2 DEVELOPMENT DESCRIPTION

2.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIA Report) provides a description of the proposed Ladyfield Renewable Energy Park (the Development) which forms the basis of the assessments presented within Chapters 6 to 17. It provides details of the construction phase, the up to 40-year operational phase, and decommissioning phase of the Development.

This Chapter includes an overview of the Development followed by a description of the main typical components and their method of construction. Measures that have been built into the design of the Development to reduce effects, also known as 'embedded' mitigation measures, are set out in Chapter 3 - Site Selection and Design, and in this Chapter. In addition to these embedded mitigation measures, Chapters 6 to 17 present mitigation and enhancement measures where specifically relevant to their assessment topic.

This Chapter of the EIA Report is supported by the following figures provided in Volume 2a - EIA Report Figures excluding Landscape and Visual Impact Assessment (LVIA):

- Figure 2.1 – Indicative Site Layout;
- Figure 2.2 - Indicative Turbine Elevation;
- Figure 2.3 - Indicative Foundation Design;
- Figure 2.4 – Indicative Crane Hardstanding;
- Figure 2.5 – Indicative Cable Trench Detail;
- Figure 2.6 – Indicative Temporary Construction Compound (TCC);
- Figure 2.7 – Indicative Substation and BESS Compound Layout;
- Figure 2.8 – Indicative Substation and Control Building and Elevations;
- Figure 2.9 – Indicative BESS Elevations;
- Figure 2.10 – Indicative Access Track;
- Figure 2.11 – Indicative Culvert Detail;
- Figure 2.12 – Indicative Met Mast;
- Figure 2.13 – Indicative Borrow Pit Layout; and
- Figure 2.14 – Landowner Felling Plan.

2.2 Description of the Development

2.2.1 Development Overview

The Development would comprise up to 13 three-bladed horizontal axis turbines up to 180 metres (m) tip height and all associated infrastructure, including Substation and Battery Energy Storage System (BESS), Compound (comprising of Substation and Control Building, BESS and ancillary infrastructure), anemometer mast, crane hardstandings, underground cabling, TCCs, an extension of one existing borrow pit, and temporary laydown areas.

The components of the Development are summarised in Table 2.1 and shown on Figure 2.1. Detailed (but indicative) designs of each component are shown in Figures 2.2-2.13. Full details are provided in Sections 2.2.2 through 2.2.14.

Table 2.1: Key Parameters of the Development

Element	Details
Turbines	13 turbines, each with a tip height of up to 180 m, as detailed in Figure 2.2, with a capacity up to 58.5 MW. Each turbine may require a small transformer located at its base. Each turbine will have a foundation with an approximate diameter of 25 m as detailed in Figure 2.3, with the exact size and nature of foundations being subject to detailed design following post consent intrusive Site Investigation studies.

Element	Details
Access Track	Access track to serve the construction and operation of the wind farm with width approximately 5.5 m as detailed in Figure 2.10, this will consist of a combination of upgraded track and newly constructed track. New tracks will be constructed of a graded stone or floated, as appropriate for the ground conditions.
Electrical Infrastructure	A substation and control building will be located approximately 0.66km west of T6. The substation and control building will be located within a compound, shared with the BESS (see below), measuring just under 1 hectare (ha), which will also include any external electrical infrastructure and vehicle parking. Substation and Control Building elevations are shown in Figure 2.8. Underground cabling, laid where possible alongside the access tracks, will link the turbine transformers to the onsite substation. Details of cable trenches to be used can be seen in Figure 2.5.
Battery Energy Storage System	The project will have a BESS with a capacity up to 41.4 MW located adjacent to the on-site substation on the same compound which is just under 1 ha, and approximately 0.66km west of T6. Figure 2.9 shows the BESS elevations.
Crane Hardstanding	Crane hardstandings will be required adjacent to each turbine, this will consist of an area of approximately 3,450 m^2 at each turbine. In addition to the main hardstanding area, there will be additional flattened areas for crane assembly; however, these will be temporary and not constitute hardstanding. The Crane hardstanding can be seen in Figure 2.4
Temporary Construction Compound	Two TCCs will be required during the construction of the Development, forming an area of hardstanding providing space for temporary welfare, parking, lay down areas and potentially concrete batching. These both will measure approximately 45 m x 30 m. One TCC is located in the north of the Site, adjacent to the north of the compound housing the Substation and BESS. The other TCC is located in the south of the Site, adjacent to the existing MoD kiosk and Quarry. Figure 2.6 shows the Indicative TCC layout.
Existing Quarry	The project will include a 50m x 40m extension to the existing quarry located at NGR 209387, 714173, as seen in Figure 12.13.
Forestry Felling	Argyll Estates (the 'Landowner') is currently undertaking felling operations within the Site under their approved Long Term Felling Plan (LTFP) and irrespective of the Development intends to fell areas within the Site in accordance with their LTFP. The Development is not considered likely to start construction earlier than 2025. Therefore, for future baselines within assessments in this EIAR, felling scheduled for 2025 or earlier has been assumed to have been undertaken and completed. Any forestry compartments scheduled for felling beyond 2025, are assumed (within future baselines) to be existing at the point of construction and thus could be affected by the Development. As the precise timescale for felling is not within the control of the Applicant, this approach is considered a worst-case scenario. The Applicant would have been content with a targeted approach of differential or 'keyhole' felling to facilitate the Development but given the intentions of the Landowner, this worst-case scenario has been adopted for all assessments. In accordance the Landowner's LTFP, restocking will take place within areas felled under their LTFP, whilst taking account of the wind turbine keyhole areas, tracks and associated infrastructure undertaken as part of the Development. For the purposes of this EIAR, the areas of felling considered to be covered by the Landowners LTFP and the felling considered as part of the Development is provided in Figure 2.14. The Development will require the felling of approximately 79.3 hectares (ha) of existing forestry. There will be replanting on-site, however off-site compensatory planting of 48.7 ha will be required.

