2 PROPOSED DEVELOPMENT

2.1 Introduction

2.1.1 This chapter establishes the need of the Proposed Development, outlines the reasonable alternatives considered in the iterative design process, and provides a comprehensive overview the main design elements and features of the Proposed Development evaluated through the EIA process.

2.1.2 This chapter is supported by the following figures, presented in **Volumes 2a** of the EIA Report:

- **Figure 2.1**: Site boundary;
- **Figure 2.2**: Site Layout;
- **Figure 2.3**: Design Iterations;
- **Figure 2.4**: Site-specific Environmental and Design Constraints;
- **Figure 2.5**: Indicative Turbine Elevations;
- **Figure 2.6**: Indicative Turbine Foundations;
- **Figure 2.7**: Typical Turbine Hardstanding;
- **Figure 2.8**: Cable Trench Details;
- **Figure 2.9**: Indicative Track Details;
- **Figure 2.10**: Indicative Construction, Mobilisation, and Substation Compound Plans; and
- **Figure 2.11**: Indicative Substation Building Elevations;

2.1.3 This chapter is supported by the following technical appendices, presented in **Volumes 3** of the EIA Report:

- **Technical Appendix 2.1**: Outline Construction Environmental Management Plan (oCEMP); and
- **Technical Appendix 2.2**: Schedule of Environmental Commitments;
- **Technical Appendix 2.3**: Gatecheck Report.

2.1.4 The supporting figures and technical appendices provide further information and are referenced throughout the chapter.

2.2 Need for Development

2.2.1 The UK and Scotland's current climate change ambitions are amongst the highest in Europe. The Scottish Government declared a climate emergency in May 2019 and the amendments to the Climate Change (Scotland) Act 2009 passed into law require a 100% reduction in CO_2 emissions by 2045. Since the June 2024 statement to the Scottish Parliament, the Climate Change (Emissions Reduction Targets) (Scotland) Act 2024 has been introduced, which sees Scotland move away from the previous annual GHG reduction targets to a system

whereby limits on the amount of GHG emitted in Scotland over a five-year period are established, known as carbon budget targets.

2.2.2 Looking to 2030, the Scottish Energy Strategy target for 50% of total energy demand (including from heat and transport) from renewable sources implies a further substantial increase in delivery of renewable energy. As such, the Scottish Government has encouraged all forms of renewable and low carbon solutions for meeting these energy targets.

2.2.3 The Scottish Government's Onshore Wind Policy Statement (2022) recognises both the continuing important role of onshore wind and the challenges it now faces in a subsidy-free environment.

2.2.4 Further detail relating to the Energy Strategy, Onshore Wind Policy Statement and ongoing demand for renewable energy generation is provided in the separate Planning Statement accompanying the application.

2.3 Development Description and Surrounding Land Uses

2.3.1 The Proposed Development is the Millennium East Wind Farm, a proposed extension to the existing Millennium Wind Farm, located approximately 7.5 km west of Fort Augustus, 8 km north of Invergarry, and 14 km south-west of Invermoriston. The Site Boundary of the Proposed Development is shown in **Figure 2.1**. Parts of the existing Millennium Wind Farm (wind turbines, access tracks, and other ancillary infrastructure) are located within the Site Boundary.

2.3.2 The Site sits within broadly undulating upland moorland, gently sloping downwards from southwest to northeast. The elevations of the Site range from 670 m Above Ordnance Datum (AOD) at the mid-western section of the Site, to the Site access junction by A887 at 129 m AOD.

2.3.3 The twenty-six wind turbines of the operational Millennium Wind Farm are arranged in three arrays, at elevations ranging from 460 m AOD to 700 m AOD – see **Photographs 2.1** and **2.2** overleaf.

Photograph 2.1: View of the operational Millennium Wind Farm[7]

Photograph 2.2: Alternative view of the operational Millennium Wind Farm[8]

[7] Source: https://www.greatglen.coop/

[8] Source: https://community.renantis.com/2016/05/12/millennium/

2.3.4 Site access is currently gained by an existing access track leading to the operational Millennium Wind Farm, running southwards from the A887.

2.3.5 As well as being used for the generation of renewable energy, the Site is currently used for livestock grazing and deer stalking. Surrounding land uses also include upland grazing and commercial forestry.

2.4 Site Selection Rationale

2.4.1 The overall approach to the Site selection is to identify areas of land where the siting of renewable energy development would result in minimal environmental effects, be free from overriding technical constraints and be economically viable.

2.4.2 Sites for the development of renewable energy technology in Scotland are initially evaluated against the following policy and general design criteria, in no particular order:

- National Planning Framework 4;
- Development Plan policy;
- Landscape character;
- Distance from dwellings;
- Cumulative impact with other wind farm developments;
- Exposed sites with good wind speed;
- Feasibility of grid connection;
- Area topography, including gradients, exposure, watercourses and land use;
- Feasibility of access for abnormal indivisible loads (AIL); and
- Compatibility with aviation interests.

