

Chapter 2: Site Selection and Design Strategy

Chapter 2

Site Selection and Design Strategy

Introduction

2.1 This chapter provides details of the approach that was taken to the Site selection and design (consideration of alternatives) of the Proposed Development. Details of how and why the turbine layout and associated infrastructure were modified during the iterative Environmental Impact Assessment (EIA) process are provided to explain how the Proposed Development described in **Chapter 3: Development Description** was designed. This chapter also outlines the Site selection process that was undertaken by the EDF Renewables Energy Ltd (the Applicant) and sets out alternatives which were considered in designing the Proposed Development.

2.2 The key design changes are illustrated on **Figure 2.1a-c and 2.2** The chapter should also be read with reference to the **Design and Access Statement** which is provided in support of the application for the Proposed Development.

Site Policy Context

2.3 National Planning Framework 4 (NPF4) was approved by the Scottish Parliament on 11 January 2023 and was adopted and published on 13 February 2023. However, the Site selection exercise was undertaken under the planning policy in force at the time (i.e., Scottish Planning Policy (SPP) (June 2014)) which provided support for wind development in principle and encouraged local authorities to guide development towards appropriate locations within their boundaries. Paragraph 161 of SPP highlighted the requirement for planning authorities to define a “*spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms*” 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.
- 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 Scottish Natural Heritage (SNH) map of wild land areas; carbon rich soils, deep peat and priority peatland habitat; and an area not exceeding 2 kilometres (km) 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.

2.4 SNH’s (now NatureScot) Guidance ‘Siting and Designing Wind Farms in the Landscape’¹ states that “Developers and those involved in wind farm design should also refer to the Spatial Frameworks being developed by planning authorities in response to Scottish Planning Policy (SPP). When considering an individual application, the adopted development plan, relevant supplementary guidance, wind energy capacity studies and SPP provide the framework within which the application should be considered”.

¹ Scottish Natural Heritage, 2017, Siting and Designing Windfarms in the Landscape (Version 3a)

2.5 NPF4 forms part of the statutory Development Plan in addition to the Scottish Borders Local Development Plan ('the LDP') (May 2016) and the Renewable Energy Supplementary Guidance ('the SG') (July 2018) for this area of Scotland. The SG includes the Spatial Framework for Onshore Wind Energy² to provide further information and detail in respect of the main wind energy related policy of the LDP. NPF4 no longer contains a Spatial Framework for Onshore Wind Energy, as previously set out in Table 1 of the now superseded Scottish Planning Policy (SPP). At the time of site selection however, SPP and thus the Spatial Framework (set out in the SG) applied. In this respect, the SG Spatial Framework identified the Site as being located mainly within an area with potential for wind farm development (Group 3). Key outcome 10 of the LDP provides support for "development of the area's full potential for electricity and heat from renewable sources, in line with national climate change targets, giving due regard to relevant environmental, community and cumulative impact considerations". Policy EP5 also states that "proposals that have a significant adverse impact will only be permitted where the landscape impact is clearly outweighed by social or economic benefits of national or local importance".

2.6 It should be noted that the new LDP (LDP2) is in development with the Main Issues Report being publicly consulted between November 2018 and January 2019. The LDP2 is set to guide development and inform planning decisions within the Scottish Borders over the next ten years. It was submitted to the Scottish Ministers in July 2022 and reporters have been appointed to carry out an examination of issues raised which commenced in September 2022. Policy ED9 of LDP2 which relates to Renewable Energy remains largely similar to the current Policy.

2.7 Furthermore, in relation to NPF4, the Site is not located within either a National Park or National Scenic Area, which are the only areas where NPF4 states explicitly that proposals for wind farms will not be supported (Policy 11). Further details in relation to the planning policy context and compliance associated with the Proposed Development are set out in the **Planning and Energy Policy Statement** accompanying the application.