It is estimated that the permanent new footprint of the Development, including infrastructure and following restoration will be approximately 11.97 ha. During the construction period, it is estimated that a further 1.7 ha will be temporarily required, which includes the extension to the existing quarry, crane assembly areas, turbine blade storage areas and both TCC's which will be reinstated following the construction works.

The grid connection for the Development would be the subject of further appraisal work through a separate planning application.

2.2.2 Wind Turbines and Associated Infrastructure

2.2.2.1 Wind Turbines

Consent is being sought for the erection of up to 13 three-bladed horizontal axis wind turbines with a maximum height from base to tip that will not exceed 180 m (with the blade in the vertical position). Figure 2.2 illustrates a typical turbine of this type. The blades will likely be made of fiberglass reinforced epoxy and mounted on a tapered tubular steel tower. The turbines will be light grey in colour and the finish of the tower and blades will be semi-gloss and semi-matt respectively.

The candidate turbine model is the Vestas V136 4.5 MW turbine which will have a maximum blade tip height of no more than 180 m above ground level, a rotor diameter of up to 136m, and a hub height of up to 112 m.

Turbines are typically of a variable speed type, so that turbine rotor speed will vary according to the energy available in the wind. Turbines of the dimensions proposed typically have rotational speeds of between 6 and 14 revolutions per minute (rpm), depending on variations in wind speed, generating power for all wind speeds between 3 and 25 metres per second (m/s). At speeds greater than 25 m/s, the turbine reduces power output by pitching the blades out of the wind to protect the turbine from damage caused by high wind speeds. These very high wind conditions usually prevail for less than 1% of the year.

The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all 13 turbines will rotate in the same direction.

When operating, the rotational movement of the blades is transferred through the gearbox, to drive the generator. This produces a three-phase power output typically at 690 Volts (V), which is transferred from the generator to the turbine transformer. The turbines will be controlled and monitored from within the proposed control building and will also be remotely monitored where performance details and statistical information for each turbine will be recorded.

Table 2.2 details the locations of each turbine.

During the construction phase, two cranes are typically required to install the turbines, consisting of a larger 800 – 1000 tonne main crane and a secondary 400 – 500 tonne tailing crane plus potentially smaller ancillary cranes typically 120 tonne and or telehandlers for generally offloading and turbine component preparation. The cranes would use the crane hardstandings as described in Section 2.2.3. The turbine supplier would determine the size, number and type of cranes to be used following the turbine procurement process, together with the exact programme and number of teams on-site.

The method for erecting each turbine would depend on the turbine supplier and site conditions. Turbine components would either be lifted directly off transportation units for erection or more typically stored adjacent to the Crane Hardstandings. The tower sections are initially erected, followed by the nacelle and then the hub. The turbine blades would then be lifted individually and attached to the hub. The overall assembly process for each turbine takes approximately two to four days, depending on weather conditions.

Table 2.2: Wind Turbine Co-ordinates and Elevations

Turbine No.	Easting	Northing	Approximate Elevation (m) AOD
1	210937	717178	310
2	211246	717039	340
3	210402	716867	280
4	210810	716579	350
5	211330	716627	390
6	210153	716298	280
7	210466	716024	330
8	210920	716018	385
9	210490	715585	325
10	210874	715645	380
11	209976	714968	290
12	210863	715171	375
13	210356	714802	370

2.2.2.2 Turbine Foundations

It is proposed that the foundation for the turbines would comprise a conventional high yield steel reinforced concrete gravity type foundation, constructed in-situ in either a single or multiple pours. The foundation would require approximately 750 m^3 of concrete per turbine base and up to 100 tonnes of steel reinforcement.

