Environmental Impact Assessment Report

Teindland Wind Farm

Volume 1

Chapter 3: Site Selection and Design Evolution

Document prepared by Envams Ltd for: Teindland Wind Farm Ltd

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Contents

3 SITE SELECTION AND DESIGN

3.1 INTRODUCTON

This Chapter of the Environmental Impact Assessment Report (EIAR) contains a consideration of alternatives and site selection process, and the design process and scheme evolution that led to the final design of Teindland Wind Farm (the Development) on land owned by Forestry and Land Scotland approximately 3 km north of Rothes, Moray (the Site).

This Chapter of the EIAR is supported by the following figures provided in Volume 2a: Figures:

- Figure 3.1: Environmental Designations;
- Figure 3.2: Main Onsite Constraints; and
- Figure 3.3a-d: Site Design Evolution.

3.2 SITE DESCRIPTION

3.2.1 Location and Characteristics

The Site is situated approximately 2.7 kilometres (km) north, at its closest point, from the centre of the village of Rothes, and 9.7 km southeast from the centre of Elgin. The Site comprises of active forestry land, centred on National Grid Reference (NGR) 329141, 854248. The Site covers an area of approximately 1,054 hectares (ha) with the location and extent shown on Figures 1.1 and 1.2. The boundary includes land which is under the control and ownership of Forestry and Land Scotland. The Site lies wholly within the administrative boundary of Moray Council (the Council).

The Site consists of coniferous forestry plantation, with an existing network of tracks facilitating forestry operations, as well as providing recreation opportunity. The surrounding area is characterised by further rolling hills featuring heathland, commercial woodland, and valleys of agricultural fields. The topography of the Site varies; ranging from 261 metres (m) Above Ordnance Datum (AOD) in the west of the Site, to 50 m AOD in the east of the Site. There are a number of named hilltops within the Site, including Hunt Hill (261 m AOD); Teindhall Hill (253 m AOD); and Hill of Orbliston (150 m AOD). There are a number of watercourses located within the Site, including Feith Burn, Burn of Garbity, Gawrie Burn; Sauchenbush; Whities Stripe; Henderson’s Well; and Cushely Burn.

The nearby major roads include the B9103 and the B9105, both of which are located to the east of the Site. The Site will be accessed from the B9103 using the existing public access point to the forest.

There are several settlements surrounding, the Site including (but not limited to):

- Rothes, located approximately 2.7 km south of the Site;
- Lhanbryde, located approximately 4.6 km north of the Site;
- Fochabers, located approximately 4.7 km northeast of the Site; and
- Elgin, located approximately 9.7 km northwest of the Site.

Public paths within 2 km of the Site are set out on the Moray Council website[1]. The Speyside Way, Fochabers to Craigellachie Core Path (CP-SW03) runs in a northeast direction beyond (east of) the river Spey approximately 1.3 km to the east of the Site boundary, and following the direction of the river from Craigellachi via Rothes and Boat ‘O Brig viaduct to Fochabers. Approximately 1.3 km north of the Site, east of the B9103, Core Path CP-EG52 runs in northwest direction towards Lhanbryde. There are a number of smaller Core Paths located in and around Rothes and Fochabers.

Further details on nearby core paths and other recreational routes can be found in Chapter 14: Socio-Economics, Land Use, Recreation and Tourism.

[1] Moray Council (2025). Moray Core Paths. Available at: https://www.morayways.org.uk/moray-core-paths/ [accessed on 13/04/2025].

3.2.2 Land Use

The Site comprises active coniferous forestry plantation.

The land is used for the production of coniferous forestry, including areas of research plots. There are well established tracks throughout the Site. These tracks facilitate the operation of the forestry works, but are also used recreationally by the public.

As detailed in Section 3.2.1 above, there are no core paths within the Site, however there is a network of forestry paths within the Site which also serve as informal recreational routes.

3.2.3 Designations

There is one SSSI within the Site, Teindland Quarry, located in the north of the Site, as well as a number of designations surrounding the Site, as shown on Figure 3.1: Environmental Designations.

Where appropriate, Chapter 6: Ecology and Chapter 7: Ornithology of this EIAR discuss the ecological designations which are of relevance to the Development.