Site Feasibility and Selection

2.8 The Site was chosen by the Applicant for further investigation for its potential for wind development. The Proposed Development Site was selected in relation to the following:

- The Site has an excellent wind resource;
- The size of the Site allows for good opportunities to explore and provide habitat management and enhancement;
- There are no environmental constraints which cannot be avoided through careful design, however the presence of the Site within a locally designated landscape (Lammermuir Hills Special Landscape Area (SLA) formed a key consideration in the design process, as detailed below;
- Existing land use and the adjacent land (Fallago Rig Wind Farm) is compatible with the development of a renewable energy scheme;
- There is good access to the Site from the B6456 public road for construction traffic and turbine deliveries, alongside existing infrastructure such as the use of the existing Fallago Rig Wind Farm access tracks, reducing the need for new tracks, and the benefit of less habitat loss;
- The Site is at distance from main settlements, with the closest being the village of Westruther approximately 6 km to the south of the nearest proposed turbine;
- The distances from the nearest properties are such that noise limits and residential visual amenity threshold impacts can be avoided; and
- There is a feasible local electricity grid connection available.

The Design Strategy

2.9 The design strategy defines the overall approach to the design of the Proposed Development. It provides the starting point for the Proposed Development's design, and subsequent alterations to this design that were made in response to a number of

² Scottish Borders Council (2018) Scottish Borders Local Development Plan Supplementary Guidance: Renewable Energy. Available [online] at: https://www.scotborders.gov.uk/downloads/file/2757/renewable_energy_supplementary_guidance

considerations including landscape and visual amenity, cultural heritage, noise, ecological, ornithological, hydrological and geological (including with respect to peat) constraints and effects, together with wind yield and feasibility of construction.

2.10 The design strategy for the Proposed Development aimed to provide a balance between avoiding or minimising environmental effects where possible, creating a legible layout which relates to the landform and scale of the Site and surrounding area. The scale of the wind farm in relationship to other existing, consented and proposed wind farms in the Lammermuir Hills (including Fallago Rig Wind Farm) was a key consideration. Whilst the Proposed Development will have larger turbines than Fallago Rig, it was important to examine how the two would look together, and to design a layout /specify a candidate turbine for Dunside that seeks to minimise cumulative effects.

2.11 The design strategy was, importantly, influenced by landscape and visual considerations including landform, scale, land use (including cumulative wind farm context, notably Fallago Fig Wind Farm) and key visual receptors. These factors influence how the Proposed Development will be perceived by people within the surrounding area, and to what extent the landscape is capable of accommodating the Proposed Development. Achieving an optimal balance between renewable energy generation and effects upon cultural heritage assets was also a key consideration, together with achieving acceptable noise emissions at nearby properties and minimising effects on ecological and hydrological receptors and the Site's peat resource to the greatest feasible extent. The design strategy also comprised a number of design objectives which are set out below. The design of the Proposed Development has aimed to meet the guidance contained within NatureScot's Siting and Designing Wind Farms in the Landscape¹, as far as possible.

Design Objectives

2.12 The overarching objectives of the design strategy were as follows:

- To maximise the potential yield, lifetime and efficiency of the project by maintaining suitable spacing between turbines;
- To use latest wind turbine technology, consisting of fewer, more efficient and larger turbines where these can be reasonably accommodated within the landscape as supported by the Onshore Wind Policy Statement³ and NPF4;
- To select a maximum turbine blade tip height, and proportions that relate to the landscape scale of the Lammermuir Hills, as well as considering the existing Fallago Rig Wind Farm, and avoid having an overbearing dominance on the character of the Site and surrounding hills;
- To make use of natural topographical screening of turbines and other infrastructure in key views, where possible, such as views from the settled East Lothian farmland to the north of the Lammermuir Hills;
- To seek to develop a turbine layout which minimises effects on the special qualities of local and more distant designated landscapes, including the Lammermuir Hills, Lammermuir Moors SLA and Eildon and Leaderfoot NSA;
- To seek to limit the visual effects of turbine proposals on sensitive receptors including residents in nearby settlements such as Westruther and properties along the Dye Water Valley;
- To seek to minimise the horizontal spread of the Proposed Development, remove outlying turbines and minimise stacking, particularly in views from nearby residential properties and Twin Law Cairns on the Southern Upland Way;
- To use existing Fallago Rig Wind Farm tracks and grid connection where possible, to minimise the need for new infrastructure;
- To use available technology to minimise the effects of turbine lighting;
- To explore opportunities within the Site to restore and enhance the landscape and biodiversity; and
- To develop a layout that fulfils the above objectives whilst respecting other environmental and technical constraints including cultural heritage; noise; ecological, ornithological; hydrological and ground conditions (including peat) related constraints identified during the EIA process.

