	Approximate Distance from the Nearest Turbine Location
Ramsar	Gladhouse Reservoir	6.2 km NE	9.6 km NE (T10)
Ramsar	Westwater	8.4 km NW	8.8 km NW (T12)
Special Site of Scientific Importance (SSSI)	Whim Bog	2 km N	4.3 km N (T12)
SSSI	Dundreich Plateau	3.3 km E	6.8 km E (T5)
SSSI	Auchencorth Moss	3.5 km N	5.4 km N (T12)
SSSI	River Tweed	5 km S	6 km S (T2)
SSSI	Gladhouse Reservoir	6.2 km NE	9.6 km NE (T10)
SSSI	Moorfoot Hills	6.2 km E	9.2 km E (T5)
SSSI	Black Burn	6.3 km N	9.7 km N (T12)
SSSI	Dolphinton – West Linton Fens and Grassland	6.4 km W	6.9 km W (T11)
SSSI	Peeswit Moss	6.9 km NE	10 km NE (T10)
SSSI	Carlops Meltwater Channels	7 km NW	7.5 km NW (T12)
SSSI	North Esk Valley	7.6 km NW	8.4 km NW (T12)
SSSI	Westwater Reservoir	8.4 km NW	8.9 km NW (T12)
SSSI	Mount Bog	8.7 km SW	10 km SW (T2)
SSSI	Lynslie Burn	9.9 km NW	10.3 km NW (T12)
SAC	Moorfoot Hills	6.2 km E	9.2 km E (T5)
SAC	Peeswit Moss	6.9 km NE	10 km NE (T10)

Designation	Designation Title	Approximate Distance from the Site Boundary	Approximate Distance from the Nearest Turbine Location
Special Protection Area (SPA)	Gladhouse Reservoir	6.2 km NE	9.6 km NE (T10)
SPA	Westwater	8.4 km NW	8.8 km NW (T12)

20. The Site is not located within any designated landscapes; however, there are a number of landscape designations within 40 km of the outermost turbine locations, including National Scenic Areas (NSAs), Special Landscape Areas (SLAs) and a Regional Scenic Area (RSA).
21. There are two NSAs located within 40 km of the outermost turbine locations: Upper Tweeddale NSA, and Eildon and Leaderfoot NSA. The Upper Tweeddale NSA is located approximately 2.3 km to the south of the Site, at its closest point, and the Eildon and Leaderfoot NSA is approximately 33 km to the south-east of the Site.
22. The Tweed Valley SLA lies 2.4 km south of the outermost turbine; Tweedsmuir Uplands SLA is 4.5 km south-west of the outermost turbines; Pentland Hills SLA is located within 40 km of the outermost turbine locations, to the north-west of the Site, and Moffat Hills RSA is located within 40 km of the outermost turbine locations, to the south-west of the Site.
23. There are three Scheduled Monuments within the Site Boundary, with a further 95 Scheduled Monuments within 10 km of the Site Boundary. The three Scheduled Monuments within the Site Boundary include:
- Whaup Law, cairn (SM2755), located approx. 231 m from the nearest turbine (T8);
  - Courhope, ring enclosures 750m NE of Greenside (SM2756) located approx. 270 m from the nearest turbine (T9); and
  - Nether Stewarton, settlement 850m W of (SM3998) located approx. 734 m from the nearest turbine (T3).
24. The above designations are discussed as necessary within the relevant technical chapters.

### 2.3 SITE POLICY CONTEXT

25. Scottish Planning Policy (SPP) (Revised December 2020)<sup>2</sup> provides support for wind development in principle and encourages local authorities to guide developments towards appropriate locations. Paragraph 161 highlights the requirement for planning authorities to define a '*spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms*' whilst stating that spatial frameworks must be based on the following criteria (set out in SPP Table 1, Page 39):
- Group 1: Areas where wind farms will not be acceptable:
    - National Parks and National Scenic Areas.
  - Group 2: Areas of significant protection:
    - Recognising the need for significant protection, in these areas wind farms may be appropriate in some 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.

<sup>2</sup> Scottish Government (2020) Scottish Planning Policy [Online] Available at: <https://www.gov.scot/publications/scottishplanning-policy/> (Accessed 22/06/2021)