2.4.3 Rather than identifying new potential sites for large-scale renewable energy development, the Applicant focused on maximising the renewable energy potential of existing sites within their asset portfolio. This strategy prioritises utilising existing infrastructure to minimise anticipated environmental effects. By adhering to the mitigation hierarchy and the relevant policies outlined in this section, the Proposed Development seeks to effectively avoid, mitigate, and compensate for any expected impacts.

2.4.4 The Applicant's detailed knowledge of the Site, including an understanding of the wind resource and the condition of existing infrastructure, was a key factor in pursuing the Proposed Development. Further technical feasibility surveys and assessments subsequently confirmed the Site's suitability for the Proposed Development.

2.5 Consideration of Alternatives

2.5.1 According to the EIA Regulations (2017a), the EIA Report should include:

"a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment."

2.5.2 With respect to the Proposed Development, the alternatives considered were as follows:

- Different turbine and infrastructure layouts/locations within the Site;
- Different turbine heights/dimensions;
- Alternative technical design and construction options for infrastructure elements such as hardstandings, new track, etc.

2.5.3 The Proposed Development design and layout was adapted and altered in response to environmental constraints and consultation feedback. The Proposed Development went through a series of four major design iterations. Main changes to the layout included re-designing new track and supporting infrastructure, reducing turbine height to blade tip, and changing turbine positions.

2.5.4 Design layout iterations considered for the Proposed Development are included within **Section 2.6** of this chapter.

2.6 Design Evolution

2.6.1 As part of an iterative design process, the Proposed Development has undergone several iterations in response to emerging environmental and engineering considerations, including:

- Environmental constraints information based on desktop studies, followed by ongoing detailed surveys;
- Feedback received through the Council's pre-application service, the pre-application consultation pack and EIA scoping responses from statutory and non-statutory consultees;
- Detailed Zone of Theoretical Visibility (ZTV) analysis from key viewpoints;
- Detailed feedback received from technical specialists assessing the anticipated effects of the Proposed Development;
- Feedback received through the first round of public consultations undertaken in February 2024; and
- Technical design constraints relating to the infrastructure requirements for the Proposed Development.

2.6.2 The final layout design iteration of the Proposed Development, as shown in **Figure 2.2**, has been developed through four principal iterations of the layout as shown in **Figure 2.3**, while **Figure 2.4** provides more detailed environmental constraints information such as the Phase 1 and Phase 2 peat depth survey results, watercourses and watercourse buffers, bog pools and bog pool buffers, and demonstrates how the infrastructure placement has avoided these constraints.

Access Route

2.6.3 For the delivery of abnormal indivisible loads (AIL) components on Site, alternative ports of entry and delivery routes were considered by preliminary routing assessments.

2.6.4 The port of entry for turbine blades has been confirmed as the Port of Kyle of Lochalsh, while Corpach Harbour would be used for tower sections and other large project components. The routing of these components to the site will include sections of the A87, A887, A830, and A82.

Site Access

2.6.5 Access on Site, for both AIL deliveries and construction vehicles, would be from the A887, turning right on the existing Millennium Wind Farm access junction and stone surface track. To accommodate AIL truck and oversail requirements (based on the candidate turbine and swept path analysis), resurfacing works might be required along the A887 and at the existing junction, as shown on the indicative Site Access Arrangement **Figure 10.6**.

Turbine Layout and Associated Infrastructure Design Evolution

Design Layout A: Pre-application Consultation and Scoping Layout

2.6.6 This pre-application consultation and scoping layout was developed prior to any detailed site-specific surveys being completed. The layout was based on site information available at the time, including buffer distances from existing wind turbines on Site, and known technical and design constraints. The layout comprised eight turbines of 200 m to tip height, which represented the maximum physical capacity of the turbine area from a wind resource perspective prior to the confirmation of detailed on-site constraints. Design Layout A was submitted as the 'Scoping Layout' with the Scoping Report for the Proposed Development in January 2024. It was also used for the formal pre-application consultation with the Council, SEPA and NatureScot in February 2024.

Design Layout B: Preliminary Layout

2.6.7 Following the formal pre-application consultation meeting with statutory consultees and receipt of a Scoping Opinion from the Energy Consents Unit, feedback and advice received on Design Layout A was taken into consideration by the Applicant and design team. Supplemented by a landscape and visual appraisal and informed by early results of on-site surveys, Design Layout B evolved to mitigate design considerations of concern and associated potential effects where practicable.

2.6.8 Proposed turbine locations were moved closer to the operational Millennium Wind Farm turbines and its existing access track, presenting a more compact scheme, and minimising the length of new tracks required to gain access to proposed new turbines.

2.6.9 An alternative position for T7 (T07A as shown in **Figure 2.3: B**) was considered at that stage and assessed towards potential impacts on views from key viewpoints, and other key environmental and design considerations, including presence of peat, priority habitats, hydrological features, and other constraints.