³ Scottish Government (2021) Onshore Wind Policy Statement Refresh 2021: Consultative Draft [online]. Available at: <https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2021/10/onshore-wind-policy-statement-refresh-2021-consultative-draft/documents/onshore-wind-policy-statement-refresh-2021-consultative-draft-28-october-2021/onshore>

2.13 During the design process, computer modelling was used as a tool to aid design. In particular, Zone of Theoretical Visibility (ZTV) models were generated and used to aid understanding of the extent of potential visual effects of the turbines both from viewpoints and nearby residential properties. Wireframes were generated to illustrate views from key locations around the Site, including consideration of Fallago Rig and other wind farms, and used to evaluate the design iterations and optimise the wind farm design. The effects of proposed lighting at night were also considered.

2.14 Minimising operational noise impacts and avoiding significant impacts on residential amenity were key design considerations. Throughout the design process, the layout of the Proposed Development was 'tested' in relation to noise limits and views from key locations, and the number of turbines and their locations were optimised to minimise adverse effects.

2.15 The main elements of the Proposed Development considered in the initial design iterations were the turbines. The locations of other infrastructure components were largely dictated by the positioning of the turbines and were designed around onsite environmental constraints. Later iterations to the turbine layout involved minor alterations to turbine and infrastructure locations, which were reviewed against all constraints. As an example, opportunities were taken to microsite turbine locations and reposition crane hardstandings, turning areas and access tracks in areas where detailed peat probing has identified deeper peat deposits, to minimise the likelihood of peat disturbance onsite, as well as to avoid more complex topography. The substation and battery storage are also located in the western portion of the Site, away from the closest visual receptors.

Design Principles

2.16 Based on a review of the Site and its landscape context and Scoping consultation responses, as well as advice contained in good practice guidance, including NatureScot's Siting and Designing Wind Farms in the Landscape, the following design principles were adopted and considered throughout the design process:

- Avoid dense clusters of overlapping turbines;
- Arrange turbines as far as possible to form an evenly spaced group or array when seen from key viewpoints;
- Avoid outlying turbines or stray tips which stand apart from the rest;
- Remove, relocate or amend the turbine tower height of turbines which appear more elevated than the majority in key views, and those which appear as outliers, and thus, disproportionately extend the horizontal spread of the turbines; and
- Through consultation, to design a reduced lighting scheme, which minimises landscape and visual effects associated with visible aviation lighting as far as possible. Further detail is provided in **Appendix 11.1: Wind Farm Aviation Lighting and Mitigation Report**.

Site Specific Design Principles

2.17 Following the identification of constraints and key issues identified through the EIA process and consultation, site specific design principles were identified and applied as part of the iterative design process. These included:

- Reduction in turbine height from 260 metres (m) to 220 m (as compared with the Scoping layout) to relate better to the scale of the underlying landscape and the scale of operational, consented and proposed wind farms in the surrounding landscape, and to minimise visibility from sensitive visual receptors including residents in Westruther;
- Removal or relocation of turbines in the south of the Site, to minimise effects on recreational receptors on the Southern Upland Way (including Twin Law Cairns) and minimise visibility from sensitive visual receptors to the south, including residents in Westruther;
- Removal or relocation of turbines in the north of the Site to reduce effects on residential receptors at Killpallet;
- To seek to minimise visual effects at the closest residential properties within the Site which will have views of the turbines, by applying a minimum 1.2 km buffer around properties, and considering their potential views in detail;
- To protect the amenity of residents of the closest residential properties in relation to operational noise from turbines;
- To seek to avoid physical interaction with heritage assets and to limit the intervisibility between the turbines and key cultural heritage assets;

- Removal of the closest turbines to the Mutiny Stones and improvements to the turbine and track layout to reduce effects on the setting of this Scheduled Monument;
- To avoid onsite constraints as far as possible, including hydrology (watercourses and private water supplies), deep peat, ecology, ornithology, archaeology, steep slopes, telecommunications links and other technical constraints;
- To strike a balance between maximising energy yield, minimising visibility from cultural heritage assets and maintaining a clear composition of the scheme in key views; and
- To explore and identify an aviation lighting scheme which both satisfies the requirements of aviation policy and minimises the visual effects of such lighting at nearby receptors.

Site Constraints

2.18 A number of technical and environmental constraints were considered in the iterative design process and have guided the positioning of both turbines and infrastructure. These are outlined below.