There are 11 Sites of Special Scientific Interest (SSSI) within 10 km of the Site. These include:

- Teindland Quarry, located within the Site;
- River Spey, located 2.0 km east from the Site;
- Coleburn Pasture, located 2.4 km northwest from the Site;
- Dipple Brae, located 3.0 km northeast from the Site;
- Loch Oire, located 3.5 km north from the Site;
- Gull Nest, located 4.2 km southwest from the Site;
- Lower River Spey, located 4.9 km northeast from the Site;
- Scaat Craig, located 4.9 km west from the Site;
- Buinach and Glenlatterach located 7.3 km west from the Site;
- Spey Bay, located 8.4 km north from the Site; and
- Tynet Burn, located 9.4 km northeast from the Site.

There are 16 Scheduled Monuments located within 10 km of the Site, the closest of which is the Church of Dundurcas, old parish church, located 1.3 km south of the Site.

There are nine Listed Buildings within 1 km of the Site, with a cluster of six directly adjacent to the east of the Site. These are made up of four B listed buildings and two C listed buildings. The closest A listed building to the Site is the Boat of Brig Tollhouse, located approximately 940 m southeast of the Site.

The Site itself is not subject to any national landscape designations intended to protect landscape quality or scenery. Part of the Site is, however, located within The Spey Valley Local Landscape Area (LLA). The closest national landscape designations to the Site are the Blackhills House Garden and Designated Landscape (GDL) located 2.1 km northwest of the Site, The Gordon Castle GDL located 4.4 km northeast of the Site, and the Fochabers Conservation Area located 4.4 km northeast of the Site.

A full list and detailed description of the landscape designations within proximity to the Site can be found in Chapter 5: Landscape and Visual Impact Assessment.

3.3 SITE SELECTION

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. The main factors are:

- Suitable high annual mean wind speed across the Site;
- Viable potential grid connection;
- Suitable and proven port of delivery and road access for the delivery of large components;

- Suitable road access;
- Sufficient distance from the nearest residential properties to ensure compliance with appropriate noise limits, as well as to reduce adverse residential visual amenity and shadow flicker effects;
- Limited theoretical visibility of wind turbines from densely populated areas;
- Limited peat on site; and
- The Site does not support any international or national ecological or landscape designations.

Forestry and Land Scotland (FLS) are the landowners of the Site, and identified the Site as potentially suitable for wind farm development through their own initial review process. The Site was one of many sites from FLS' portfolio that was proposed to developers and, following a review of the Site against the above factors, the Applicant agreed with FLS to progress wind farm development at the Site.

3.4 LAYOUT DESIGN

The purpose of a wind farm development is to harness the power in the wind to generate electricity. The optimum design is therefore to locate wind farms in areas exposed to the highest windspeeds, with turbines located in the optimum position. However, this does not take into account the potential environmental effects of a wind farm. The design of a wind farm must therefore be a balance between achieving an acceptable level of adverse environment effects and maximising energy yield. In addition to these factors, the technical limitations of constructing a wind farm must also be considered in the design stage.

The optimum layout of a wind farm is based 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. The following additional criteria must also be considered in the design of a wind farm:

- Wind speed;
- Prevailing wind direction;
- Existing infrastructure;
- Topography;
- Ground conditions;
- Local environmental issues and constraints; and
- Landscape and visual and cultural heritage considerations, relating to potential views of the wind farm.

The identification of environmental effects is an iterative process, running in tandem with the design process. As environmental effects and sensitivities are identified, the layout of the development undergoes 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 EIAR. This layout represents the optimum fit within the technical and environmental parameters of this Development.

In addition to the turbines, the other elements of the Development which have been designed to minimise environmental effects include: the access tracks, crane hardstanding areas, temporary construction compound, the substation compound, and 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.

3.4.1 The Design Strategy

The approach to the design of the Development has considered, wherever possible, an approach and design that includes all of the following:

- Maximising the renewable energy generation capacity;
- Minimising the number of watercourse crossings;
- Maximising the use of existing tracks;
- Optimising the layout with respect to wind resource and environmental constraints;
- Optimising the layout with regard to topography;
- Limiting the number of turbines visible at key locations; and

- Limiting the overall visibility of the wind farm as much as possible.