Design Layout C: Chilled Layout

2.6.10 This layout was informed by a detailed engineering appraisal, further results of additional on-site surveys (including phase 2 peat and habitat condition surveys), as well as further landscape and visual appraisal. Preliminary locations for temporary and permanent ancillary infrastructure, including access tracks, crane hardstandings, substation, and a Battery Energy Storage System (BESS) compound, were incorporated in Design Layout C.

2.6.11 Based on Design Layout B, the Chilled Layout adjusted turbine positions to avoid key environmental and design constraints, including areas containing pockets of peat of greater than 1.0 m deep (based on Phase 1 and Phase 2 peat probing survey data), waterbody and watercourse buffers, steep slope gradients, and areas requiring excessive cut and fill.

2.6.12 The Phase 2 peat surveys established that the alternative position of T7 (T07A as shown in **Figure 2.3: B**) would result in significant volumes of excavated peat. Therefore, the position of T7, as shown in **Figure 2.3: C**, was preferred.

2.6.13 The turbine layout remained at eight turbines; however, following a revised landscape and visual appraisal and wind resource assessment, the tip heights of five turbines were reduced to 180 m. Changes to tip heights were made following landscape and visual impact advice, focusing on the topography of the Site, and anticipated effects on key viewpoints in the vicinity of the Proposed Development.

2.6.14 A location suitable for the deployment of substation and BESS compounds was identified east of T2 (as shown in **Figure 2.3: C**), on an existing hardstand to minimise ground disturbance. However given this would ultimately be permanent infrastructure and more widely visible to the surrounding area, this location was discounted in favour of a location that would be less visually prominent.

Design Layout D: Final Layout

2.6.15 Design Layout D, as shown in **Figure 2.3: D** and **Figure 2.2**, represents the final stage of the design layout iterations, which includes the final placement of turbine locations, substation compound, siting and design of ancillary infrastructure, and biodiversity enhancement areas.

2.6.16 Based on Design Layout C, and following additional survey work, including Phase 2 peat probing (gap-fill exercise) and detailed habitat condition survey, turbine positions, crane hardstandings, connecting access tracks and ancillary infrastructure, were amended and/or re-positioned to ensure that Proposed Development components would avoid key environmental and design constraints as far as practicable.

2.6.17 Following a site visit and subsequent consultations with the estate's manager and foresters, the following biodiversity enhancement measures were identified to form part of the Proposed Development:

- Native woodland planting;
- Peatland restoration;
- Riparian woodland planting; and
- Treatment of bracken.

2.6.18 The identified biodiversity enhancement measures would benefit both, the estate and wider local environment. Additional details, in relation to the identified areas and measures are included in the outline Biodiversity Enhancement Management Plan that is submitted with the s36 Application for consent, as **Technical Appendix 6.7**.

2.6.19 Individual assessment chapters in this EIA Report provide more detailed commentary on design inputs and respond to specific matters relating to that particular technical topic, in

particular pertaining to the scale of the proposed turbines and the landscape fit of the scheme.

Turbines

2.6.20 The turbine locations on Design Layout D remain the same as in Design Layout C, albeit with minor adjustments to the turbine positioning and crane pad orientations which were introduced following the additional Phase 2 peat probing surveys, to ensure that proposed infrastructure avoids deep peat as much as possible. Despite the minor adjustments, the revised and final positioning of proposed turbines has remained in line with the design principles and objectives as detailed in the **Design and Access Statement**, submitted with the s36 application for consent.

Battery and Substation Compounds

The Substation Compound was moved to the southern existing borrow pit, co-located with the borrow pit and required borrow pit extension, as shown in **Figure 2.2**. The new location was preferred, as the borrow pit edges would screen the substation and BESS from key viewpoints. This location would also ensure the use of existing infrastructure is maximised, while minimising ground disturbance. Further, the BESS identified in Layout C was removed from the Proposed Development, and a temporary construction compound was placed on the existing hardstanding by the proposed substation compound.

Access Tracks, Turning Points, and Junctions

2.6.21 The Final Layout facilitates the use of existing Millennium Wind Farm access track as far as practicable. New access track sections, turning points and junctions were re-designed to ensure that pockets of deep peat are avoided. Track sections that could not avoid areas of peat deeper than 1 m, due to design or other environmental constraints, would be floated. The sections proposed for floating track are shown in **Figure 2.2**.

Temporary Mobilisation Compound

2.6.22 A temporary mobilisation compound is proposed by the existing Millennium Wind Farm access junction, south of A887, as shown in **Figure 2.2**.

Temporary Construction Compounds

2.6.23 The main temporary construction compound was placed adjacent to the existing wind farm track, on an existing hardstanding east of T2, as shown in **Figure 2.2**. The western section of the compound encroaches a 50 m watercourse buffer, as shown in **Figure 2.4** and **Chapter 8: Hydrology, Hydrogeology, Geology and Peat**. Nevertheless, no excavation would be required at this section of the hardstanding to deploy the construction compound. In addition, no other construction activities that could impact the hydrological features of the Site would be permitted to take place at this section of the compound (e.g., refuelling, storage of fuels and oils, etc.). Appropriate commitments are included in the Schedule of Environmental Commitments of the EIA Report, submitted as **Technical Appendix 2.2**, so

that the hydrological features of the Site are safeguarded during the construction stage of the Proposed Development.