- Ecology: Avoidance of sensitive habitats; observing appropriate separation distances with respect to protected species and associated habitat features (including bats, otters and mountain hare, watercourses and key habitat features).
- Residential Properties: Maintaining a buffer around residential properties and considering views in detail to avoid breaching of the residential visual amenity, noise and shadow flicker limits as expected to be defined through the consents process.
- Cultural Heritage: Avoiding designated cultural heritage assets within the Site which are considered to be nationally important including Scheduled Monuments (in particular, the Mutiny Stones), and any known non-designated heritage assets within the Site.
- Hydrogeology and Peat: Maintaining a 50 m buffer where possible from watercourses, designing site infrastructure to minimise the number of new watercourse crossings. Avoiding construction in areas identified as likely Groundwater Dependent Terrestrial Ecosystems (GWDTEs) as well as areas of deep peat (>1 m) where possible.
- Topography: Avoiding steeper slopes or more complex topography where feasible to ensure constructability and minimising the need for significant cut and fill engineering works.
- Recreation: Turbines were removed from the initial layout to improve separation distance and views from the Southern Upland Way and Twin Law Cairns. Buffers around grouse butts were adopted in areas where recreational shooting takes place on the estate.

2.19 An illustrative constraints plan is shown in **Figure 2.4** to demonstrate the design process. This plan does not include all constraints that informed the design (e.g., confidential information on certain protected species) and is not presented at the level of detail at which certain constraints were reviewed. Furthermore, various key potential environmental effects of the Proposed Development, including landscape and visual effects, effects upon the settings of cultural heritage assets and effects on ornithology, could not influence design directly via constraints mapping. These effects influenced the design instead by iterative assessment (e.g., the generation of wireline visualisations).

The 'Do-Nothing' Scenario

2.20 The 'do-nothing' scenario can be considered as the existing site conditions, taking account of only clearly foreseeable changes over the lifespan of the Proposed Development. Effects were assessed relative to this baseline in each of the topic chapters. If the Proposed Development does not proceed, it is reasonable to assume that the management of the Site will continue as present, largely an area managed for sheep grazing and recreational shooting.

Site Infrastructure

Turbine Design

2.21 The selection of an appropriate scale of turbine (tower height and rotor diameter) was a key consideration. It was considered, early in the wind farm design process, that current commercial large-scale wind turbine technology of 260 m height

(as identified in EIA Scoping) to blade tip should be reduced to account for landscape and visual considerations. Various options were explored (see 'Project Design Evolution' section of this chapter) with the aim of maximising energy yield whilst minimising environmental effects where possible.

2.22 The proposed turbines will be three bladed horizontal axis turbines. The EIA is based upon a maximum blade tip height for turbines of 220 m, with worst case scenarios in terms of hub height and rotor diameter variations considered as required by other technical chapters. The worst-case candidate turbine which is assumed to inform assessments can differ across the EIA disciplines (for example noise, ornithology, transport etc.) therefore different candidate turbines may be specified in the relevant chapters of this EIA Report where necessary to inform assessments of effects.

Ancillary Infrastructure

2.23 The design of the access track layout was based on the following objectives, which fundamentally sought to balance environmental objectives by making the Proposed Development footprint as small as possible, whilst ensuring health and safety objectives for site working are maintained:

- To use existing access tracks as far as possible, minimising the necessity for new excavation;
- To facilitate safe access to each turbine, avoiding steep slopes, ground with potential instability and deeper areas of peat;
- Maintaining a 50 m buffer from watercourses where possible;
- Minimising the need for new watercourse crossings;
- To avoid protected species features and more sensitive habitats as far as possible;
- To keep overall new track length to a minimum, reducing stone requirements and associated potential environmental effects;
- To build health and safety aspects into track design from as early a stage as possible, including avoiding slopes which are too steep for access and creating clear definitions between turbine working areas and access tracks; and
- To follow the existing ground topography as much as possible, minimising the necessity for cut and fill engineering works and associated visual effects.

2.24 The infrastructure required was designed and arranged in such a way as to avoid the identified onsite constraints to the greatest feasible extent. Whilst the majority of the infrastructure layout was designed alongside the final turbine layout design, the location of some turbines was changed according to identified onsite constraints throughout the iterative EIA process. Elements such as the locations of crane hardstandings, borrow pits, substation and construction compound were also assessed for their potential effects throughout this process.

