Chapter 4: Description of Development

Figures

Appendices

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4 Description of Development

4.1 Introduction

4.1.1 This Chapter describes the elements that constitute the Gordonbush Extension Wind Farm proposal (the Development). It provides a description of the key development components and information regarding the construction, operation and decommissioning phases. The Development is located on Gordonbush Estate, adjacent to the operational Gordonbush Wind Farm and approximately 9.5 kilometres (km) to the north-west of Brora (see Figure 1.1: Site Location and Figure 4.1: Site Context).

4.1.2 The layout of the Development, which would have a total installed capacity of up to 56MW, is shown on Figure 4.2: Site Layout.

4.1.3 The turbine layout was influenced by a variety of environmental and technical factors, as discussed in Chapter 3: Site Selection, Design Evolution and Consideration of Alternatives of this ES.

4.1.4 The operational wind farm would include the following key components, which are described in further detail in this Chapter:

- 16 wind turbines in total comprising:
  - 13 wind turbines at up to 130m tip height; and
  - 3 wind turbines at up to 115m tip height;
- crane hardstanding area at each wind turbine location with a maximum area of 1900m^2;
- one permanent meteorological mast at up to 90m in height and associated hardstand with a maximum area of 840m^2 ;
- an operations building with parking for operational and maintenance staff;
- on site access tracks (of which approximately 7.96km are new access tracks and approximately 11km are existing tracks where upgrades may be undertaken to facilitate delivery of the wind turbine components);
- a network of underground cabling to connect each wind turbine to the existing onsite substation;
- modifications to the existing on site control building and grid substation to accommodate additional cables and equipment; and
- any associated ancillary works required.

4.1.5 In addition to the above components of the operational wind farm, the construction phase would comprise the following:

- a temporary concrete batching plant;
- temporary telecommunications infrastructure;
- a temporary meteorological mast;
- a temporary construction compound and storage area; and

- reopening and extension of two of the original borrow pits developed as part of the Gordonbush Wind Farm.

4.1.6 Existing infrastructure from the operational Gordonbush Wind Farm would be utilised for the proposed extension where possible and is therefore included within the site boundary. This includes the use of the existing operations building and grid substation for the grid connection; existing access tracks and two of the original borrow pits. Figure 4.2 illustrates the existing infrastructure in place at Gordonbush Wind Farm.

4.1.7 The above key components for the construction and operational phases of the Development are described in further detail in Section 4.3 (Core Development Components) and Section 4.4 (Associated Development Components).

4.1.8 It is estimated that the maximum permanent development footprint of the wind farm would be approximately 9.9ha. During the construction period it is estimated that a further 13.65ha would be temporarily required which would be reinstated following completion of the construction works. The maximum land-take requirements are set out in Table 4.1.

Table 4.1: Land Use

Wind Farm Component	Temporary Land Use (m^2)	Permanent Land Use (m^2)
Turbines	9,600	30,400
New Cut Track	0	39,023
New Float Track	0	9,378
Existing track (to be upgraded and retained)	0	11,000
Existing track (for construction only, then reinstated)	0	0
Existing forestry track (to be upgraded)	0	0
Passing Places (4x4 vehicles)	0	2,700
Borrow Pits	114,369	0
Turbine Vehicle Turning Heads	0	3,240
Temporary Construction Compound	7,500	0
Concrete Batching Plant	5,000	0
Operations Building and Compound	0	2,500
Substation	0	0
Permanent Meteorological Mast	0	840
Total (m^2)	**136,469**	**99,081**
Total (ha)	**13.65**	**9.9**

4.2 Site Access

4.2.1 The principal construction and operations access to the site would utilise the same delivery route used for Gordonbush Wind Farm, including routes taken for abnormal loads (see Figure 12.3: Route Options and Sensitive Receptors). From the A9 trunk road at Brora, the route would turn west along an unclassified road past the Clynelish Distillery to meet the C6 Strath Brora road. The route would continue along this road to Ascoile. Dependent on the wind turbine selected for use on Gordonbush Extension, additional works to accommodate abnormal loads along the delivery route could include:

- Widening of the A9/Clynelish Distillery junction at the Old School House;
- Localised widening along the unclassified road past Clynelish Distlillery and C6 Strath-Brora road; and
- Structural modifications to or replacement of existing bridge structures to allow passage of turbine components.