Typically, each turbine foundation will consist of a circular foundation with a radius of approximately 12.5m which sits on the underlying rock or suitable substratum.

The detailed design for the foundation would be dependent on the geotechnical site investigations undertaken during the enabling works to establish the nature of the subsoil condition at each turbine location. Each foundation would be designed separately according to the chosen turbine type, manufacturer specification and ground conditions. Various cable ducts and other ancillaries will be installed within the foundations and under the access track crossing points.

The ground excavation methods would vary depending on the local ground conditions and the nature of the surface vegetation. The general processes would be as follows:

- Topsoil/turf will be stripped and stored in order to be reused in restoration of the turbine construction area;
- Subsoil (if present) will be stripped and stored, keeping this material separate from the topsoil/turf;
- Excavation of turbine foundations down to an approved load bearing strata will then take place followed by the installation of a blinding layer of concrete upon which the steel reinforcement will be fixed, ducts and holding down bolts installed, followed by the shuttering and casting of concrete;
- After the foundation has been poured, the concrete suitably cured and a copper earthing installed, the area would be backfilled using selected back fill from the excavation and compacted to provide a suitable platform to accommodate the turbine erection, pending turbine installation.

Once the turbines have been installed, the immediate construction area around the turbine bases (other than crane hardstandings) would be restored using the retained topsoil or turf to within approximately 1 m of the tower bases. Material won from foundation excavations would, if suitable, be used in the landscaping areas of cut and fill forming the access tracks, crane bases, borrow pit

reinstatement and other site infrastructure. If not suitable, it would be disposed of off-site by a licensed waste carrier to a suitably licensed facility.

2.2.2.3 Transformers and Cabling

Depending on the final choice of turbine, transformers will either be located within the turbine tower (with internal switchgear) or externally, close to the base of the tower. For the purposes of this assessment, it has been assumed that the transformers will be located adjacent to each turbine. An external transformer will normally be placed within a Glass Reinforced Plastic (GRP) housing, the size of housing will depend on the type of transformer selected but in general it will be approximately 3 m x 2.5 m in plan and 2.5 m in height above surrounding ground level, located adjacent to the turbine within the hardstanding area.

The transformers will be either oil-filled with a bunded footing to remove any risk of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage from 690 V to 33 kilovolts (kV).

Turbines will be connected by 33 kV single phase power cables which will be laid in trenches alongside the access tracks, with a depth of 1 m. The excavated trenches will also include SCADA cables or fibre optic cables. This will allow interrogation and control of individual turbines as well as remote monitoring. A copper cable will also be installed in the trench and will be connected to the substation and each turbine to provide an earthing system to provide protection from lightning strikes and electrical faults. The cables will be laid on a sand bed, then surrounded by further sand and backfilled using suitably graded material. Clay, or equivalent low permeability barriers, will be inserted into the cable trenches at regular intervals to avoid the trenches becoming preferential drainage pathways. Details of a typical cable trench is shown in Figure 2.5.

2.2.3 Crane Hardstandings

Each turbine requires an area of hardstanding adjacent to the turbine foundation to provide a stable base on which to site the turbine components and cranes for the erection of the turbine.

The main working area at each hardstanding area composed of crushed stone will be approximately 65 m x 25 m, with the total footprint of the hardstandings at each turbine will be approximately 3,450 m^2. This footprint includes smaller temporary hardstanding areas which are required for the assembly of the main crane jib and 'blade fingers' which are required for the storage of the turbine blades.

A typical arrangement is shown in Figure 2.4; however, the final arrangement of the hardstanding will depend on the method of erection and exact specification of the cranes chosen by the turbine erection contractor. The hardstandings will be sufficiently level and with a suitable load-bearing capacity to ensure the safe storage of turbine components and operation of the cranes.

Surface water and groundwater levels will be managed to ensure that natural drainage patterns are maintained and that water levels within excavations do not rise beyond appropriate and safe limits.

Construction of the temporary crane hardstanding would be similar to the construction of the site tracks as described in Section 2.2.4. Surplus excavated material would be reused elsewhere within the Site such as for track maintenance during construction or during borrow pit reinstatement. Similarly, any surplus topsoil would be used to restore track edges or the borrow pits after construction.

The crane hardstanding would be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the Development. These would also be utilised during decommissioning.

2.2.4 Access Tracks

The access tracks have been designed to minimise environmental disturbance and land take where possible by re-using as much existing forestry track as possible, seeking to avoid areas of deep peat, environmental constraints identified during the EIA and minimising the number of watercourse crossings.

The length of onsite access tracks will total approximately 13.7 km which consists of localised upgrades to 4 km of existing forestry track and 9.7 km of new track.