2.6.24 Two additional smaller temporary construction compounds are proposed on existing infrastructure on Site; one within the first and northern existing borrow pit at National Grid Reference (NGR) E336476, N810467, and the second on the existing turbine hardstanding of an operational Millennium Wind Farm turbine, located at NGR E228635, N808348.

2.7 Proposed Development

Key Components

2.7.1 The main components of the Proposed Development Infrastructure would comprise the following:

- Eight wind turbines of approximately 6.2 MW each, five with a maximum tip height of up to 180 m and three with a maximum tip height of up to 200 m;
- Foundations supporting each wind turbine;
- Onsite distribution sub-station and control building;
- Temporary mobilisation and construction compounds;
- A network of new on-site access tracks and associated watercourse crossings;
- A network of underground cables to connect turbines to a distribution substation;
- Borrow pit extension; and
- Habitat and biodiversity enhancement measures.

Wind Turbines

2.7.2 Grid references, maximum heights to tip, and ground-level AOD values for the proposed wind turbine locations are identified in **Table 2.1**.

Table 2.1: Proposed Turbine Locations

Turbine Number	Easting	Northing	Maximum tip height (m)	Ground Level AOD (m)
T1	227255	808475	180	645
T2	227860	808387	180	590
T3	228080	808985	180	592
T4	228643	808991	200	557
T5	229184	808831	200	538
T6	229866	808652	200	511
T7	230180	808302	180	510
T8	228619	809443	180	533

2.7.3 The proposed turbine locations and ancillary infrastructure would be subject to a maximum micrositing tolerance of 50 m in any direction. In those places where environmental features may be potentially affected by micrositing, tolerance would be constrained to less than 50 m, and such changes would be managed in consultation with an appropriately qualified and

experienced Environmental Manager or Environmental Clerk of Works (EnvCoW) during the construction phase of the Proposed Development. The micrositing constraints relevant to the Proposed Development are set out within each of the technical sections of this EIA Report. Any movement of the turbines from the Proposed Development layout outwith the micrositing tolerance would be agreed with the Council and would be in accordance with the mitigation set out in this EIA Report.

2.7.4 A summary of the environmental commitments is provided in **Technical Appendix 2.2: Schedule of Environmental Commitments.**

Wind Turbine Structure

2.7.5 It is proposed that there would be eight turbines of approximately 6.2 MW, within the Site. The candidate turbine considered for the Proposed Development and subsequently used for the EIA Report is the Siemens-Gamesa SGRE 155.

2.7.6 The height of the proposed turbines from the ground to blade tip would be a maximum height of up to 200 m. However, as shown in **Table 2.1**, five of the turbines would have a maximum height of up to 180 m.

2.7.7 The turbines would have an approximate indicative rotor diameter of 155 m. The final model and actual dimensions of the wind turbines selected for the Proposed Development would be influenced by the economic market and technological advances at the time of procurement. However, blade tip heights would not exceed the heights specified in **Table** 2.1. Indicative turbine elevations are shown on **Figure 2.5**.

2.7.8 The turbines would be three bladed, horizontal axis turbines with tubular towers. The blades would be made from reinforced composite materials such as fibreglass. The turbine towers would be made of steel.

2.7.9 It is anticipated that the steel turbine towers would be recycled at the end of their operational life. The potential to reuse, recycle, or recover materials from the fibreglass-reinforced polyester blades at the end of their operational life is currently limited. Potentially viable options for the treatment of turbine blade waste will be considered in detail prior to decommissioning of the proposed wind turbines. It is anticipated that at that point, technological options for the management of blade waste will have advanced sufficiently to enable the avoidance of disposal of turbine blades to landfill. Measures to adhere to relevant policies, in place at the time of decommissioning, will be incorporated in a detailed decommissioning plan that would be subject to review by the Council, and other interested parties prior to decommissioning.

Colour and Finish

2.7.10 The wind turbines would be of the same basic appearance and colour. It is proposed that the turbines would be of a matt grey colour finish. Although off-white has been an accepted colour for turbines, more recently constructed wind turbines have been a mid-grey tone, which reduces the distance over which turbines are visible, especially in dull weather or low light conditions. The choice of material and colour for the proposed turbines is an important

consideration in terms of visual impact. Finishing would be expected to be agreed by a condition placed on consent.

Turbine Foundations

2.7.11 Turbine foundations would be dependent upon Site-specific ground conditions at the turbine locations and the type of turbine chosen. However, it is envisaged that installation of the turbines using a steel reinforced concrete base (gravity foundation) would be suitable.

2.7.12 The concrete gravity foundations would be located underground. A quantity of earth would therefore need to be removed. The amount of earth to be removed would depend upon Site-specific ground investigations at each turbine location. Topsoil, peat and other material would be removed from the foundation area and stored so that it may be used later for reinstatement.