4.2.2 The full extent of any required improvement works would be determined following selection of the wind turbine for the site.

4.2.3 Full details of the assessment of effects on the local road network are provided in Chapter 12: Access, Traffic and Transport of this ES.

4.3 Core Development Components

Wind Turbines

Turbine Specification

4.3.1 The Development comprises 16 three-bladed horizontal axis wind turbines. The turbines are automatically controlled to ensure each turbine faces directly into the wind. As a result of this, the orientation of the wind farm would alter with changes in wind direction.

4.3.2 Where it has been necessary to select a specific representative turbine model or component size for the purposes of undertaking the environmental assessment, the candidate turbine models have been based on the Vestas V105-3.3 and Siemens SWT2.3 turbine models. Figures 4.3a and 4.3b show maximum dimensions and elevations for these candidate turbines.

4.3.3 The final choice of turbine would be dependent on economics and available technology at the time of construction, but would have a maximum blade tip height of 130m. Of the 16 turbines, the Developer is committed to reducing the tip height of 3 turbines (Turbines 14 to 16) to minimise potential landscape and visual impacts. These turbines would be reduced to 115m as illustrated on Figure 4.2: Site Layout. Turbine grid references and maximum dimensions for each turbine are as listed in Table 4.2.

Table 4.2: Turbine grid references and maximum turbine dimensions

Turbine Number	Grid Reference	Maximum Height to Blade Tip (m)	Maximum Hub Height (m)	Maximum Rotor Diameter (m)
1	284738 914846	130	77.5	105
2	284766 914339	130	77.5	105
3	285454 913704	130	77.5	105
4	285841 913380	130	77.5	105
5	285315 913037	130	77.5	105
6	285015 913928	130	77.5	105
7	284410 914122	130	77.5	105
8	284221 913677	130	77.5	105
9	284669 913649	130	77.5	105
10	285111 913393	130	77.5	105
11	284020 913260	130	77.5	105
12	284692 913100	130	77.5	105
13	284992 912698	130	77.5	105
14	283820 912873	115	68.5	93
15	284369 912733	115	68.5	93
16	284659 912370	115	68.5	93

4.3.4 The turbines would generate electricity in wind speeds between approximately 4 and 25 m/s (9 to 56mph). At wind speeds greater than this the turbines would shut down for self-protection.

4.3.5 The turbine towers would be of tapering tubular steel construction. The blades would be made from fibre-reinforced epoxy. The finish of the turbines is proposed to be semi-matt pale grey colour.

4.3.6 A transformer would be required for each turbine. This would be located adjacent to each turbine, as is consistent with the existing wind farm. The external transformers are typically 4m x 3m area and 2m in height and would be sited within the hardstanding area as shown on Figure 4.4: Typical Turbine Foundations and Crane Hardstanding.

Turbine Installation

4.3.7 Turbine towers, blades and nacelles are likely to be transported from the Port of Entry to the Development using tractor units pulling trailers with self-steering rear axles.

4.3.8 On arrival onto the site, the wind turbine components would be delivered and offloaded at the hardstanding of the wind turbine to be erected. Two cranes, a main crane and support crane, would work together with an erection squad to unload the delivery vehicles and erect the wind turbine components. Where weather conditions do not allow components to be erected, these would be temporarily stored until conditions allow erection to resume.

Turbine Bases

<u>Foundations</u>

4.3.9 Dependent on the ground conditions at each wind turbine location, a piled or gravity foundation would be used to support the wind turbines. A typical foundation arrangement showing both gravity and piled foundation solution is shown on Figure 4.4, although these would vary depending on the final turbine selection, the applied loads from the wind turbine and ground conditions at each turbine location. Site-specific designs would be developed once the turbine is selected and detailed intrusive ground investigations are undertaken during the detailed design phase.

4.3.10 Construction of a gravity foundation would generally require the excavation of subsoil and rock to a specified sub-formation level, usually up to 5m below existing ground level. The depth of the excavation would depend on the depth to a competent bearing strata with the excavation slopes graded to a safe angle to ensure they remain stable during construction. The sub-formation would then have a layer of structural fill placed across it to create a level platform, prior to the in-situ casting of a steel-reinforced concrete foundation. Foundations would likely be circular and consist of a main base section with a smaller plinth section cast above this. The foundations would have a diameter of approximately 20m.