- Group 2 areas include World Heritage Sites; Natura 2000 and Ramsar sites; Sites of Special Scientific Interest; National Nature Reserves; Sites identified in the Inventory of Gardens and Designed Landscapes; Sites identified in the Inventory of Historic Battlefields; areas of wild land as shown on the 2014 Nature Scot (formerly Scottish Nature Heritage, SNH) map of wild land areas; carbon rich soils, deep peat and priority peatland habitat; and an area not exceeding 2km around cities, towns and villages identified on the local development plan.
  - 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.
26. The vast majority of the Site lies within a Group 3 area, which notes the Site has the potential for wind farm development<sup>3</sup>; as the Site Boundary includes access from the A703, there is a small portion of the Site within a Group 2 area, associated with the settlement of Eddleston. It is important to note that works associated with the Development within this Group 2 portion of the Site will be limited to public road widening works. The Development's wind turbines and associated infrastructure are located wholly within a Group 3 area. The Site does not lie within a 'Group 1' area as it is not covered by any national or international designation in respect of landscape, ecology, ornithology or cultural heritage; and lies outside of any Wild Land Area, defined within Group 2 as a 'nationally important mapped environmental interest'. Additionally, the Site is largely free from high quality carbon rich soils. The NatureScot Carbon and Peatland Map (2016)<sup>4</sup> shows that the Site does not occupy land designated as Class 1 or Class 2, which identify land as Carbon Rich Soil, Deep Peat and Priority Peatland Habitat.
27. In 2017, the Scottish Government published the Onshore Wind Policy Statement (OWPS) (2017) and Scottish Energy Strategy (2017) (2017 SES) which recognise that increased efficiency and power output in wind turbine technology, has resulted in increases in the size and scale of wind turbines (e.g. increased turbine blade length and resultant increases in overall tip heights). For example, paragraph 23 of the OWPS states that '*we acknowledge that onshore wind technology and equipment manufacturers in the market are moving towards larger and more powerful (i.e. higher capacity) turbines, and that these – by necessity – will mean taller towers and blade tip heights*'.
28. Whilst the ministerial foreword of the OWPS (page 3) and the 2017 SES (page 43) also state that '*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*' as onshore wind continues to play an important role in meeting Scotland's energy generation and climate change goals.
29. In March 2021 the Scottish Government published 'Scotland's Energy Strategy Position Statement' (2021 SES) which builds on the support for onshore wind outlined in the 2017 SES. The 2021 SES notes that:
30. "The Scottish Government is committed to supporting the increase of onshore wind in the right places to help meet the target of Net Zero. In 2019, onshore wind investment in Scotland generated over £2 billion in turnover and directly supported approximately 2,900 full-time equivalent jobs across the country."
31. The 2021 SES also identifies the Scottish Government's key priorities for energy, which amongst others includes a refresh of the OWPS.

<sup>3</sup> Scottish Borders Council Supplementary Guidance Renewable Energy July 2018 [Online] Available at: [https://www.scotborders.gov.uk/downloads/file/2757/renewable\\_energy\\_supplementary\\_guidance](https://www.scotborders.gov.uk/downloads/file/2757/renewable_energy_supplementary_guidance) (Accessed 22/06/2021)

<sup>4</sup> NatureScot (2016) Carbon and Peatland Map 2016 [Online] Available at: <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map> (Accessed 16/06/2021)

## 2.4 SITE SELECTION

32. The selection of an appropriate site which has the potential to support a commercial wind farm development is a complex and lengthy process. It involves examining and balancing a number of environmental, technical, planning and economic issues. Only when it has been determined that a site is not subject to major known environmental, technical, planning or economic constraints is the decision made to invest further resources in developing the proposal and conducting an EIA.

### 2.4.1 Extant Consent

33. There is an extant consent on the site for 18 wind turbines (115 m to tip) and associated infrastructure. The Section 36 consent and deemed planning permission for Cloich Forest Wind Farm was granted by Scottish Ministers following a Public Local Inquiry (PLI) on the 8<sup>th</sup> July 2016 (Planning and Environmental Appeals Division (DPEA) Reference: WIN-140-1), under reference number EC00003108 ('the Consented Scheme').

### 2.4.2 Site Selection

34. In accordance with the EIA Regulations the design alternatives need to be studied with key reasoning, taking into account the potential environmental effects. The Site was selected as a suitable site for wind farm development by Cloich Windfarm Partnership LLP ('the Applicant') because it met the following criteria:

- Existing consent at the Site for the Consented Scheme demonstrates an established planning principle for an onshore wind farm in this location, and a legal fall-back position should consent not be granted for the Development;
- A sufficiently high annual mean wind speed across the Site;
- Viable grid connection;
- Suitable road access;
- The revised wind farm layout is able to maintain sufficient distance from residential properties to ensure and maintain compliance with ETSU-R-97 noise limits, as well as to avoid or reduce the potential for adverse effects on residential visual amenity and shadow flicker effects; and
- The Site does not support any international or national ecological or landscape designations, and Scheduled Monuments within the Site can be safeguarded, including:
  - Whaup Law, cairn (SM2755), located approx. 231 m from the nearest turbine (T8);
  - Courhope, ring enclosures 750m NE of Greenside (SM2756) located approx. 270 m from the nearest turbine (T9); and
  - Nether Stewarton, settlement 850m W of (SM3998) located approx. 734 m from the nearest turbine (T3).

## 2.5 SITE DESIGN

35. The purpose of a wind farm development is to harness the wind to generate electricity. From a yield perspective, the optimum design would locate wind farms in areas exposed to the highest wind speeds, with turbines placed in the most exposed locations. However, this may not account for the potential environmental effects of a wind farm. The design of a wind farm must therefore balance environment effects and energy yield. In addition to these factors, the technical limitations of constructing a wind farm must also be considered in the design stage.

36. The layout of a wind farm draws upon on a range of technical criteria. A minimum distance must be maintained between wind turbines to reduce the effects of turbulence and associated increased turbine fatigue and reduction in energy yield. This separation

distance is usually a function of rotor diameter and prevailing wind direction, with turbine manufacturers requiring turbines to be located typically between three and seven times the rotor diameter apart depending on wind and site conditions. Once established, this separation distance is used for turbine spacing in the ongoing design.