2.7.13 Turbine foundations would be set down to the depth of suitable bearing strata with an approximate diameter of 25 m and circular or octagonal shape (see **Figure 2.6**). Should geotechnical investigations demonstrate that the required bearing capacities are not achievable, a piled foundation design would be adopted using the same overall design footprint.

2.7.14 An anchor ring and foundation bolts would be cast into a central column onto which the turbine tower would be fixed. Concrete for the foundations would either be delivered to the Proposed Development in a “ready mix” form or processed in a concrete batching plant located on Site within a construction compound.

2.7.15 For the purposes of this EIA Report, a maximum (worst case) scenario of a 3– 4 m deep, 25 m by 25m circular or octagonal footprint foundation has been assumed. The concrete bases would be allowed to cure (reach their design strength) before turbines are fitted.

Turbine Lighting

2.7.16 Air Navigation Order Article 222 (2016) requires turbines exceeding a tip height of 150 m to display aviation lighting to indicate their presence. Dispensations for reduced lighting schemes can be agreed with the Civil Aviation Authority (CAA), according to the guidance provided in CAP-764 (2016). For the Proposed Development, the CAA has agreed to a reduced lighting scheme whereby only four of the eight cardinal turbines (that is turbines T1, T5, T7 and T8) require to be lit with visible lighting (2000 candela, reducing to 200 candela in good visibility) positioned on the hubs. Additionally Infra-red (IR) lighting would be installed on peripheral turbines to meet the requirements of the Ministry of Defence (MOD). Subject to the evolution of CAA policy, the Applicant would also consider the installation of an aircraft detection lighting system (ADLS) on the Proposed Development. This would switch on the visible lights only when an aircraft passes within specified horizontal and vertical distances from the wind farm.

2.7.17 Further information on aviation turbine lighting is provided in **Chapter 12: Aviation and Radar**.

Turbine Erection

2.7.18 The turbine components would be delivered to the relevant storage area for each component, whether it be to a specific turbine hardstanding or to a storage area located at one of the construction compounds, until weather conditions are appropriate for turbine erection. The bottom turbine tower section would firstly be fixed to the anchor ring and foundation bolts embedded into the central column of the foundations, followed by the upper turbine tower sections being crane lifted into place. The cranes would then lift the nacelle into place on the top section of the turbine tower. Blades would then be individually lifted and fitted to the rotor hub.

Turbine Hardstandings

2.7.19 Level hardstanding areas are required adjacent to each turbine base for the operation of a heavy lifting capacity crane, and a smaller service crane, used for assembly of the turbine components. They would also be used as storage areas for the turbine components. The hardstandings would be to the same general specification as the turbine access tracks that they adjoin, but a slightly greater depth of construction is envisaged.

2.7.20 It is anticipated that each hardstanding would be 50m x 20 m with a 5.5 m wide track running along the length of the hardstanding. Two blade fingers, each 20 m x 6 m, may be required on the track side of the hardstanding. The cut-and-fill batters on the hardstandings would be determined by detailed Site Investigation.

2.7.21 In addition to the hardstanding for the main assembly crane, up to two additional temporary crane pads may be required for crane assembly. These crane pads are shown on the Typical Turbine Hardstanding Arrangement drawing at **Figure 2.7**.

2.7.22 Each turbine supplier has their own hardstanding configuration, including associated laydown areas, working areas, crane pads and blade fingers. Therefore, the exact configuration of the hardstanding would not be determined until the turbine supplier has been chosen. However, for the purposes of the EIA, the worst-case scenario hardstanding arrangement has been chosen.

2.7.23 The hardstandings would be constructed using suitable surplus material generated from the excavation process elsewhere within the development area and from borrow pits where possible. Topsoil and peat would be excavated, and stone laid and compacted to the required depth. The depth of the hardstandings would be dependent on the ground conditions at each location.

Transformer Houses

2.7.24 Each turbine would be expected to have an associated transformer, located either internally or externally to the turbine. External transformers would be located within a weather-proof housing which would have indicative dimensions of 2m height by 1.5 m wide by 2 m deep. Transformer housing would be colour finished to blend in with the surrounding landscape.

Site Entrance and Access Tracks

2.7.25 The access route to turbines would be made up of a total of approximately 2.27 km of new and floating tracks from the access point off the A887 and existing wind farm access track.

2.7.26 The following principles have been applied as far as practicable in the design of the on-site access tracks:

- Tracks make use of existing infrastructure and track/disturbed ground where possible;
- Track length is kept to a minimum to reduce construction time, the requirement for stone, and land-take;
- Gradients are to be kept to acceptable levels to accommodate the requirements of delivery vehicles, and also to allow construction plant to move safely around the Site;
- Tracks are routed to avoid sensitive hydrological, ecological and archaeological features as far as practicable and to keep watercourse crossings to a minimum;
- Tracks are routed to avoid areas of deepest peat;
- Tracks are designed to minimise the required cut-and-fill quantities; and
- Horizontal and vertical alignments of tracks are designed in such a way as to comply with Turbine Supplier requirements, for example minimum turning radius and vertical curvature on both the tracks and hardstandings.