The Site will be accessed via two access points off the A819. A new access junction is proposed at NGR 209101, 716517, to be constructed in the north of the Site, as part of the Development. Secondly, an existing access junction at NGR 208923, 713010 would be upgraded and the existing crossing over the River Aray would be removed and a new bridge installed.

Both access points would be capable of accepting turbine blades and components and although it is likely that only one would be used for turbine component delivery, both are assessed as such within this EIAR. For the purposes of this EIA it is assumed a new bridge will be installed over the River Aray for the southern access as a worst case scenario.

The existing Site entrance to the south would be upgraded and used to facilitate the construction of new tracks, and for bringing plant and other necessary equipment to the Site to allow construction of the aforementioned site entrance in the north of the Site.

New tracks will be constructed to connect the existing forestry tracks to the turbine locations to enable the turbine components, construction materials and construction staff to be transported to their locations, and to enable access for subsequent maintenance visits. The proposed track layout is illustrated in Figure 2.1.

Access tracks will have a running width of approximately 5.5 m, with an additional 1 m verge on either side subject to local ground conditions. The tracks have been designed to minimise the extent of cut and fill to ensure a maximum gradient of approximately 12% can be maintained and have sufficient radii for turning of the construction vehicles, abnormal loads and plant. Wherever possible the tracks will be designed on a circular basis such that a one way system can be adopted ensuring safe access and an alternative access in case of emergencies to any part of the site. Where this circular arrangement isn't viable turning heads have been included in the design as necessary to allow abnormal load vehicles and cranes to undertake turns during the turbine delivery and assembly process. These are incorporated into the crane hardstanding areas in order to minimise land take.

Excavated soils would be stored at no greater than 3 m in height, directly adjacent to, or near the tracks on ground appropriate for storage of materials (i.e., relatively dry and flat ground, a minimum of 50 m away from any watercourses). Wherever possible, reinstatement will be carried out as track construction progresses.

The access track will be left in place after construction of the Development and can be used for estate or forestry access as well as access to the turbines for maintenance and repair works.

All access tracks will incorporate robust drainage, including drainage channels running adjacent to the tracks, on one or both sides. The track would be designed with a crossfall towards the drainage channels to prevent a build-up of surface water and allowing the track to act as a watercourse. The make-up of the tracks will also be designed to prevent any instances of surface water build up.

Cross drainage pipes will be installed at regular intervals to prevent flooding or surcharging of the drainage channels and to maintain natural drainage catchments.

The implementation of the drainage design will be developed in response to a risk appraisal undertaken by the contractor and will be proactive, rather than being reactive to any events arising once works commence. The design will reduce the risk of sedimentation (from loose material) and pollution (from accidental spillage) of all downstream watercourses.

2.2.5 Watercourse Crossings

As noted above, the track layout design has sought to limit the number of watercourse crossings; however, given the nature of the Site and the principles of wind farm design 20 new watercourse crossing points will be required. 10 existing crossing points will require upgrading.

Site visits and Lidar Surveys have shown that not all watercourses shown on OS maps are present on the ground. These watercourses are not present year-round due to the location of the Site, at the top the Glen Aray Sub-catchment.

The type and design of each watercourse crossing will be dependent on the stream morphology, peak flows, local topography and ecological requirements, and will be chosen to avoid or minimise potential environmental effects. A typical watercourse crossing design is shown in Figure 2.11.

Any crossing would be designed in accordance with Construction Industry Research and Information Association (CIRIA) Culvert Design and Operation Guide (C689)[6] and incorporating the most recent climate change allowances, to ensure sufficient capacities for spate or flooding events.

Any watercourse crossings would be subject to registration under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)[7] (CAR) and Water Environment (Miscellaneous) (Scotland) Regulations 2017[8].

2.2.6 Borrow Pit

It is the intention to source aggregate for the construction of site access tracks, crane hardstanding areas, and upgrades of existing forestry tracks from the on-site borrow pit, rather than an off-site quarry, which has the advantage of reducing the number of Heavy Goods Vehicles (HGV) on public roads.

An existing quarry is located on site and has been identified for extension, as shown in Figure 3.13. Stone previously won from this quarry was found to be acceptable and was used to create some of the existing tracks within the Site. Approximately 24,847 m^3 of stone may be extracted from this quarry. It is estimated that the borrow pit will have additional capacity to that required for construction materials and it is therefore likely that the final dimensions will be smaller than those presented. For the purpose of the EIA Report it is assumed that the borrow pit is used to its full extent as worst case, and the top 0.15 m layer of fine material required for all access tracks and hardstandings will be imported to site.