4.3.11 Where a piled foundation is required, the construction process follows that of the gravity base, with the pile group installed following the completion of the structural fill platform. The construction process would then be completed as per the gravity base.

4.3.12 Each foundation would require approximately 500m³ of concrete and 55 tonnes of steel reinforcement.

4.3.13 Dependent on the wind turbine selected for use on the site, the connection piece used between the wind turbine and foundation can vary. Possible solutions include cans, pedestal length bolts and full length bolts. Cans and pedestal bolts would be cast into the foundation pedestal, full length bolts will extend through the pedestal and into the main base section. The construction process would be as per the above for gravity and piled bases with the connection piece placed at the appropriate stage during the process.

4.3.14 The foundation excavation would be back-filled with compacted layers of suitable graded material from the original excavation. The finished surface around the turbines would be capped with crushed rock to allow for safe personnel access to each turbine.

4.3.15 Plate 4.1 illustrates the typical construction of turbine foundations.

Plate 4.1: Construction of Turbine Foundations *(photos from Gordonbush Wind Farm)*

4.3.16 Electrical cable ducts and other ancillary services would be installed into the foundations as required.

Hardstandings

4.3.17 As shown on Figure 4.4, the turbine foundations would be surrounded by a hardstanding. It is anticipated a maximum area of 1900m² would be required for the hardstanding at each turbine. The hardstanding areas accommodate the cranes required for construction and maintenance, and provide a laydown area for temporary storage of components adjacent to each turbine location.

4.3.18 Crane hardstandings would be constructed level to ensure the safe operation of the cranes. The final detail of the crane hardstanding would depend on the exact specification of the wind turbine supplier. It is anticipated that a large crawler or wheeled/mobile crane (estimated at 1200 tonne capacity) would be required for turbine erection, with one smaller (estimated 160 tonne capacity) pilot crane assisting with the lift procedure.

4.3.19 Hardstanding construction would involve stripping the topsoil and peat to expose a suitable bearing strata on which to build the hardstanding. The hardstanding would then be constructed by placing and compacting suitable crushed rock (obtained from suitable on-site borrow pits) to the required level. The upper soil/peat horizon, together with any vegetation, would be placed to one side for later reinstatement, if appropriate.

Access Tracks

4.3.20 The access track layout is shown on Figure 4.2: Site Layout. From the C6 Strath Brora road at Ascoile, access to the site would be achieved by utilising the existing track infrastructure developed as part of the operational Gordonbush Wind Farm where possible (see Figure 4.1 and Plate 4.2a and 4.2b).

4.3.21 There is currently approximately 21km of track constructed as part of the operational wind farm site that has been built to a high standard with a width of around 4.5-5m. Approximately 11km of the existing tracks would be utilised to access the Development and the existing control and substation buildings. Localised widening of the existing track may be required to facilitate the delivery of the wind turbine components dependent on the wind turbine chosen to be used on the Development.

Plate 4.2a: Junction from C6 Strath Brora road at Ascoile

Plate 4.2b: Existing Gordonbush Wind Farm Access Track

4.3.22 Approximately 7.96km of new tracks with a minimum 4.5m wide running surface and localised widening on corners would be required to access the turbines from the existing access tracks, for use both during construction and operation. The access track would be designed to incorporate passing places that would be suitable for construction plant and 4x4 traffic (approximately 25m x 3m) (see Figure 4.5: Indicative Access Track Details).

4.3.23 As described in Chapter 3: Site Selection, Design Evolution and Consideration of Alternatives of this ES, the access track layout has been designed taking into account a range of environmental and technical constraints. This included a requirement to maintain appropriate gradients for construction and delivery vehicles and avoid watercourses, habitats highly dependent on groundwater and any areas of deeper peat where possible.

4.3.24 From experience gained during construction of Gordonbush Wind Farm, measures would be put in place to ensure dust created by construction traffic (on drier days) is suppressed (see Appendix 4.1: draft CEMP and Appendix 4.2: Lessons Learnt).