37. The following criteria must also be considered in the design of a wind farm:
- Wind speed;
  - Prevailing wind direction;
  - Existing infrastructure;
  - Topography;
  - Ground conditions;
  - Local environmental sensitivities; and
  - Landscape and visual considerations.
38. The design process is iterative and develops in tandem with environmental surveying that identifies environmental sensitivities which are considered and taken into account within the design process. As environmental effects and sensitivities have been identified, the layout of the Development has undergone a series of modifications to avoid or reduce potential environmental effects through careful design. This process has resulted in the layout of the Development presented in this EIA Report. This layout represents the optimum fit within the technical and environmental parameters of the Site and its surroundings.
39. In addition to the turbines, the other elements of the Development which have been designed to minimise environmental effects include: the access tracks, proposed borrow pits, crane hardstanding areas, temporary construction compound, and the substation compound (including the Battery Energy Storage System (BESS)). The effects of these have been minimised through use of existing track infrastructure where possible, careful design, siting, routeing, and construction methods.
40. The key constraints to onshore wind farm site design which need to be taken into account during the design process include:
- Visibility from sensitive receptors, including nearby properties, settlements and designated landscapes;
  - Presence of sensitive habitats and protected species;
  - Presence of sensitive ornithological species;
  - Presence of watercourses, private water supplies and related infrastructure;
  - Presence of cultural heritage features;
  - Proximity to noise sensitive receptors;
  - Presence of peat;
  - Ground conditions and topography; and
  - Key recreational and tourist routes.
41. The principle of the design strategy was to maximise the number of turbines and wind energy capture, whilst minimising significant adverse environmental effects. Therefore, some of these constraints were given a 'hard' constraint value in the design that was not breached and others were assigned a 'soft' constraint value that could be impinged with sufficient justification that effects were still acceptable. This led to a comprehensive process of constraints mapping. This EIA Report and its conclusions constitute the outcome of the application of the design strategy and design objectives adopted for the Development.
42. Embedded mitigation (avoiding the potential for impacts to arise through Development design) was used to minimise any predicted environmental effects and, where applicable to a specific technical assessment, this mitigation is detailed in the relevant chapter within this EIA Report. Additionally, embedded mitigation relating to design changes are detailed

below in Section 2.6 of this Chapter. This was particularly relevant to the avoidance of direct effects, *e.g.* on known protected species. By employing an iterative design process, undertaken in conjunction with the EIA process, a number of potential effects were avoided completely.

43. The design strategy has been informed by a number of general and site-specific design objectives relating to the siting and design of the turbines in the first instance, whilst acknowledging that the feasibility and appropriateness of other ancillary infrastructure locations (including access tracks) should also be considered throughout the design process.

### **2.5.1 Site Specific Environmental Constraints and Design**

44. The specific environmental factors considered in the design of the Development are set out below, with their influence on the design discussed.

#### **2.5.1.1 Landscape and Visual**

45. Best practice guidance, including *Siting and Designing Wind Farms in the Landscape*, Version 3<sup>5</sup> was considered throughout the design process.
46. Residential properties in proximity to the Site were a key consideration in the design of the Development, which sought to utilise existing topography and forestry so that it will screen the turbines where possible. Where open views towards the Site are available, in particular in views from the north-east, the aim was to create a compact layout with evenly spaced turbines and minimal stacking.
47. During the design process the Development layout was examined from a number of key design viewpoints including several locations within the Upper Tweeddale NSA, including Black Meldon and Cademuir Hill Fort. As it was not possible to remove visibility of the Development from elevated locations within the NSA, the design objective was to create a compact layout with evenly spaced turbines and minimal stacking, that was broadly in keeping with the Consented Scheme. Turbine scale in relation to the underlying landscape was also a consideration, with the large-scale landscape considered able to accommodate turbines of the maximum height proposed (149.9 m). Avoiding the need for visible aviation lighting was a key consideration in choosing this turbine height.
48. In addition to the position of the turbines, consideration was given to reducing landscape and visual effects relating to ancillary infrastructure including access tracks, onsite substation and BESS. These elements are generally located within areas of forestry which provide screening from nearby receptors. In addition, keyhole felling will be used to minimise the total area and visibility of forestry felled.
49. Further information about landscape and visual effects is provided in **Chapter 5: Landscape and Visual Impact Assessment**.

#### **2.5.1.2 Archaeological and Cultural Heritage Features**

50. The design of the Development has taken into account the consultation responses received from Historic Environment Scotland (HES) and the Council Archaeologist and has sought to reduce the impact upon heritage assets through mitigation by design, where possible.
51. Minimising and avoiding changes to setting that may affect the cultural significance of designated heritage assets was an important driver in the design process. Specifically, the layout has sought to maintain views between Scheduled Monuments, where this contributes to setting, as well as the potential impact on Portmore House (LB2037) and

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<sup>5</sup> Scottish Natural Heritage (now NatureScot) (2017) *Siting and Designing Wind Farms in the Landscape* Version 3 [Online] Available at: <https://www.nature.scot/siting-and-designing-wind-farms-landscape-version-3a> (Accessed 22/06/2021)

its associated Inventory Garden & Designed Landscape (GDL00318). Most notably the reduction in turbines from the 18-turbine Consented Scheme (up to 115 m to tip) to a 14 turbine Scoping layout, which was further reduced to a 12-turbine scheme (albeit with slightly taller turbines of up to 149.9 m to tip), creates a more compact, evenly spaced layout in order to limit views of turbines towards or from hillforts, most notably those on the southern side of the Tweed Valley which look northwards towards the Meldons. Although this could not be completely avoided due to the nature of the surrounding topography and density of hillforts. The design has sought, where possible, to not introduce any new effects upon heritage assets as the result of the Development beyond those identified for the Consented Scheme.