2.7.27 The access track would generally be unpaved (stone surface) and of 5.5 m running width, with a 1 m shoulder verge on either side and 2:1 side slope. The track could be up to 7 m wide on bends. The indicative access tracks design and cable runs are shown on **Figure 2.9** and **Figure 2.8**.

2.7.28 Turning heads and junctions of sufficient size to accommodate articulated vehicles would also be provided at several locations, as indicated on **Figure 2.2**. Some further widening would be necessary along the access track route to allow for passing places/temporary lay down areas, with the locations subject to detailed design post-consent although passing places have been indicated on **Figure 2.2**.

2.7.29 In general terms, the construction method would see topsoil, including peat, removed and stored adjacent to the construction area until required for reinstatement. The Outline Peat Management Plan (**Technical Appendix 8.3**) sets out options for reuse of the excavated material and provides guidance on management and handling of excavated peat and soils.

2.7.30 Excavations would continue to expose a suitable horizon or bedrock on which to construct the track.

2.7.31 The tracks would be constructed in layers, with a geo-textile membrane if required, overlain by a base of coarse stone, and subsequent layers of higher graded crushed stone. Each layer of stone would be compacted and shaped to provide a profile and surface finish of a quality suitable for the turbine construction vehicles. The estimated depth of stone forming the access tracks would be 600 mm, though the final thickness used would be dependent on local ground conditions and load capacity.

2.7.32 The requirements for access track drainage would be determined at detailed design stage and on-site during construction. The access tracks would have a suitable cross-fall to drain run-off and, where gradients are present, lateral drains would intercept any flow along the

road. The dimensions of the lateral drains would be matched to the estimated water flow and outlets would be suitably located with erosion protection as required.

2.7.33 Where ground conditions are of a permeable nature, swales would be utilised alongside the access tracks to allow natural filtering of surface water into the ground. Where areas are less free draining, land drains or drainage ditches would be installed as topography and ground conditions dictate. Drainage filters would be installed at suitable locations to remove silts from the run-off.

2.7.34 Post construction, the vegetated turf layer would be used for reinstatement. This would allow re-establishment of natural vegetation to the area. Reuse of the turf layer is the preferred option over seeding the edges of the access track, as seeding rarely gives a representative cover and has been known to encourage deer grazing on verges.

Watercourse Crossings

2.7.35 One minor new watercourse crossing would be required for gaining access to T7. No upgraded watercourse crossings would be required along existing track. The locations of existing and new watercourse crossings are shown in **Technical Appendix 8.5**.

Borrow Pits

2.7.36 The Proposed Development would require crushed stone to construct new tracks, create hardstanding areas for the cranes and lay the turbine foundations.

2.7.37 The total estimate of stone required is approximately 44,149 cubic metres (m^3)[9], the majority of which is expected to be won from the two existing on-site borrow pits, shown in **Figure 2.2**. For purposes of assessing worst-case effects, **Chapter 10: Traffic and Movement** assessment will consider a scenario where 50% of the stone requirement would be brought in from off-site sources.

2.7.38 Further detail on the location and indicative extent of the borrow pit extensions are provided in **Technical Appendix 8.6.**

2.7.39 During borrow pit excavation activities, blasting may be required. Blasting operations should take place under strictly controlled conditions with the agreement of the Council, at regular times within the working week, that is, Mondays to Fridays, between the hours of 10.00 and 16.00. Blasting on Saturday mornings would not be undertaken without the prior agreement of the Council.

Substation Compound

2.7.40 The indicative layout and elevations of the substation compound are shown on **Figure 2.10** and **Figure 2.11**.

2.7.41 The substation compound would measure approximately 50 m x 40 m. It would also contain a storage yard/laydown area. The substation compound would be enclosed by palisade type fencing. Lighting would be kept to a minimum, would be limited to working areas only and

[9] Conservative estimate used as worst-case scenario for the EIA Report.

would comply with health and safety requirements. Lighting would be down lit and linked to timers and movement sensors so that light pollution is kept to a minimum.

2.7.42 The substation area would include structures for use of the Distribution Network Operator (DNO) (to be used by the Scottish Hydro Electric Power Distribution (SHEPD)). This includes a switchgear and control building which would accommodate switchgear, protection and control equipment for the DNO. This building is where power from the Proposed Development would be marshalled and measured.

2.7.43 The substation compound would also include storage containers (housing predominantly spare parts) and a diesel generator with fuel supply which would power auxiliary systems should there ever be a grid outage, and any bunding or drainage required.

Wind farm Operator Control Building and Compound

2.7.44 A switchgear and control facility would be placed in the substation building. It would house 33 kilovolts (kV) switchgear, control and protection equipment, supervisory control and data acquisition (SCADA) equipment, low voltage battery systems, welfare facilities (toilet, washing and basic food preparation area), telecommunications equipment, workshop and offices.