The borrow pit will require the use of plant to both extract and crush the resulting rock to the required grading. Precise details will be confirmed at the construction stage, but is anticipated that once the topsoil and overburden has been removed and stored safely for the quarry reinstatement the rock will be drilled and blasted by an approved and experienced contractor in layers working into the hill side. The rock once blasted would be fed into a suitably licensed mobile crushing plant, which would prepare stone of suitable grading for road and crane base construction. Any blasted rock too large for the crushing plant will be broken down by hydraulic breakers to size the crusher can accommodate.

Following construction, the borrow pit would be restored to an approved design, the restoration will include replacing any surplus or unused material, soil or turf materials to restore the slopes to a stable profile and allow regeneration.

[6] Benn, J, Kitchen, A, Kirby, A, Fosbeary, C, Faulkner D, Latham, D, Hemsworth, M (Dec 2019) Culvert, screen and outfall manual (C786F) https://www.ciria.org/ItemDetail?iProductCode=C786F&Category=FREEPUBS (Accessed 22/08/2022)
[7] Scottish Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 [Online] Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made (Accessed 22/08/2022)
[8] Scottish Government (2017) Water Environment (Miscellaneous) (Scotland) Regulations 2017 [Online] Available at: http://www.legislation.gov.uk/ssi/2017/389/contents/made (Accessed 22/08/2022)

2.2.7 Substation and BESS Compound

The Substation and BESS Compound would be located adjacent to the new access track at the northwest of the Site, centred at approximately NGR 209466, 716504, as shown on Figure 2.1. This Compound is an area of crushed stone hardstanding measuring just under 1 ha.

It is anticipated that the on-site Substation and BESS Compound will house the transformers, switchgear, metering, telecommunications equipment, electrical control panels, control equipment, storage and workshop, welfare facilities and office as well as the BESS itself.

The Substation and BESS Compound will contain a storage yard/laydown area for the materials required during operations or erection of external electrical equipment. The Substation and BESS Compound will be surrounded by stock proof fencing, typical of that used elsewhere in the area.

The Substation and Control Building is likely to comprise a single storey unit measuring approximately 30 m x 20 m with a pitched roof. The Substation Building will contain internal and external transformers and switch-gear, stores and welfare facilities. Cables from the turbine transformers will converge at the Substation and Control Building.

The final designs for the buildings and compound will incorporate sustainable design features and will be agreed with the Council.

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

It is anticipated that the control equipment will be contained within the Substation and Control Building. This single storey control building will also house welfare facilities (toilet, washing and basic food preparation area), site communications (i.e., SCADA), workshop and offices.

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

The BESS is located on the same compound as the Substation and Control building and will have a capacity of not more than 41.4 MW.

2.2.8 Grid Connection

The grid connection would be routed through existing forest tracks and within the A819, to a new substation on the transmission system located at Creag Dubh, approximately 3km to the north of the site's northern boundary, on the western side of the A819. The grid connection does not form part of this Application and is subject to a future application subject to the Development receiving planning consent. However, the grid route will be considered proportionately in this EIA report.

2.2.9 Temporary Construction Compounds

Two TCC's will be required during the construction of the Development, forming an area of hardstanding providing space for temporary welfare, parking, lay down areas and potentially concrete batching. These both will measure approximately 45 m x 30 m. One TCC is located in the north of the Site, adjacent to the north of the compound housing the Substation and BESS (centred at approximately NGR 209277, 716506). The other TCC is located in the south of the Site, adjacent to the existing MoD kiosk and Quarry (centred at approximately NGR 209340, 714198 m). These TCC's are shown on Figure 2.1.

A typical TCC arrangement is shown on Figure 2.6. Welfare facilities for site personnel will be required during construction which would be located within the TCC. There will be a water supply on-site for hygiene purposes, by way of a temporary storage tank.

The area to be used for the TCC would be stripped of topsoil (which will be stored for future re-instatement) to expose a suitable formation. A geosynthetic material base or similar will then be

laid followed by a layer of suitable material then a further geosynthetic material laid prior to the top surface of blended fines.

Appropriate bunding arrangements will be employed in all areas where fuel and oil storage tanks will be situated, in order to prevent contamination of the surrounding soils, vegetation, surface water and ground water. The fuel storage area will be above ground with secondary containment in accordance with SEPA's GPP2 (Above Ground Oil Storage Tanks)[9], and GPP8 (Safe storage and disposal of fuel oils)[10], and will be situated a minimum of 50 m from watercourses to reduce the risk of pollution of watercourses. Any contaminated run-off within the sealed bund will be removed by a licensed waste carrier to a licensed waste management facility.

Following completion of the construction phase, the components of the TCC will be removed and the area fully restored.

2.2.10 Met Mast

A permanent mast is proposed to be located at approximately National Grid Reference (NGR) 209700, 714800. The met mast will be a free-standing lattice tower up to 112 m in height, as shown in Figure 2.12.