Project Design Evolution

2.25 The design strategy and principles outlined above have been taken into account as the design of the Proposed Development has evolved. The design process involved multiple workshops with environmental and technical team members to address potential constraints associated with one or more of the turbines or elements of the associated infrastructure. Each team member also summarised feedback from the relevant technical stakeholders as appropriate to the design process, and comments received through consultation with the local community and organisations were given due regard during the evolution of the project design. This design process and consideration of feedback is described in further detail below and shown in **Figures 2.1a-c and 2.2**.

2.26 It is noted that a meteorological ('met') mast does not form part of the Proposed Development.

Layout 1: Preliminary Layout

2.27 The preliminary layout (Layout 1) for the Proposed Development, comprising up to 20 turbines of up to 250 m to blade tip, was developed by the Applicant, and this was based largely on technical and operational efficiency criteria i.e., wind yield. The layout also took account of key landscape sensitivities as well as other wind farms (e.g., Fallago Rig). This layout represented the 'maximum development scenario' in relation to turbine numbers considered to be possible on the Site. All 20 turbines were located within the SBC administrative area.

Layout 2: Scoping Layout

2.28 Layout 2 (Scoping Layout) was based largely on technical and operational efficiency criteria of the maximum parameters for the purpose of identifying a robust scope for the EIA. Known high-level constraints such as watercourses and cultural heritage features were avoided in developing this layout. Turbine height was increased to 260 m with a maximum number of 20 turbines. Turbines were moved to improve separation distance from the existing Fallago Rig Wind Farm which is immediately to the west and to make sure all potential oversail areas remained within the confines of the Site boundary. This layout was presented in the EIA Scoping Report and at the first public exhibition.

Layouts 3 and 4: Interim Layouts

2.29 Following refinement to the design strategy, landscape and visual modelling, emerging findings of the EIA process (including field survey findings), engineering analysis and responses received at Scoping, there were a number of design iterations which sought to design out likely significant environmental effects. The main change between Scoping and the second public consultation (layout 5 below) involved the removal of 3 turbines (T5, T14, and T15) to increase separation from the Southern Upland Way (including Twin Law Cairns) and retain a 1.2 km buffer with properties at Byrecleugh. T4 was moved to reduce visibility from the property at Killpallet. Other changes included the movement of turbines to optimise the layout and address onsite constraints, such as:

- The consideration of views from the Mutiny Stones Scheduled Monument;
- Moving turbines to improve views and reduce visibility from nearby residential properties;
- Moving turbines to improve spacing and separation distances; and
- Composition of layout from key design viewpoints.

2.30 The maximum blade tip heights of all turbines were also reduced to 220 m to reduce the prominence of turbines in key views and to better reflect the underlying landscape scale and scale of neighbouring Fallago Rig Wind Farm (see **Table 2.1** below). These changes were captured in Layouts 3 and 4. These changes were reviewed from a landscape and visual perspective to ensure that the magnitude of visual effect would not increase at key viewpoints.

Layouts 5 – 12: Interim Layouts

2.31 Following Layout 4, T7 was removed on heritage grounds due to its proximity to the Mutiny Stones. Layout 5 was presented at the second round of public exhibitions and comprised 17 turbines with a maximum height of 220 m. Following the public exhibitions, there were a number of further design iterations resulting in Layouts 6 – 12 which saw iterations of the removal and reinstatement of T4 and T10. These involved various adjustments of largely similar layouts to review and improve the design to take account of environmental considerations associated with layouts comprising 15 and 16 turbines. The principal changes between layout 4 and layout 12 included the removal of four turbines:

- The removal of T4 and T7 on heritage grounds (proximity to Mutiny Stones);
- T10 was removed due to landscape and visual constraints. This allowed for other turbines in the south of the layout to move west, which helped to improve the composition of the layout in views from Twin Law Cairns and Westruther; and
- T8 was removed to enable improved inter-turbine separation in the north of the Site, whilst also improving views from key visual receptors.

2.32 Turbine numbering was amended between layout 11 and layout 12 to align to the number of turbines in the layout following removal of turbines through the earlier iterations.