Access Track Construction

4.3.25 Site access tracks would be constructed with locally (on site) won graded rock from borrow pits and, where necessary, geotextiles with the surface course comprising of a durable unbound graded rock surfacing material. This construction broadly matches the existing access tracks created for Gordonbush Wind Farm.

4.3.26 Depending on local ground conditions, access tracks would be constructed using a combination of ‘floating track’ or ‘cut track’ designs:

- Generally, a ‘floating track’ design does not involve excavation and would be utilised on the site in areas where peat depth is greater than 1m. Geotextile material is laid onto the unbroken existing surface at a width to suit the track. Layers of crushed stone would then be laid on the geotextile to form a track capable of supporting the turbine delivery vehicles and construction plant. This type of track construction is typically used in peaty areas across Scotland including other constructed wind farm developments and public roads. The benefits of the floating track design are that it allows access track construction on soft terrain and does not require excavation of deep peat as the surface layer is not broken, resulting in reduced peat volumes for re-use across the site. There is minimal disruption of the sub-surface flow of water within the peat body, and no new channels are formed by which water can drain from the peat mass.

- In areas of shallow or no peat (0-1m), a 'cut track' design would be utilised for which the topsoil and peat would be stripped to expose a suitable bearing strata on which to build the track. The track would then be constructed by placing and compacting suitable crushed rock (obtained from suitable on-site borrow pits) to the required level. Given the variable and undulating topography across the site, earthwork cuttings and embankments will be required to achieve the required gradients for tracks and crane hardstandings. The upper soil/peat horizon, together with any vegetation, would be placed to one side for later reinstatement, if appropriate.

4.3.27 Peat depth across the site, confirmed through peat probing, is generally shallow (<1m). Figure 4.2 illustrates where 'floating track' and 'cut track' are proposed across the site depending on the depth of peat (see also Chapter 9: Hydrology, Hydrogeology and Geology and relevant appendices).

4.3.28 Where appropriate, peat and soil from excavations on site would be utilised for reinstatement along both sides of the track verges and allowed to regenerate naturally. Further details are provided in Appendix 4.1: draft CEMP and Appendix 9.3: Peat Management Plan.

Access Track Drainage

4.3.29 Construction of site access tracks requires robust drainage. Run-off from the access tracks will be shed via a crossfall into track side ditches and settlement lagoon/ponds to attenuate flows and remove sediments before discharging to land. Further details are provided in Appendix 4.1 draft CEMP. Existing drainage infrastructure will be utilised where possible, as described in ES Chapter 9: Hydrology, Hydrogeology and Geology.

4.3.30 Where practical, interceptor (cut-off) ditches would be formed on the upslope side of the track to collect and divert clean water away from the access tracks. Refer to Figure 4.5: Indicative Access Track Detail.

4.3.31 Cross drains would be installed at regular intervals to prevent flooding / surcharging of trackside drainage and maintain hydraulic pathways. As far as possible, these would coincide with naturally occurring drainage channels.

Access Track Watercourse Crossings

4.3.32 The proposed routes for the site tracks have been designed to ensure that no new watercourse crossings are required, with the existing access tracks constructed as part of Gordonbush Wind Farm utilised where possible.

Temporary Construction Compound and New Operations Building

4.3.33 A temporary construction compound containing: welfare; offices; parking for cars and plant; and storage facilities, would be required for construction workers at the location shown on Figure 4.2. This is a different location to the temporary compound used for Gordonbush Wind Farm and has been relocated to minimise potential impacts on local residents during construction (see Appendix 4.2: Lessons Learnt).

4.3.34 The existing operations building located at the substation area and developed as part of Gordonbush Wind Farm is some 5.3km from the site entrance and thus an additional operations building is proposed closer to the site entrance for welfare provision for operations staff working on the wind turbines located in the southern sections of the site.

4.3.35 For the health and safety of operations staff, this new operations building provides a base which can be utilised in the event of inclement weather. A building in this location would be easier to access from a number of the Development's wind turbine locations, compared to the existing operations building at the substation. Additionally, the new operations building would allow more efficient working through allowing storage of materials and equipment in a location which is more accessible for work on the wind turbines to the south of the wind farm, saving journeys to the existing building.