52. In addition, the design of the layout has sought to avoid archaeological sites recorded within the Site, in order to avoid direct impacts upon known archaeological features and securing preservation in situ.
53. Further information about heritage assets is provided in **Chapter 6: Archaeology and Cultural Heritage**.

### **25.13 Ecological Features**

54. Desk-based surveys and Site visits were undertaken as part of the ecology baseline studies which were used to inform the final design of the Development. Site surveys included the following:
- Extended Phase 1 habitat survey;
  - National Vegetation Classification (NVC) Survey;
  - Badger survey;
  - Otter survey;
  - Pine marten survey;
  - Red squirrel survey;
  - Great crested newt survey;
  - Bat habitat suitability survey;
  - Bat activity survey; and
  - Fish fauna survey.
55. The purpose of these surveys was to identify sensitive habitats and species within and close to the Site to ensure that the Development's design would take them into account.
56. Although protected species were recorded, including moderate levels of bat activity and the presence of badger, pine marten and otter, no notable ecological sensitivities that cannot be avoided or appropriately mitigated have been recorded.
57. Risk to bats as a result of collision with operational turbines has been minimised by the implementation of a 50 m separation distance between blade tips and high-value bat habitats, such as woodland, riparian habitats, and forest edges, in accordance with NatureScot (formerly SNH) published guidance.
58. The NVC survey identified habitats with the potential to be groundwater dependent. Most of these have been assessed from a hydrological perspective to be ombrotrophic, and therefore not groundwater dependent.
59. Given the relatively small area that these ecological sensitivities covered compared to the overall development area, the ecological constraints did not pose significant design limitations, and ensuring these areas were avoided through design with a suitable distance from development was achieved.
60. Best practice, as detailed within **Chapter 7: Ecology**, has been adopted to avoid disturbance to protected species or direct effects on sensitive habitats; this largely relates to embedded mitigation including measures outlined in a Construction Environmental

Management Plan (CEMP). The final layout was informed by the aforementioned surveys, which ensured that the Development avoided the most sensitive habitats.

61. Ecology effects are assessed within **Chapter 7: Ecology**.

#### **25.14 Ornithological Features**

62. Ornithology surveys were undertaken between March 2019 and February 2020 (inclusive) over the Site and appropriate survey areas. In consultation with NatureScot it was agreed that the aforementioned ornithology surveys could be used to update the historical 2011/12 surveys undertaken for the Consented Scheme.

63. The surveys recorded flights from a number of priority species including: pink-footed goose, greylag goose, goshawk, osprey, and curlew.

64. Ornithological features have been considered at all stages of the Development design, from initial feasibility to final layout. Standard best practice measures will also be implemented during construction (including timing felling works outwith the breeding season) to ensure compliance with relevant legislation protecting all breeding wild birds. This has helped to avoid or greatly reduce impacts on ornithological features.

65. Ornithology effects are assessed within **Chapter 8: Ornithology**.

#### **25.15 Peat**

66. Peat depth surveys were undertaken across the Site, through which it was established that the majority of the Site was not underlain with peat. Isolated, and limited, pockets of peat and deep peat were identified across the Site. Areas of peat that are greater than 1.0 m in depth were considered as a hard constraint for new infrastructure as a result of the Development. Areas of peat less than 1.0 m in depth were considered as a soft constraint and avoided as far as possible.

67. Further information on peat and other ground conditions of the Site is contained within **Chapter 9: Geology, Ground Conditions, and Peat**.

#### **25.16 Water Environment**

68. During the EIA process desktop and site surveys were carried out to inspect and identify all water features including private water supplies within the area with potential to be impacted by the Development.

69. The hills within the Site are dissected by several watercourses including:

- Middle Burn;
- Early Burn;
- Flemington Burn;
- Martyr's Dean;
- Gibb's Cloich;
- Courhope Burn;
- Courhope Glen; and
- Harehope Burn.

70. The aim of the design process was to achieve a layout that avoids effects on sensitive hydrological receptors including private water supplies, discussed below. All turbines and associated infrastructure, with the exception of access tracks, have been located a minimum of 50 m from any watercourse or waterbody.

71. The arrangement of access tracks has been designed to limit the number of watercourse crossings where possible or to re-use existing crossing points. The Development layout will require potential upgrades to up to 11 existing watercourse crossings and two new watercourse crossings.

72. Effects upon hydrology are assessed within **Chapter 10: Hydrology and Hydrogeology**.

#### **25.1.7 Private Water Supplies**

73. During the EIA process, desktop and Site surveys were carried out to inspect and identify properties served by a Private Water Supply (PWS).
74. The aim of the iterative EIA design process was to achieve a layout that avoids potential effects on the sources of PWS by locating infrastructure outwith of the catchments of identified sources or maximising the distance between Site infrastructure and the supply. Turbines, compounds and borrow pits have been located outwith PWS catchments.
75. Where new access tracks or upgrades to existing tracks are required, within 100 m of supplies, mitigation measures are proposed. Potential effects and mitigation measures are all discussed in detail within **Chapter 10: Hydrology and Hydrogeology** and associated technical appendices.