2.33 Other minor changes were made to some turbine locations, primarily to improve spacing and thus turbine performance, avoid areas of peat identified in the phase 2 surveys, and to maintain separation from existing shooting areas where practicable. Layout 12 was presented in the Gatecheck 1 Report.

Layout 13: Final Layout

2.34 A number of design iterations took place between Layout 12 and Layout 13, the final Layout. This included the consideration of locations for supporting infrastructure and access tracks, after taking into consideration the environmental constraints identified, including those associated with hydrology and peat, landscape and visual amenity and ornithology.

2.35 The final layout has taken account of the full range of design objectives described above considered in balance with each other and has taken into account all relevant detailed desk and field-based information, onsite constraints and sensitivities identified through the developing EIA process.

2.36 A summary of the modifications made to the turbine layout is provided in **Table 2.1** and shown in **Figures 2.1a-c and 2.2**. These modifications have been made in response to the design strategy and site-specific design principles.

2.37 A selection of wireframes to illustrate design progression between the Scoping layout (Layout 2) and the final turbine layout (Layout 13) are shown in **Figures 2.3a-c**.

Table 2.1: Modifications to Design

Layout	Details	Changes to Previous Layout and Outcome
Layout 1	Turbines: 20 Blade Tip Height: 250 m	N/A
Layout 2 (Scoping and shown at first public exhibition)	Turbines: 20 Blade Tip Height: 260 m	Variation to Layout 1. Turbines moved to increase separation distance from Fallago Rig wind farm turbines and ensure they are located within Site boundary. 50 m buffer from watercourses applied. Considerations to residential visual amenity at Killpallet and Byrecleugh. Consideration to appearance of project in relation to existing wind farm as seen from the Southern Upland Way and Twin Law Cairns.
Layout 3	Turbines: 17 Blade Tip Height: 220 m	Variation to Layout 2. T4 – moved SW to reduce visibility from Killpallet and therefore reduce effects on residential visual amenity. T5 – removed due to proximity to Southern Upland Way and to improve the layout including in views from Twin Law Cairns and Westruther. T9 – moved north away from Mutiny Stones. T14 – removed to reduce effects on residential visual amenity – within 1.2 km buffer of Byrecleugh and prominent from this group of properties. T15 – removed due to proximity to Southern Upland Way and to improve the layout including in views from Twin Law Cairns and Westruther. T20 – moved west out of 1.2 km residential buffer to reduce effects on residential visual amenity. Other turbines – minor changes to position to improve spacing / separation or composition of layout from key design viewpoints. Maximum blade tip height reduced from 260 m to 220 m to reduce effects on visual receptors and to relate to the landform and scale of the Site and surrounding area. The scale of the wind farm in relationship to other existing, consented and proposed wind

Layout	Details	Changes to Previous Layout and Outcome
		farms in the Lammermuir Hills (including Fallago Rig Wind Farm) was a key consideration.
Renumbering of turbines (1-18) following removal of T5, 14 and 15 ⁴		
Layout 4	Turbines: 18 Blade Tip Height: 220 m	Variation to Layout 3. This layout considers the separation distances of Fallago Rig Turbines (6 x 4) and a new separation distance for the Proposed Development turbines (5.5 x 3.5). Inclusion of one additional turbine to the layout.
Layout 5 (Shown at second public exhibition)	Turbines: 17 Blade Tip Height: 220 m	Variation to Layout 4. This layout removes T7 on heritage grounds (proximity to Mutiny Stones) and other turbines tweaked to improve separation for wind yield.
Layout 6	Turbines: 14 Blade Tip Height: 220 m	Variation to Layout 5. T4, T8 & T10 removed to improve separation distance from Fallago Rig – moving remaining turbines southwards.
Layout 7	Turbines: 15 Blade Tip Height: 220 m	Variation of layout 5/alternative layout to Layout 6. T10 – removed due to L&V constraints, allowing other turbines in the south of the layout to move west, which helped to improve the composition of the layout in views from Twin Law Cairns and Westruther. T8 - removed due to lack of space in north of the Site when other turbines move eastwards. Turbine separation distance between Fallago Rig turbines adjusted to match those at Dunside WF (5.5 x 3.5 ⁵ 172 m rotor diameters)
Layout 8	Turbines: 16 Blade Tip Height: 220 m	Variation of layout 5/alternative layout to layout 6 and 7. An alternative design to 7, this design retains T4 and T10, with T8 removed. The separation distances used at Fallago Rig (6 x 4) were used for the Proposed Development in this iteration.
Layout 9	Turbines: 15 Blade Tip Height: 220 m	Variation of layout 8. T4 - removed due to proximity to Mutiny Stones and to reduce the horizontal field of view occupied by turbines from locations along the Southern Upland Way, including Twin Law Cairns. Minor amendments to all turbine positions to improve separation.
Layout 10	Turbines: 16	Variation of layout 8/alternative layout to layout 9 with T4 retained. Minor amendments to all turbine positions to maintain suitable separation.