4.3.36 Figures 4.8 to 4.10 illustrate the layout and elevations of the proposed new operations building.

Meteorological Masts

4.3.37 One permanent meteorological mast (met mast) would be erected to collect meteorological data for the operational life of the Development and has been located to ensure it obtains the best quality data for the site. Figure 4.2 indicates the location of the permanent meteorological mast and a typical elevation is shown on Figure 4.6. It is assumed that the mast would have a reinforced concrete foundation of 8m x 8m, in addition to a 840m^2 crane pad for mast erection. The construction of the foundation would follow a similar process to that of the wind turbine foundations.

4.3.38 It is anticipated that the new permanent met mast would be sufficient to serve both the southern section of the operational Gordonbush Wind Farm and the extension site (if consented). Therefore, the more southern of the two permanent meteorological masts, erected as part of the operational Gordonbush Wind Farm, would be removed once the proposed extension has been constructed. The northern most existing permanent meteorological mast would remain in situ.

4.3.39 A temporary meteorological mast for the purpose of Power Performance Testing is proposed. The exact location of the mast would be determined in agreement with the turbine supplier and therefore cannot be identified at this stage, although would be located on one of the turbine locations. The temporary mast would be erected early in the construction programme and would record data for several months before turbine erection. Prior to the turbines being constructed, the turbine mast would be decommissioned and removed.

Electrical Infrastructure

<u>Grid Connection</u>

4.3.40 It is anticipated the Development would connect to the electricity transmission network using the existing control building and grid substation developed for Gordonbush Wind

Farm (see Figure 4.2 and Plate 4.3). Works to the existing substation and operations building would be required to accommodate additional cables and equipment associated with the Development. The substation would connect the Development to the adjacent existing Beauly to Dounreay 275kV transmission line.

Plate 4.3: Existing Gordonbush Wind Farm Substation

4.3.41 An application for connection to the grid has been lodged separately to the network operator.

On-site Cabling

4.3.42 Turbines are likely to be connected by electrical circuit 'arrays', with the output connecting to the substation. The cabling for this would be laid in trenches of varying width (depending on the number of cables) and approximately 1m in depth alongside the site access tracks. These trenches would also carry earthing and communications cables.

4.3.43 Cables would be laid directly in trenches with a sand surround and then backfilled with excavated sub-soil and peat topsoil. Alternatively cable ducts could be installed underground, backfill materials would be as per those aforementioned, and the cables pulled through following completion of the duct installation. Earthing cables and communications cables would be included in the same trench.

4.4 Associated Development Components

Concrete Batching

4.4.1 It is anticipated that concrete batching would be undertaken on site. The location of the batching plant is shown on Figure 4.2. The batching facility would comprise batching towers and a number of feeder hoppers used to store the constituent parts (water, fine and course aggregates and cement), which are mixed to form concrete.

Borrow Pits

Predicted Aggregate Requirements

4.4.2 It is estimated that approximately 144,000m³ of stone would be required (see Table 4.3 below) for construction of the Development (including access tracks, structural fill beneath turbine foundations, and hardstandings at turbine bases and compounds).

Borrow Pit Locations

4.4.3 Stone required during construction is expected to be obtained from borrow pits which were utilised for the existing Gordonbush Wind Farm site (as shown on Figure 4.2). Where the borrow pits do not yield suitable material for certain construction operations such as concrete batching or access track capping, it may be necessary to import material to the site. This would be determined following detailed ground investigation works.

4.4.4 The volumes provided in Table 4.3 are considered to be indicative of the volume of stone each borrow pit would provide but this is subject to detailed ground investigation and design during the pre-construction design phase. It is anticipated the extraction volumes from each borrow pit would vary as further information becomes available during the detailed design phase. Further details are provided in Appendix 9.4: Borrow Pit Assessment.

Table 4.3: Borrow Pits

Borrow Pit Reference	Location Coordinates	Indicative Volume
BP1	284826, 912623	48,000m^3
BP2	285989, 913373	96,000m^3

4.4.5 The borrow pits would require the use of plant to both win and crush the resulting rock to the required grades. It is anticipated that rock would be extracted by breakers and some blasting may be required.