Constraints were identified through desk study, site survey and analysis including consideration of the responses received from consultees during the early stages of the EIA process. 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 landscape. Wind farm layouts are designed to balance aesthetics from key viewpoints, taking account of landscape character types and the topography at and around the site, in accordance with the "Siting and Designing Wind Farms in the Landscape"[2] produced by Scottish Natural Heritage (now NatureScot);
- 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 and the perceived interaction between these e.g., sightlines;
- Proximity to noise sensitive receptors;
- Presence of peat; and
- Ground conditions and topography.

The principles of the design strategy were 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 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. These constraints areas are shown in Figure 3.2. This led to a comprehensive process of constraints mapping. This EIAR and its conclusions constitute the outcome of the application of the design principles adopted for the Development.

Embedded mitigation (layout changes, and use of control documents) was used to minimise any predicted environmental effects, and where applicable to a specific technical assessment, such mitigation is detailed in the relevant chapter within this EIAR. 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.

This approach is consistent with the mitigation hierarchy set out in the Scottish Government's National Planning Framework 4[3]. In achieving this, there is a balance between the beneficial effects of a wind farm on climate change (as assessed in Chapter 10 of this EIAR) and the potential adverse effects on other aspects of the environment. In optimising this balance, the aim was to maximise renewable energy generation whilst reducing adverse environmental effects to a level expected, based on case history across Scotland, to be acceptable in planning terms. Where adverse environmental effects could be reduced further than this, without affecting the renewable energy generation capacity, they were.

3.4.2 Site Specific Environmental Constraints and Design

3.4.2.1 Landscape and Visual

Turbines layout design sought to concentrate turbines within the central part of the Site and set them back from the northern and eastern edges of the site to reduce the proximity and mitigate visual impacts on the adjacent Spey Valley. Achieving this would also reduce proximity to areas of more complex landform and landcover and, in more distant views from the north, provide a greater degree of separation from landforms which form the more distinctive aspects of skylines in these views – notably Ben Aigan, Ben Rinnes and Brown

[2] NatureScot (2017). Siting and designing wind farms in the landscape - version 3a. Available at: https://www.nature.scot/doc/siting-and-designing-wind-farms-landscape-version-3a [accessed on 13/04/2025].

[3] Scottish Government (2024). National Planning Framework 4. Available at: https://www.gov.scot/publications/national-planning-framework-4/ [accessed on 13/04/2025].

Muir. Further detail on resulting landscape and visual effects is provided in Chapter 5: Landscape and Visual.

3.4.2.2 Archaeological and Cultural Heritage Features

Minimising and avoiding changes to setting that may affect the cultural significance of designated heritage assets was an important driver in the design process.

Archaeological constraints were provided prior to design enabling direct physical construction impacts to be avoided through the design process. There are no designated heritage features within the Site boundary, and non-designated features were avoided by proposed infrastructure wherever practicable, preserving these features in situ.

Setting effects were considered through the design process. Alternative turbine layouts did not give rise to materially different effects on the setting of heritage assets, so no changes were required specifically in this respect. Effects on the settings of heritage features generally benefited from the changes made to the layout for landscape and visual reasons (see Section 3.4.2.1, above.

Further information about heritage assets is provided in Chapter 8: Archaeology and Cultural Heritage.

3.4.2.3 Ecological Features

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:

- Habitat surveys (National Vegetation Classification, Groundwater Dependent Terrestrial Ecoystem, and Fish); and
- Protected species surveys (bats, otter, red squirrel, water vole, badger, pine marten, wildcat) and incidental observations were made of common reptiles and wood ant nests during other surveys.

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.

The results of the Phase 1 Habitat and NVC surveys are provided in TA A6.1. This data has been analysed and interpreted highlighting two elements within the overall habitat assemblage that are of local or greater nature conservation importance:

- Woodlands of Long-Established of Plantation Origin (LEPO) (Class 2b); and
- Peatlands and related habitats.

The results of the protected mammal surveys are provided in TA A6.2. This data has been evaluated and identified the following species as being of local or greater nature conservation importance:

- Otter;
- Pine marten;
- Red squirrel;
- Wildcat; and
- Badger.

Best practice, as detailed within Chapter 6: 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 Chapter 16: Summary of Mitigation. The final layout was informed by the aforementioned surveys, which ensured that the Development avoided the most sensitive habitats.