⁴ Please note that this change was not reflected in the gate check 1 report.

⁵ Turbine separation distance is required to minimise wake and turbulence and ensure manufacturer warranty; calculations based on rotor diameter x rotor diameter.

Layout	Details	Changes to Previous Layout and Outcome
	Blade Tip Height: 220 m	
Layout 11	Turbines: 15 Blade Tip Height: 220 m	Variation of layout 8/alternative layout to layout 9 with T10 removed due to proximity with Fallago Rig. Minor amendments to all turbine positions to maintain suitable separation.
Renumbering of turbines (1-15) following removal of T10		
Layout 12	Turbines: 15 Blade Tip Height: 220 m	Variation to Layout 11. T6 - moved north-east away from steeper ground. T8 - moved south, slightly uphill and away from grouse butts.
Layout 13 (Final layout)	Turbines: 15 Blade Tip Height: 220 m	Variation to Layout 12. T1 - nudged south east 20 m to avoid overlap with deep peat. T2 - moved slightly SW to avoid peat. Track leading from Turbine 14 to Turbines 13 and 15 realigned to avoid watercourse crossing. T13 - moved 120 m north to removed need for full size turning head with new track alignment. T4, T10 hardstanding mirrored. T7 hardstanding rotated anti-clockwise slightly to avoid peat. Turning head at T8 shifted south to avoid peat. T15 moved slightly east to move from deep peat.

Wind Farm Tracks

2.38 Access Tracks and other wind farm associated infrastructure were developed having regard to the location of wind turbines as per Layout 12. Minor updates were carried out prior to Layout 13, a product of the second design workshop which reflected the consideration of watercourse crossings, construction compounds and borrow pits. Amendments to the layout include:

- Watercourse crossing to north-west cluster moved to use existing crossing;
- Additional 3 m wide light-vehicle track provided between north-west and north-east clusters;
- Track to north-east cluster (past ByreCleugh) realigned to follow existing track (except section past Mutiny stones where a setback was applied) – temporary construction compound moved to suit;
- Start of track to north-east cluster moved north slightly to avoid crossing additional field boundary;
- Start of track to southern area realigned slightly (prior to construction compound) to avoid peat; and
- Track from T11 to T13/T15 realigned to avoid watercourse crossing and cross short stretch of deeper peat (floating track).

Design Conclusions

2.39 This chapter sets out the process undertaken to identify the Site and the design strategy, the design objectives and summarises the evolution of alternative layouts that were considered during the design of the Proposed Development.

2.40 The inherent nature of wind turbines as tall, modern structures means that the form of the Proposed Development as a whole is important, and a clear design strategy is necessary. The overall aim of the design strategy was to create a wind farm with a cohesive design that is sympathetic in form and scale to the surrounding landscape context (including existing wind farms), whilst achieving an appropriate balance between maximising renewable energy yield and minimising other environmental, community and technical effects. Seeking to achieve a carefully designed layout which seeks to minimise cumulative effects when considered with Fallago Rig Wind Farm and other consented and proposed wind farms within the Lammermuir Hills was also a key consideration.

2.41 The careful design of the layout of the proposed turbines and associated infrastructure, and the reduction in the number of turbines from 20 (Layout 1) to 15 (Layout 13), resulted in the avoidance or reduction of a number of potentially significant effects from the Proposed Development. Overall, as a result of the iterative design approach, the adverse effects of the Proposed Development have been minimised as far as is reasonably practicable. It is considered that the Proposed Development as presented in Layout 13 is the optimal layout for the Site taking cognisance of the key environmental constraints in the design process while maximising output, in line with NPF4. This layout forms the basis for the assessment of residual environmental effects in this EIA Report and a full description of the Proposed Development based on it is set out in **Chapter 3**.