2.2.11 Access to Site

Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that would provide access to the Site to ensure they are suitable and to identify any modifications required to facilitate access.

A preliminary transport access study is included in Technical Appendix A13.1: Abnormal Load Assessment (ALA). The Site will be accessed via two access points off the A819. A new access junction is proposed at NGR 209101, 716517, to be constructed in the north of the Site, as part of the Development. Secondly, an existing access junction at NGR 208923, 713010 would be upgraded.

The following potential abnormal loads delivery route has been identified:

- Port of Entry – Corpach Harbour;
- From Corpach Harbour, proceeding east on the A830;
- Loads would exit the A830 to join the A82 southbound;
- At Tyndrum, loads would exit the A82 to join the A85 westbound;
- To the west of Dalmally, loads would exit the A85 to Join the A819 southbound;
- Loads would then proceed on this road to one of the two site accesses.

The proposed track layout is illustrated in Figure 2.1 and shows the two site entrances.

2.2.12 Site Signage

During construction and operation of the Development, the Site will have suitable signage to protect the health and safety of workers, contractors and the general public.

2.2.13 Micro-siting

In the event that unsuitable ground conditions are encountered during the construction of the Development, there may be a requirement to micro-site elements of infrastructure. It is proposed that a 50 m micro-siting allowance in any direction for turbines and all other infrastructure is applied to the Development. Within this distance, any changes will be subject to approval of the

[9] SEPA (2017) Above ground oil storage tanks: GPP 2 [Online] Available at: https://www.netregs.org.uk/media/1299/gpp-2-pdf.pdf (Accessed 22/08/2022)
[10] SEPA (2017) GPP 8 Safe storage and disposal of used oils [Online] Available at: https://www.netregs.org.uk/media/1435/gpp-8-v3-swni.pdf (Accessed 22/08/2022)

Ecological Clerk of Works (ECoW) with specialist geotechnical advice as required. Beyond this distance, any relocation of infrastructure will require written approval from the Council.

The potential for micro-siting was considered when the detailed survey and assessment work was undertaken. For example, the habitat and peat surveys covered a wider area than just the footprint of the proposed turbine and infrastructure locations (full details of survey areas can be found in Chapter 11 – Geology and Peat). Any likely significant effects arising from micro-siting have been considered in the preparation of this EIA Report, and specific areas to be avoided have been identified in technical chapters where necessary.

2.2.14 Restoration

Site restoration will involve the restoration of track and hardstanding verges, borrow pit and both TCC's to provide a natural ground profile with non-geometric surfaces and tie-ins with existing undisturbed ground levels. Restoration will be undertaken at the earliest opportunity to minimise storage of turf and other materials and to allow restoration of disturbed areas as early as possible and in a progressive manner.

A restoration plan for the Site will be secured by condition and agreed with the Council and relevant statutory consultees.

2.3 Construction And Development Phasing

The on-site construction period is estimated at approximately 24 working months in duration and would comprise the principle operations:

- Timber felling and timber extraction;
- Works to southern Site access and bridge;
- Extraction of stone from the on-site borrow pit;
- Upgrade of existing access tracks and construction of new access tracks, including new and upgraded watercourse crossing points;
- Construct the new northern Site access;
- Construction of the two TCC's;
- Construction of the Substation and BESS Compound;
- Installation of temporary and permanent drainage;
- Construction of turbine foundations;
- Construction of crane hardstandings;
- Construction of one permanent met mast;
- Delivery, erection and commissioning of wind turbines;
- Construction of the Substation and Control Building;
- Excavation of shallow cable trenches approximately 1 m from the edge of the access tracks and cable laying adjacent to the access tracks where possible;
- Crane hardstandings for drainage;
- Connection of on-site electrical distribution cables;
- Commissioning of the site equipment; and
- Reinstatement of the borrow pit and both TCC's.

2.3.1 Construction Period

It is expected that many of the above operations will be carried out concurrently, although an indicative Construction Programme is illustrated in Table 2.3.

The starting date for construction activities will largely be dependent upon the date that consent may be granted, pre-commencement conditions satisfied and grid availability; subsequently, the programme would be influenced by constraints on the timing and duration of any mitigation measures confirmed in the individual technical chapters or by the consent decision, as well factors such as weather and ground conditions experienced on the Site.

It is proposed that construction activities be limited to between 07:00 and 19:00 Monday to Saturday, with no construction work expected on Sundays or Bank Holidays. Any works out-with these hours will need to be approved in writing by the Council.

Construction noise will be managed via a site-specific Noise Management Plan (NMP) provided to the Council. The embedded mitigation contained in the NMP will include the commitment to liaise directly with local residents, and the wider community via a Community Liaison Group.