2.7.45 The control welfare facilities would include a suitably sized foul waste holding tank, which would be emptied by tanker and removed from the project area on an appropriate timescale for disposal at a suitably licensed off-site facility or a composting toilet, and bottled water or a small water bowser. The details of the system to be put in place would be agreed with the Council.

2.7.46 The compound would contain any external plant required for assisting with any additional grid compliance requirements that may, or may not be asked of the Proposed Development by the DNO and or the National Energy System Operator (NESO). Exact details for this equipment will not be known until a full electrical design has been commissioned and subsequently approved by the DNO and the NESO.

2.7.47 Cabling from the wind turbines would converge at the switchgear and control building.

2.7.48 The switchgear and control building would be constructed in keeping with the local built environment. The final designs for the building and compound would incorporate sustainable design features and would be agreed with the Council prior to construction.

Construction Phase

2.7.49 Construction of the Proposed Development is anticipated to take approximately 17 months from mobilisation to completion.

2.7.50 An indicative construction programme is set out in **Table 2.2**. Many of these construction activities would be carried out concurrently, although predominantly in the order set out below. A more detailed construction plan would be prepared prior to construction.

Table 2.2: Indicative Construction Programme (Months)

Activity & Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Site mobilisation / demobilisation	■																
Construction of construction compounds and access points		■															
Track and hardstanding construction			■	■	■												
Construction of turbine foundations						■	■										
Substation construction							■	■	■	■							
Excavating trenches and laying electrical and communications cables									■	■	■	■					
Site restoration													■	■			
Turbine delivery and instillation														■	■		
Turbine fit out and grid connection																■	■
Turbine commissioning																■	

Construction Traffic

2.7.51 It is anticipated that the largest volume of traffic would be associated with the construction phase of the project, when vehicles are likely to be travelling from major centres and ports to deliver materials to the Site. The origins of materials and goods related to the turbines are expected to be the ports of Kyle of Lochalsh for turbine blades, and Corpach harbour for tower sections and other large components.

2.7.52 The main routing of the construction traffic access routes would likely comprise sections of the following:

- A87;
- A887;
- A830; and
- A82.

2.7.53 Further details is provided in **Chapter 10: Traffic and Movement** of the EIA Report. The Abnormal Indivisible Load (AIL) route is shown in **Figure 10.1**.

Construction Workforce

2.7.54 A detailed construction workforce schedule (i.e. employee numbers throughout the construction programme and likely shift patterns) would not be known until the contract for the building of the Proposed Development has been awarded. However, the maximum number of staff likely to be on Site at any one time would be approximately 50 people.

Mobilisation Compound

2.7.55 During the construction period, a temporary mobilisation compound would be required. This would facilitate the construction activities prior to the main construction compound becoming operational. The location of the mobilisation compound is shown on **Figure 2.2**.

2.7.56 The mobilisation compound would comprise temporary cabins to be used for the site offices, the monitoring of incoming vehicles and welfare facilities for Site staff including toilets; parking for construction staff visitors and construction vehicles; secure storage for tools and small parts; a receiving area for incoming vehicles; and temporary security fencing around the compound.

2.7.57 To create the mobilisation compound, turf and topsoil would be stripped and bunded at the edge of the mobilisation compound. A layer of geotextile membrane would be placed on the subsoil, and Type 1 aggregate stone would be imported and compacted to create temporary surfaces. Appropriate temporary drainage mitigation would be installed around the mobilisation compound which would be decommissioned on completion of construction activities.

2.7.58 The compound would be located south of the A887, by the existing wind farm access junction, and its dimensions would be 20 m x 20 m.

Construction Compounds

2.7.59 During the construction period, four construction compounds would be required. The main compound would include a laydown area for wind turbine components. A compound to facilitate the construction of the new substation would be located within the existing borrow pit. The locations of the proposed construction compounds are shown on **Figure 2.2**.

2.7.60 The compounds would be used as storage areas for the various components, fuels and materials required for construction. Typically, the major structural components of the turbines would be delivered to the turbine hardstandings. Temporary lay-down areas would be provided for parking and unloading vehicles, including AIL.

2.7.61 Any lighting would be directional in accordance with Institute of Lighting Professionals (ILP) guidance and mounted on the individual portacabins.

2.7.62 The construction compound and lay down areas would be constructed by first stripping the topsoil/peat, which would be stored in a mound for subsequent reinstatement at the end of the construction period, in line with industry best practice[10]. Care would be taken to maintain separate stockpiles for turf and the different soil/peat types to prevent mixing during storage. A geotextile would then be placed on the sub-stratum, which would be overlain by a working surface of stone to approximately 400 mm thickness.