#### **25.1.8 Noise Sensitive Receptors**

76. The potential for noise effects to arise at residential properties located in the surrounding area of the Site was an important consideration in the design process. The nearest noise sensitive receptor to the Development is approximately 900 m south-east of the nearest turbine location (T4).
77. Each layout iteration was modelled to determine its noise impact on nearby receptors. Through the iterative EIA design process, turbines were moved away from noise sensitive receptors. As these receptors, and their associated noise buffers, were considered as a hard constraint throughout the design process, the Development does not breach the consented noise limits established for the Consented Scheme.
78. A noise assessment is presented in **Chapter 11: Noise**.

#### **25.1.9 Socio-Economics, Land Use, Recreation and Tourism**

79. A desk-based study of local socio-economics, land use, recreation and tourism receptors was undertaken at an early stage to establish the socio-economics and land use of the local area, and gain a full understanding of the recreation and tourism receptors within the wider area.
80. The desk-based study established that the wider area is host to various tourism and recreation receptors, largely based around the natural environment and notable man-made structures, such as historic buildings. These receptors were considered throughout the design process. Furthermore, the desk-based study identified several core paths and local recreational routes of importance; these were considered in full.
81. Effects upon the socio-economic, land use, recreation & tourism resources are assessed within **Chapter 15: Socio-Economics, Land Use, Recreation & Tourism**. Additionally, **Chapter 5: Landscape and Visual Impact Assessment** also assesses the visual impact of the Development on key receptors which relate to tourism and recreational assets.

#### **25.1.10 Telecommunications**

82. A desk-based study and external consultation with telecommunication providers was carried out to understand the existing infrastructure within the Site, and within nearby areas.
83. The desk-based study and consultations identified telecommunication infrastructure, and these were avoided throughout the EIA design process.
84. Effects upon telecommunications are assessed within **Chapter 17: Other Issues**.

## **2.5.2 Design Considerations**

### **2.5.2.1 Wind Resource**

85. Wind resource can be affected by various site characteristics, such as the prevailing wind direction, and local topography. The wind resource was modelled across the Site and fed into the design process. As a rule, the more elevated areas of Site have the greatest wind resource, and this must be balanced against the landscape and visual effects that may arise at higher elevations.

### **2.5.2.2 Turbine Spacing**

86. The spacing of the turbines is a key consideration in wind farm layout design; turbines need to be arranged a suitable distance apart such that turbulence from a specific turbine does not unduly affect the operation of a turbine which is downwind from it. The spacing for turbines needs to be larger in the prevailing wind direction and will vary from site to site and between different turbine models. The spacing is proportional to the size of the wind turbine rotor, whereby the larger the rotor, the larger the spacing must be between turbines. Consequently, this affects how many turbines can be accommodated within a site.

### **2.5.2.3 Topography and Ground Conditions**

87. The suitability of ground conditions was considered during the design of the Development, which principally considered areas of steep slope, peat, and proximity to hydrological features.
88. The Site has complex topography, and substantial areas of steep hillside. Where gradients greater than 20% were identified, these areas were not considered suitable for the siting of wind turbines. Additionally, as far as possible gradients greater than 14% were similarly avoided for tracks. This restricted large parts of the Site in the central and southern parts of the Site where steep slopes are prevalent. The presence of steep slopes also presented a key element to the design of the Site infrastructure, including access tracks and hardstanding areas.
89. The presence of peat has been assessed both from an environmental and technical perspective. Peat greater than 1.0 m depth was minimal and localised, generally on land which was more flat in comparison to the hill tops of the Cloich Hills. Identified peat deposits, greater than 1.0 m in depth, were scattered along a central band within the middle of the Site. In addition, there is an area of peat greater than 1.0 m in depth to the east of the centre of the Site, where one of the main site access tracks is located – however, this access track is an already existing forestry track and impacts upon the area of peat can be minimised by the implementation of suitable construction practices. Areas with peat deeper than 1.0 m, and areas with a peat depth of 0.5 m – 1.0 m, were avoided as far as possible. No turbines, or immediate associated infrastructure is located within peat. Existing forestry tracks are the only elements of the Development Site infrastructure which are located in areas of peat. However, it is important to note that instances in which this occurs are minimal and avoided as far as possible. Upgrades to existing forestry tracks are likely to be localised and minimised as far as possible. This is fully assessed within **Chapter 9: Geology, Ground Conditions and Peat**.