Table 2.3: Indicative 24 Month Construction Programme

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Site Mobilisation/ Demobilisation			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Forestry Clearance	■	■	■																					
Access Track and Hardstanding Construction					■	■	■	■	■	■	■	■												
BESS, Control Building and Substation											■	■	■	■										
Steel Imports etc. for Turbine Foundations									■	■	■	■	■	■	■	■								
Electrical Cabling Delivery														■	■	■	■							
Crane Delivery																	■					■		
Turbine Erection																		■	■	■	■			
Commissioning																							■	■
Fuel Delivery	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Concrete delivery										■	■	■	■	■	■	■	■							

2.3.2 Construction Methods and Environmental Management

The construction phase will be controlled via a series of detailed method statements, which will be prepared by a Contractor appointed by the Applicant. The Applicant will monitor and ensure the contractor can correctly discharge their legal and contractual obligations while working on site during construction. While these method statements will be formulated following detailed site investigation and detailed engineering design, it is possible to indicate the outline of the methods that will be used, particularly in relation to environmental management.

The services of specialist advisors will be retained as appropriate, such as an archaeologist and ecologist, to be called on as required to advise on specific environmental issues. The appointed Contractor will ensure construction activities are carried out in accordance with the mitigation measures outlined in this EIA Report.

Prior to construction, a detailed CEMP would be prepared that collates all measures required during construction to avoid and minimise environmental harm including guidance and best practice. The CEMP would include, but not limited to:

- Site induction and training;
- Working hours;
- Enabling works;
- Surface water and drainage management;
- Waste management;
- Wastewater and water supply monitoring and control;
- Oil and chemical delivery and storage;
- Water quality monitoring;
- Ecological protection measures;
- Construction noise management;
- Cultural heritage protection measures;
- Handling of excavated materials;
- Reinstatement and restoration;
- Traffic management;
- Environment incident response and reporting; and
- Use and extent of borrow pits.

To ensure that the mitigation and management measures detailed within this EIA Report are carried out, construction personnel and contractors will be required to adhere to the CEMP which will form an overarching document for all construction site management requirements.

Contractors will also be required to adhere to the following to minimise environmental effects of the construction process:

- Conditions required under the consent;
- Requirements of statutory consultees including SEPA and NatureScot;
- Any other relevant mitigation measures identified in this EIA Report; and
- All relevant statutory requirements and published guidelines that reflect 'good practice'.

The Applicant will require that all contractors follow the requirements of ISO14001 - 'Environmental Management Systems - Specification and Guidance for Use'

[11], and will provide the following:

- Details of main contractor's corporate environmental policy;
- Assessment of environmental impacts during construction;
- Procedures and controls for environmental management;
- Environmental monitoring details and reporting systems;
- Schedule of contractual and legislative requirements; and

[11] BS EN ISO 14001:2015 Environmental management systems. Requirements with guidance for use

- Schedule of relevant consents, licences and authorisations.

The CEMP will be agreed with the relevant statutory bodies including SEPA, NatureScot and the Council prior to commencement of construction, and performance against the CEMP will be monitored by the Applicant's Construction Project Manager throughout the construction period.

Particular environmental impacts and associated mitigation measures required to be addressed within the CEMP are discussed in relevant sections of this EIA Report.

2.3.3 Construction Materials

The key materials which would be required for the construction of the track, turbine foundations, hardstanding areas and cable trenches are:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete quality aggregate: high strength structural grade, which is not prone to substantial leaching of alkalis;
- Steel reinforcement; and
- Electrical cable.
- Water

All materials will be sourced and transported to the Site from local suppliers, where possible, with the exception of materials sourced from on-site borrow pit. Any material imported to Site will be chemically similar to those on site, as far as possible. This will avoid disruption to the chemical balance of existing materials on Site.

2.3.4 Construction Movements

Various vehicle types are required during the construction stage of the Development, of these; the majority would be standard road vehicles of similar type to those using local roads on a daily basis. However, the delivery of some of the wind turbine components would require vehicles and transport configurations that are longer, wider and/or heavier than standard road vehicles (see Chapter 13 - Traffic and Transport).

2.3.5 Waste Management

Waste materials will be minimised as far as possible in accordance with the waste hierarchy. All waste will be removed off-site by a licensed waste carrier for safe disposal at a suitably licensed waste management facility in accordance with current waste management regulations. Wherever possible, excavated stone or soils will be reused on-site, primarily for the restoration of disturbed ground. Any materials which cannot be re-used or restored on Site will be classified as waste and removed off site by a licensed waster carrier for reuse under an appropriate waste exemption or disposal and a licensed waste facility.