2.7.63 Reinstatement would involve removing the stone and underlying geotextile before carefully ripping the exposed substrate and replacing the excavated soil/peat. The compound within the existing borrow pit adjacent to the proposed new substation would be reinstated in line with the rest of the borrow pit, as indicated in **Technical Appendix 8.6.**

Construction Hours

2.7.64 It is anticipated that the main construction hours for the Proposed Development would be between 07.00 and 19.00 from Monday to Friday, and 08.00 and 13.00 on Saturdays unless otherwise agreed with the Council. Certain activities, such as electrical works in the substation or turbine erection in the event of delays due to high winds, may require to be undertaken outwith these hours. Construction hours generally also apply to the delivery of materials to the Proposed Development; however abnormal loads may be delivered out of these hours when the road network is at its quietest to reduce traffic disturbance. Delivery of the nacelles, towers and blades to the Site would require the use of abnormal sized and slow-moving trucks. These trucks would require a police escort, and the timing of these deliveries may be dictated by the police. More details can be found in **Chapter 10: Traffic and Movement**.

[10] Current best practice includes *Good Practice during Wind Farm Construction* (2019), A joint publication by Scottish Renewables; Scottish Natural Heritage; Scottish Environment Protection Agency; Forestry Commission Scotland; Historic Environment Scotland; Marine Scotland Science; AEECoW. 4th Edition.

Operational Phase

Turbine Monitoring and Control

2.7.65 Wind turbines have a proven track record for operating safety. All turbines are controlled by a SCADA system, which would gather data from all the turbines and provide the facility to control them from a remote location. The SCADA system would gather data from all the turbines via communications cables connecting to each turbine (the cables being buried in the electrical cable trenches).

2.7.66 In the case of any fault, including over-speed of the blades, overpower production, or loss of grid connection, the turbines shut down automatically through integrated braking mechanisms. They are also fitted with vibration sensors so that, if, in the unlikely event a blade was damaged, the turbines would again be automatically shut down.

Meteorological Effects

2.7.67 Turbines, as with any tall structure, can be susceptible to lightning strike and appropriate measures are included in the turbine design to conduct lightning strike down to earth and minimise the risk of damage to the structure. In the case of a lightning strike on a turbine or blade, the turbine would be automatically shut down.

2.7.68 In cold weather, ice can build up on blade surfaces when operating. The turbines can continue to operate with a thin accumulation of snow or ice but would be shut down automatically when there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Many models now include de-icing technology.

2.7.69 In the circumstances of a lightning strike hitting a turbine or an ice throw incident taking place, the Proposed Development turbines are sufficiently far away from recreational routes that no users of such routes would be impacted.

Turbine Servicing and Repair

2.7.70 Each manufacturer has specific maintenance requirements; however, it is anticipated that routine servicing of the turbines would typically be undertaken twice a year, with a full annual service and a minor service every intervening six months. In the first year, there is also likely to be an initial three-month service post-commissioning. Individual turbines would be switched off when servicing is ongoing. Maintenance and servicing would include activities such as changing of gearbox oils and individual turbine components.

2.7.71 Blade inspections would likely be required between every two and five years. These would traditionally be undertaken using a cherry picker or similar but may also be performed with a 50-tonne crane and basket or using drones. Repairs to blades would use the same equipment. Light winds and warmer, dry conditions are required for any blade repairs hence summer (June to August) would be the most appropriate period for this work.

2.7.72 Operational waste would generally be restricted to small volumes of waste generated from machinery repair and maintenance. The maintenance contractors would dispose of any such waste off-site, in line with Scottish waste management regulations and duty of care.

Track Maintenance

2.7.73 Once the Proposed Development is operational, the volume of traffic using the access tracks would be low. Correspondingly, the need for any track maintenance works is anticipated to be low and infrequent. Any such works required would generally be undertaken during the drier conditions in the summer months.

Operational Workforce

2.7.74 A team of several staff including engineer fitters would supervise the operation of the wind turbine installation and would visit the Proposed Development to conduct routine maintenance. The frequency of these visits would depend on the turbine manufacturer.

Decommissioning Phase

2.7.75 The Proposed Development is anticipated to have an operational life of 35 years, after which it would be decommissioned, and the Proposed Development components dismantled and removed. Any alternative to this outcome would require separate consent from the ECU, and so is not considered within this EIA Report.

2.7.76 During decommissioning the turbines and associated infrastructure would be dismantled and removed, along with any associated above ground electrical equipment. This decommissioning work would be the responsibility of the Applicant, or any subsequent owners of the Proposed Development. Underground cables would be left in place and foundations would be removed to a depth of 0.5 m below ground level to avoid environmental impacts from deeper removal. Prior to decommissioning of the Site, a method statement would be prepared and agreed with the Council using any guidance relevant at that time.

2.8 References

Civil Aviation Authority (2016), 'CAP 764: Policy and Guidelines on Wind Turbines'.

Department for Business, E. and I.S (2023), 'Energy Trends and Prices statistical release'.

Scottish Government (2023), 'Draft Energy Strategy and Just Transition Plan'.

Scottish Government (2022), 'Onshore Wind: Policy Statement'.

Scottish Government (2019), 'Climate Change (Emissions Reduction Target)(Scotland) Act 2019'.

Scottish Government (2014), 'Scottish Planning Policy'.

UK Government (2016), 'The Air Navigation Order 2016'.

UK Government (1997), 'Town and Country Planning (Scotland) Act 1997'.