Ecology effects are assessed within Chapter 6: Ecology.

3.4.2.4 Ornithological Features

Ornithological desk studies have been supplemented by 2 years of field survey of the Site, including:

- Vantage Point (VP) flight activity surveys;
- Adapted Moorland Breeding Bird Survey;

- Breeding Schedule 1 raptor searches;
- Black grouse searches; and
- Capercaillie Habitat Suitability Assessment.

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.

Ornithology effects are assessed within Chapter 7: Ornithology.

3.4.2.5 *Peat*

Peat depth surveys were undertaken across the Site, through which it was established that the majority of the Site was not underlain with deep (> 0.5 m) peat. Isolated, and limited, pockets of 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 locations with shallower peat were used in preference, as far as practicable. Detailed Phase 2 peat probing was undertaken in specific locations where deep peat was identified, to allow design away from such areas as far as practicable.

Further information on peat is contained within Technical Appendix A12.1: Peat Assessment and Peat Management Plan.

3.4.2.6 *Water Environment*

During the EIA process desktop and site surveys were carried out to inspect and identify all water features including public and private water supplies (where accessible) within the study area.

As detailed in Section 2.2.1 of this Chapter, there are a number of watercourses within the Site.

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

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 six existing watercourse crossings (where track widening or structural upgrades are required) and two new watercourse crossings.

During the EIA process, desktop and Site surveys were carried out to inspect and identify properties served by a Private Water Supply (PWS).

The aim of the 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.

Further information on the water environment can be seen in Chapter 12: Hydrology.

3.4.2.7 *Noise Sensitive Receptors*

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.

A background noise survey was carried out at properties close to the Site, which would be suitable for use as representative of other residential properties in the area. The data from this survey was used to set noise limits, in accordance with guidance, against which predicted noise levels from the turbine layout could be assessed.

Each key 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 would not breach the noise limits.

A noise assessment is presented in Chapter 9: Noise.

3.4.2.8 Forestry

In accordance with the Control of Woodland Removal Policy[4], impacts on trees were minimised. The principal reasons that the Development proposals affect trees are:

- To widen the Site access point and tracks and the cleared area around them to facilitate their use by wind turbine delivery vehicles and construction traffic;
- For the construction of wind turbines, with crane hardstandings and key-hole gaps in the trees to minimise effects on bats; and
- For the construction/storage compound, substation compound and BESS area.

As the Site is a commercial conifer forest, trees in one block are generally of the same age. Where the trees in a block are mature, the trees at the edge can become "wind firm", where the trees in the middle are not. Consequently, cutting into a block such as this can cause 'wind blow' of the trees within the block, which would be an indirect impact on trees. Blocks such as this were identified through examination of desk-based and field survey data, and were avoided through the design process as far as practicable.

3.4.3 Site Specific Technical Constraints

3.4.3.1 Wind Resource

Wind resource can be affected by various site characteristics, such as the prevailing wind direction, and local topography. As a rule, the more elevated areas of Site have the greatest wind resource and taller turbines increase access to the higher wind resource, and this must be balanced against the landscape and visual effects that may arise at higher elevations.

3.4.3.2 Turbine Spacing

The spacing of the turbines is a key consideration in wind farm layout design; turbines need to be arranged a minimum distance apart such that turbulence from a specific turbine does not unduly affect the operation of a turbine which is downwind. The spacing is directly proportional to the size of the wind turbine rotor, whereby the larger the rotor the larger the spacing between turbines, and the fewer turbines that may be accommodated within a specific area.

The spacing chosen for the Development has been selected based on modelling assumptions and is designed to maximise the energy yield from the Development.

3.5 SITE ACCESS

Access to the Site will be taken from the B9103 in the north of the Site, as shown in Figure 4.1.

Further details on access to the Site are provided in Chapter 11: Traffic and Transport.

3.6 DESIGN EVOLUTION

The final layout as presented in Chapter 4, Development Description, of the EIAR has been the subject of a number of iterations and refinements which sought to avoid or minimise predicted adverse effects as far as reasonably practicable 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.

Whilst the Development went through numerous design iterations, a selection of the key turbine layout design iterations are described below and are shown in Figures 3.3a through to 3.3d which demonstrates how the layouts have evolved throughout the EIA process.