The main items of construction waste and their sources are:

- Hardcore, stone, gravel from temporary surfaces to facilitate construction, and concrete;
- Subsoil from excavations for foundations and roads;
- Timber from temporary supports, shuttering and product deliveries;
- Miscellaneous building materials left over from construction of the Substation and Control Buildings;
- Sanitary waste from chemical toilets (if used);
- Plastics packaging of material; and
- Lubricating oils, diesel - unused quantities at end of construction period.

Subsoil not required for reinstatement purposes will be collected at the end of the construction phase and disposed of according to best practice and existing waste legislation. Waste oils and

diesel will be removed from the Site and disposed of by an approved waste contractor in accordance with provisions of the Special Waste Regulations 1996[12].

2.3.6 Health and Safety Related Issues

Health and safety issues during construction and decommissioning fall under the Construction (Design and Management) (CDM) Regulations 2015[13]. Health and safety will be initially addressed as part of the Pre-Construction Information Pack prepared by the Applicant. The Contractor will be required to prepare a Construction Phase Plan (Health and Safety Plan) and to forward information to the Applicant during the works to enable the Health and Safety File to be completed.

Turbines are designed to be safe and are built to withstand extreme wind conditions. The turbines selected for the Development will have a proven record in terms of safety and reliability.

Day-to-day operational and maintenance activities will be co-ordinated with the private landowner's operational requirements.

Public access to the Site will be restricted throughout the working area during construction for health and safety reasons and will be reinstated following cessation of construction activities.

An Operations and Maintenance Manual for the design life of the Development will be prepared by the Contractor and will cover all operational and maintenance procedures.

2.4 Operational Phase

The Development will have an operational lifespan of up to 40 years from full commissioning of the proposed turbines.

2.4.1 Turbine and Infrastructure Maintenance

Turbine maintenance will be carried out in accordance with the manufacturer's specification. The following routine turbine maintenance will be undertaken:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes;
- Blade, gearbox and generator inspections; and
- Replacement of blades and components as required.

It is proposed that operational site inspections will be undertaken on a weekly basis and the servicing of turbines will be undertaken as per the turbine manufacturer requirements, usually once per year.

Ongoing track maintenance will be undertaken to ensure safe access is maintained to all parts of the Development all year round.

All wastes arising as a result of servicing and maintenance (e.g., lubricating oils, cooling oils, packaging from spare parts or equipment, unused paint etc.) will be removed from the Site and reused, recycled or disposed of in accordance with best practice.

2.4.2 Snow Clearance

Safe access to the Development is required year-round. There is potential for the Development to experience snowfall and therefore clearance of snowdrifts may be necessary via grading of the track using suitable ploughing plant.

[12] UK Government (2021) The Special Waste Regulations 1996 [0nline] Available at: https://www.legislation.gov.uk/uksi/1996/972 (Accessed 23/08/2023)
[13] Health and Safety Executive (2015) Construction Design and Management Regulations 2015 [Online] Available at: http://www.hse.gov.uk/construction/cdm/2015/index.htm (Accessed 23/08/2023)

2.5 Decommissioning

As noted previously, the operational lifespan of the Development and associated infrastructure will be up to 40 years. Following this, an application for consent may be submitted to retain or replace the turbines and associated infrastructure, or alternatively they will be decommissioned.

Decommissioning would involve the following:

- Dismantling and removal of the wind turbines and electrical equipment;
- Reinstatement of the turbine areas and associated hardstanding; and
- Demolition and removal of control building and compound.

Turbine components and electrical equipment would be dismantled and removed in a similar manner to their delivery and erection. Cranage would be used to dismantle the turbine towers and blades into sections which would then be transported from the Site by HGV (i.e., the loads may not constitute abnormal loads). The nacelle is likely to require transport as an abnormal load, and a route assessment will be undertaken prior to decommissioning to identify the best route to remove the nacelle off-site. Turbine components would be broken up off-site in controlled environments ready for reuse, recycling or appropriate disposal.

The removal of the top 1 m of the turbine base and plinth would be undertaken, requiring an excavated trench around the upstand to provide a working area. Breakout of the top part of the plinth would be undertaken using an excavator-mounted jack hammer. The cables would be cut level with the remaining concrete. Once the broken-out concrete has been removed, the area would be reinstated by backfilling with soil/peat to an agreed method statement.

A similar process would be undertaken for the Substation and Control Buildings, with the equipment removed off-site for breaking up and appropriate disposal and the building demolished. The top 1 m of the concrete foundation slab would be broken up and removed, and the ground reinstated with topsoil. However, cut faces are likely to be retained, as there would be insufficient material to fully backfill the substation area.

The access tracks will be retained in situ at decommissioning for use by the landowner. The cables will also be left in situ.

Overall, it is estimated that the decommissioning period for the Development would be approximately 12 months.