## 2.6 DESIGN EVOLUTION

90. The final layout presented in this EIA Report has been chosen following a number of iterations and refinements which sought to avoid or minimise predicted adverse effects via design embedded mitigation. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable project. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' within the design of the scheme.
91. Whilst the Development went through numerous design iterations, a selection of the key turbine layout design iterations are described below and shown in Figure 2.3a-b which demonstrates how the layouts have evolved during the EIA process. The key design iterations presented are:
- Consented Scheme Layout (July 2016);
  - Scoping Layout (October 2019);
  - January Design Day Layout (January 2020);
  - April Design Day Layout (April 2020);
  - Final Draft Layout (September 2020); and
  - Turbine Freeze Layout (January 2021).
92. As an understanding of Site constraints developed, turbine layout iterations were increasingly informed by the following technical parameters and constraints detailed below:
- Minimum turbine spacing/separation of approximately 5 x rotor diameter downwind and 3 x rotor diameter crosswind and a south-westerly prevailing wind direction (approximately 240 degrees);
  - Avoidance of slopes of 20% or greater; and avoidance of slopes of 14% or greater where possible (Figure 2.2);
  - A hard constraint of 50 m buffers around the banks of watercourses for turbine locations and associated crane hardstanding (Figure 2.2);
  - A hard constraint to avoid all known archaeological records (Figure 2.2);
  - A hard constraint of a minimum 250 m buffer around sensitive Groundwater Dependent Terrestrial Ecosystems (GWDTE) (Figure 10.6);
  - A hard constraint to avoid locating turbines within 800 m of a residential property;
  - A hard constraint to avoid locating turbines within 160 m of the Cross Borders Drove Road (Figure 2.2);
  - A hard constraint to avoid locating turbines in peat (>0.5 m) (Figure 2.2);
  - A soft constraint to avoid locating turbines inside surface water catchments serving Private Water Supply catchments;
  - A soft constraint to balance the visual composition of the Development.

### 2.6.1 Consented Layout – July 2016 – 18 Turbines – Tip Height 115 m

93. In July 2011 a scoping request was submitted on behalf of Partnership for Renewables (PFR) for a wind farm development consisting of 18 (three-bladed) turbines, with a maximum tip height of 132 m.
94. The Consented Scheme, consented in July 2016, comprised of a wind farm layout of 18 turbines with a maximum tip height of 115 m. The Consented Layout is presented in Figure 2.3a.
95. The Applicant purchased the Partnership for Renewables development portfolio in 2017, including the Consented Scheme.
96. An initial feasibility study was undertaken to understand what scope there was for a redesigned wind farm in the same location that uses taller, higher yielding turbines. Wind turbines are generally becoming larger with greatly improved generation outputs that can

be achieved from an increased rotor size, alongside a significant reduction in electricity generation costs. This study concluded that a project which broadly reflects the Consented Scheme could be designed using a smaller number of taller turbines.

### **2.6.2 Scoping Layout – October 2019 – Up to 14 Turbines – Maximum Tip Height 145 m**

97. A design workshop, attended by technical and environmental specialists from the EIA team, was held in the autumn of 2019 following the completion of the preliminary environmental survey work. This was informed by the identified environmental constraints digitised and analysed by the technical assessors.
98. In designing the Scoping Layout, turbines were positioned to avoid, as far as possible, immediately known onsite constraints (such as residential property noise buffers and peat presence, as known at the time). It also incorporated consideration of landscape and visual effects with a focus on designing a visually balanced scheme within the context of the surrounding landscape and its sensitivities that was broadly in keeping with the Consented Scheme.
99. The key design changes which influenced the development of the Scoping Layout are summarised below:
- Use of taller turbines than consented; and
  - Reduction in the maximum number of turbines from 18 to 14.
100. The Scoping Layout (shown on Figure 2.3a) was developed in October 2019 and consisted of up to 14 turbines with a maximum tip height of 145 m.
101. The Development was scoped under the EIA Regulations in October 2019, and a Scoping Opinion was received from the Scottish Government on the 18<sup>th</sup> December 2019 (ECU Reference: ECU00001956).

### **2.6.3 January Design Day Layout – January 2020 – Up to 12 turbines – Maximum Tip Height 149.9 m**

102. Following the Scoping process, the Applicant considered a layout which removed turbines in the western extent of the Site. The change in the total turbine number from 14 to 12 was made to further reduce environment impacts (primarily landscape and visual effects).
103. Additionally, the Applicant increased the maximum tip height of the Development from 145 m to 149.9 m. This change to the tip height was to ensure economic viability of the Development, following the reduction in turbine numbers to enable consideration of more productive turbines. The change in turbine tip height resulted in increased spacing between turbines to improve energy yield.
104. The nominal height increase was not considered to result in turbines being at odds with the scale of the landscape and enabled a reduction in turbine numbers. Together these changes provided a greater opportunity to improve visual composition.
105. As described in **Chapter 4: EIA Methodology** of this EIA Report, this change in the proposed maximum turbine tip height followed the completion of the formal Scoping process. On behalf of the Applicant, Arcus submitted a further consultation letter to the ECU on the 20 January 2020; this letter was circulated to EIA consultees and is published on the ECU website<sup>6</sup> under the Reference: ECU00001956. EIA consultees were invited to review their previous consultation responses in light of the consideration of slightly taller turbines and the ECU subsequently confirmed that the agreed EIA scope remained

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<sup>6</sup> Scottish Government (2020) Energy Consents Unit [Online] Available at: <https://www.energyconsents.scot/Default.aspx> (Accessed 26/06/2021)

suitable and that formal re-scoping was not required (see Technical Appendix A4.3 of **Chapter 4: EIA Methodology**).