Each of the turbine layout iterations was devised based on the following technical parameters and constraints detailed below:

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[4] Forestry Commission Scotland (2009). The Scottish Government's Policy on Control of Woodland Removal. Available at: https://www.forestry.gov.scot/publications/285-the-scottish-government-s-policy-on-control-of-woodland-removal [accessed on 13/04/2025].

- Minimum turbine spacing/separation of approximately 5 times the rotor diameter in line with the prevailing wind direction (i.e., southwest) and 3 times the rotor diameter across the prevailing wind direction;
- A hard constraint of 50 m buffers around the banks of watercourses for turbine locations, including the turbine foundation and hardstanding. To achieve this, a 70 m buffer of watercourses was applied in design (Figure 3.2);
- A hard constraint to avoid all known archaeological records (Figure 3.2);
- A hard constraint to avoid all known important ecological features, including schedule 1 raptor nest sites (not shown on Figure 3.2, to maintain confidentiality of these sensitive locations);
- A hard constraint of 1 km buffers around the residential properties for turbine locations (Figure 3.2);
- A hard constraint (not mappable) to reduce residential visual amenity to a level that would be acceptable, based on previous experience;
- An aim to minimise turbine locations in deep peat (> 0.5 m); and
- An aim to achieve a balanced visual composition that respects the original design objectives.

3.6.1 Layout Design Iterations

Table 2.1 details the key design iterations that have taken place throughout, from Scoping through to the final design as described in Chapter 4. These design iterations can be seen in Figures 3.3a-3.3d.

Table 2.1 Layout Design Iterations

Layout	Number of Turbines	Design Notes
Scoping Layout	17 turbines of up to 230 m tip height	Initial feasibility based on preliminary environmental and technical considerations (desk-study only).
Pre-Design Chill	13 turbines of up to 230 m tip height	The location of turbines was informed by a number of factors, including: • Avoiding oversail of the Site boundary; • Maintaining the required turbine spacing; • Avoiding land within 70 m of watercourses; • Avoiding buffer zones of ornithological receptors (nests of schedule 1 raptor species); • Avoiding direct impacts on heritage features within the Site; and • Avoiding locations within 1 km of residential properties, as an indicative constraint against noise effects.
Design Chill	12 turbines, 8 x 230 m tip height 4 x 200 m tip height	The Design Chill layout incorporates infrastructure elements not present on the Pre-Design Chill Layout, including a construction compound, substation, and BESS. The turbine layout was also amended following a design meeting, in which constraints and views of the turbines were considered. This included the following: • T4 from the Pre-Design Chill layout was removed as this was not covered by the viewshed areas of the ornithology surveys; • Removing infrastructure that would require partial felling of trees in mature forestry blocks where possible; • Optimising views of the turbines from key viewpoints, seeking to achieve a balanced design; • Reducing residential visual amenity effects to a level considered likely to be acceptable; and • Given the changes in turbines for the reasons above, other turbines were relocated in order to maintain

Layout	Number of Turbines	Design Notes
		compliance with the aims of the previous design iteration (see the row above this).
Design Freeze	12 Turbines, 8 x 230 m tip height 4 x 200 m tip height	The frozen design differs from the chilled design in the hardstanding orientation around T2, which was amended to remove the hardstanding from the 50 m watercourse buffer of Cushley Burn. The BESS and Substation Compound orientations differs slightly, being moved c. 70 m to the west to minimise potential visual impacts in views from the east. The track orientation around the BESS and Substation compounds were also amended allowing a secondary access to the BESS compound for safety reasons (see Chapter 15: Other Issues). A meteorological mast was also included in the frozen design, with associated guy wires and access tracks. The turbines were re-numbered, so that they ran from 1 to 12, and were ordered in sequence they would be experienced in, starting from the Site access point.

3.7 SUMMARY

Various technical and environmental factors were considered in the iterative design process. These were informed through a variety of baseline surveys and consultation with a range of stakeholders.

The final turbine layout and associated infrastructure assessed in this EIAR has been carefully developed taking these factors into account and is considered to balance the requirement to increase the renewable energy generation capacity of the Site whilst minimising the introduction of new environmental effects.

The final Development turbine layout and associated infrastructure is described in Chapter 4: Development Description and shown on Figure 4.1.