106. The Tip Height Increase Consultation was undertaken in January 2020. A copy of responses are included within Technical Appendix A4.4.
107. The reduction in turbine number from 14 to 12 and movement of turbine positions was beneficial in achieving a more balanced composition from key viewpoints. This included: close views from the east and south-east, e.g. LVIA Viewpoints 6 (Core Path 154 near Eddleston) and 11 (A703 near Langside Farm); distant views from Viewpoint 19 (Cademuir Hill Fort) in the Upper Tweeddale NSA; distant views from the Moorfoot Hills (e.g. Viewpoint 20 (Blackhope Scar)); and distant views from the Pentland Hills (e.g. Viewpoint 24 (Bleak Law)).
108. The January Design Day Layout saw all turbines move beyond 50 m from watercourses, to ensure there will be no direct hydrological impact as a result of turbines; similarly, a turbine (T10 as per the Scoping Layout) was moved from the 160 m buffer of Courhope, ring enclosures 750m NE of Greenside (SM2756) to reduce indirect setting effects.

#### **2.6.4 April Design Day Layout – April 2020 – Up to 12 Turbines – Maximum Tip Height 149.9 m**

109. The Layout developed on the April Design Day (Figure 2.3b) reflected a re-design of the January Design Day Layout following feedback from the first round of public exhibitions held for the Development. At this stage, turbine movements were largely based around landscape and visual considerations, protection of private water supplies, noise (residential receptors), and ecological feature constraints.
110. The key landscape and visual considerations included views from the closest residential receptors, settlements and roads in the surrounding area, recreational locations and views from the Upper Tweeddale NSA.
111. The April Design Day Layout (Figure 2.3b) reduced the visibility of the Development from some of the closest residential receptors including those at Harehope (to the south of the Site), whereby turbines moved north away from this cluster of properties and down the slope. The horizontal extent of the Development was also reduced in views from properties at Nether Stewarton, and the prominence of the turbines was reduced in views from Cloich Farm.
112. The layout reduced the horizontal extents of the Development and achieved a more evenly spaced layout in views from key locations in the Upper Tweeddale NSA including LVIA Viewpoints 4 (Black Meldon), 9 (Haswellsykes) and 19 (Cademuir Hill Fort). It also reduced visibility of turbines from the Meldon Valley (LVIA Viewpoint 5). The April Design Day Layout (Figure 2.3b) reduced visibility of turbine hubs in views from the west e.g. LVIA Viewpoints 8 (B7059 between Boghouse and Kaimhouse) and 12 (A702 approach to West Linton). It also improved the composition of the layout in views from Gladhouse Reservoir as represented by LVIA Viewpoint 21.
113. In addition to the landscape and visual considerations and moves detailed above, there were several other moves for other environmental considerations, as summarised in Table 2.2 overleaf.

**Table 2.2: Key Design Changes following January Design Day Layout to April Design Day Layout**

<b>Turbine No.</b>	<b>Key Design Changes from January Design Day Layout to April Design Day Layout</b>
T1	Moved approx. 1.2 km north away from an area housing an important ecological feature, and away from nearby residential properties down the slope.
T2	Moved approx. 321 m north away from nearby residential properties down the slope.
T9	Moved approx. 780 m south and removed from the 160 m buffer of Whaup Law, cairn (SM2755) to reduce indirect setting effects.
T10	Moved approx. 277 m south-west away from the residential property of Cloich Farm – this move was in the interest of operational turbine noise at the residential property.

### 2.6.5 Final Draft Layout – September 2020 – Up to 12 Turbines – Maximum Tip Height 149.9 m

114. The Final Draft Layout (presented on Figure 2.3b) was developed in September 2020 following a design review meeting where further constraints mapping from completed surveys and more detailed Digital Terrain Modelling (DTM) data were used to microsite turbine and infrastructure locations within the complex topography on the Site.
115. Changes to turbine locations (as detailed in Table 2.3. below) were largely driven by engineering considerations although environmental considerations also benefitted. Moving the turbines away from steeper gradients significantly reduces the amount of cut and fill earthworks and improves the fit of the road and turbine pad infrastructure within the landscape. By reducing the construction footprint of the Development, it will be constructed with less land disturbance, reducing the potential for land slip and the area of forestry to be felled. Therefore, these moves benefit various environmental disciplines including hydrology, ecology, and ornithology.

**Table 2.3: Key Design Changes following April Design Day Layout to Draft Final Layout**

<b>Turbine No.</b>	<b>Key Design Changes from January Design Day Layout to April Design Day Layout</b>
T1	Moved approx. 60 m north-east onto land which had a less steep gradient.
T6	Moved approx. 70 m north-east onto land which had a less steep gradient.
T7	Moved approx. 61 m north-west onto land which had a less steep gradient.
T8	Moved approx. 155 m north-east, downhill from approx. 457 m AOD to approx. 450 m AOD. Whilst this move was largely driven by engineering constraints, and to maintain turbine spacing, it also further reduced landscape and visual effects in some views.
T9	Moved approx. 98 m north-east to maintain turbine spacing.
T11	Moved approx. 108 m north onto land which had a less steep gradient.
T12	Moved approx. 50 m north to maintain turbine spacing.

116. The layout takes account of key landscape and visual considerations as described above, including views experienced from nearby residential properties and key design viewpoints such as those within the Upper Tweeddale NSA. The changes as described in the table above resulted in a slight improvement to the composition of the layout from several locations including LVIA Viewpoints 17 (Glentress Forest, Makeness Kipps), 21

(Gladhouse Reservoir), 23 (Stob Law), 24 (Bleak Law) 25 (Lee Pen) and 26 (B7007 northern edge of the Moorfoot Hills).

### 2.6.6 Turbine Freeze Layout – January 2021 – Up to 12 Turbines – Maximum Tip Height 149.9 m

117. The Turbine Freeze Layout (presented on Figures 2.3b) represents the Development layout proposed in this EIA Report; the layout is comprised of up to 12 turbines at a tip height of up to 149.9 m. The layout incorporates necessary rotor spacing requirements, based on a prevailing south-westerly wind, and the turbines positioned to minimise interaction with onsite constraints, including areas of deep peat and watercourses. This included some minor refinements (as described in Table 2.4 below, and following text) to a number of turbine positions, as more detailed site survey results became available.
118. The layout incorporates infrastructure elements which were not present on the Scoping Layout and other earlier iterations. This includes internal access tracks, a substation compound, a temporary construction compound, and borrow pit locations. The Site contains an existing internal network of forestry tracks which have been used as much as possible.

**Table 2.4: Key Design Changes following Draft Final Layout to Turbine Freeze Layout**

Turbine No.	Key Design Changes from Turbine Chill Layout to Turbine Freeze Layout
T1, T2, T4, T5, T6, T7, T9, T10, & T12	No change from Draft Final Layout.
T3	Moved approx. 36 m north to avoid impacts on the catchment area of a Private Water Supply (PWS); move included refinement of associated access track further away from Private Water Supply catchment.
T8	Moved approx. 45 m south-east to avoid a deposit of peat.
T11	Associated infrastructure, including access track and crane hardstanding, reorientation to avoid peat deposit and to ensure crane hardstanding is beyond nearby 50 m watercourse buffer.

119. Following a PWS site visit, T3 was moved approx. 36 m north of its location as per the Draft Final Layout; the movement of T3 moved it further downhill from the ridgetop it was originally close to, and away from a geological fault line. This positive move further minimises the potential for PWS impacts to arise from the construction of T3 as the turbine is now located on the far side of the ridge from the PWS and its catchment. Additionally, by moving the turbine away from the geological fault line, further confidence is achieved that there is no sub-surface connectivity between the T3 location and the PWS. Further information on this is contained within **Chapter 10: Hydrology and Hydrogeology**.
120. T8 and its associated infrastructure was moved 45 m south-east to avoid a deposit of peat. Likewise, T11's associated infrastructure was reoriented to avoid a peat deposit – these amendments result in all of the Development's turbines and crane hardstandings being located out of peat deposits. Additionally, the reorientation of T11 associated infrastructure also removed it from a 50 m buffer of a nearby watercourse.
121. The technical assessments within this EIA Report include an allowance for micro-siting of the application layout up to 50 m to ensure that any new environmental or engineering factors can be addressed at the time of detailed foundation design and construction.

### **26.6.1 Final Infrastructure Layout**

122. The final infrastructure layout is presented on Figure 3.1: Detailed Development Site Layout of **Chapter 3: Project Description**.

#### *Access Tracks*

123. The internal onsite access track layout for the final turbine arrangement was developed so that it meets the following criteria:

- Upgrade of existing tracks where possible;
- Minimisation of the variation in the vertical alignment of the tracks;
- Minimising the overall length of new tracks;
- Ensuring a safe and efficient layout to facilitate wind farm construction;
- Minimisation of incursion into environmental constraint areas (e.g. deep peat, sensitive habitats, watercourse buffers);
- Minimisation of the number of watercourse crossings and alignment of tracks so that crossings are approximately at right angles; and
- Minimisation of tracks through areas of peat greater than 0.5 m in depth.

#### *Borrow Pits*

124. The borrow pit locations have been selected to avoid environmental constraints and were identified following a review of geological data and topography to determine where extractable rock of suitable quality is to be found. Borrow pit 1 is located in the north of the Site, along the northern main access track; it is an existing quarry used by FLS for construction of forestry tracks. Borrow pit 2 is located in a disused quarry in the east of the Site. Borrow pit 2 was originally located north, near Cloich Farm; however, following a PWS site visit to Cloich Farm, the borrow pit position was relocated to ensure its operation had no effect on the property's PWS.

#### *Substation Compound*

125. The location of the substation compound, adjoining the northern main the access track, was selected as it is an appropriate distance away from the turbine locations and close to the construction compound. Its location is in an area with no hard constraints.

126. The substation compound is located on the lower slopes of Peat Hill within an area of young forestry which will provide screening from surrounding landscape and visual receptors.

#### *Temporary Construction Compound*

127. The location of the temporary construction compound, adjoining the northern main the access track, was selected as it is an appropriate distance from the turbine locations and close to a borrow pit for construction. Its location is in an area with no hard constraints.

128. The temporary construction compound is located adjacent to both borrow pit 1 and the proposed substation compound within an area of young forestry which will provide screening from surrounding landscape and visual receptors.

#### *Access*

129. Access will be via the A703, the 'D17 Whim – Shiplaw' and the 'D18 Cloich' public roads, which is the same access as the Consented Scheme.

## **2.7 SUMMARY**

130. Various economic, technical and environmental considerations were established by a combination of baseline surveys, assessment and consultation with stakeholders.
131. The final turbine layout and associated infrastructure assessed in this EIA Report has been carefully developed taking these factors into account and is considered to achieve the balance required to increase the renewable energy generation capacity of the Site whilst minimising the introduction of new environmental effects.
132. The final Development turbine layout and associated infrastructure is described in **Chapter 3: Project Description** and shown on Figure 3.1.