Borrow Pit Reinstatement

4.4.6 Following construction, the borrow pits would be reinstated with a suitable restoration profile (refer to Appendix 9.4: Borrow Pit Assessment).

4.4.7 The reinstatement profiles of the borrow pits would take place along the following principles:

- Utilise the stockpiled restoration soils that are to be excavated in order to reopen each borrow pit to create slopes with the excavation at an approximate gradient of 1 (V) in 2 (H);
- The crest of the slopes would intersect the uppermost rock face at a position which partially obscures the lower part of the faces. The toe of the restoration faces would be blended into the borrow pit floor, which would be re-profiled on a small scale basis to allow drainage and the reintroduction of appropriate cover; and

- The upper part of the borrow pit faces would remain exposed and would be allowed to become weathered. It is envisaged that this face would acquire an appearance similar to that of other natural rock exposures in the locality.

4.5 Construction Programme

4.5.1 It is expected that many of the above operations would be carried out concurrently, although predominantly in the order identified in Table 4.4, to minimise the overall length of the construction programme. A typical construction period for a wind farm of this size is estimated to be approximately 13 months. The 13 month construction programme is illustrated in Table 4.4, with the final period dependent on weather and ground conditions experienced at the site.

4.5.2 Site reinstatement would be programmed and carried out to allow rehabilitation of disturbed areas as early as possible in order to minimise storage of excavated material on vegetation.

Working Hours

4.5.3 Construction activities are anticipated to be between 07.00 and 19.00 hours Mondays to Fridays, and 07.00 to 14.00 hours on Saturdays between April and September. In winter months (i.e. between October and March), working hours are anticipated to be between 07:30 and 17:00 Mondays to Fridays and 07:30 and 14:00 on Saturdays. No working activities would be planned on Sundays during any period. In the event of work being required outwith these hours, e.g. abnormal load deliveries, commissioning works or emergency mitigation works, the Planning Authority will be notified prior to these works taking place, wherever possible.

4.5.4 Operation of crushing equipment located within / next to borrow pits will generally be limited to 08.00 to 18.00 hours Mondays to Fridays and 08.00 to 13.00 hours Saturdays, with no operation on Sundays.

Table 4.4: Indicative Construction Programme

Activity/Month	1	2	3	4	5	6	7	8	9	10	11	12	13
Mobilisation	■												
Borrow Pits		■	■	■	■	■	■	■					
Access Track Construction		■	■	■	■	■							
Hardstanding Construction			■	■	■	■	■						
WTG & Met Mast Foundations			■	■	■	■	■	■					
Operations Building			■	■	■	■	■	■					
WTG & Met Mast Erection									■	■	■	■	
Reinstatement		■	■	■	■	■	■	■	■	■	■	■	
Demobilise													■

4.6 Environmental Management during Construction

4.6.1 Prior to construction works, sensitive ecological areas, and other specific sensitive locations (e.g. watercourses) would be marked out as appropriate on site by specialist advisers in order to avoid unnecessary encroachment and protect sensitive areas during construction. The contractor would ensure that no vehicle movements or other activities take place outwith the approved working area. There may be a requirement to microsite elements of the Development as a result of additional constraints encountered during site works. Typically, micrositing is allowed up to 50m without any further permission but with notification to the relevant bodies as would be specified in any development consent. Micrositing over 50m would require written permission of the relevant body. Any micrositing would however, require to be agreed with the specialist advisors (e.g. the Ecological Clerk of Works) as appropriate.

Construction Environmental Management Plan

4.6.2 A Construction Environmental Management Plan (CEMP) for the operational Gordonbush Wind Farm was put in place during the construction of that scheme following agreement with The Highland Council, SNH and SEPA. The same principles of this CEMP would be adopted for Gordonbush Extension; however, new best practice techniques and lessons learned from the operational scheme would be incorporated.

4.6.3 A draft CEMP is provided in Appendix 4.1 of this ES. The principal objective of this document is to provide information on the proposed infrastructure and to aid in avoiding, minimising and controlling adverse environmental impacts associated with the Development. Furthermore, this document aims to define good practice as well as specific actions required to implement mitigation identified in this ES, the planning process and/or other licensing or consenting processes. The CEMP would be updated during the pre-construction phase and would form part of the contract documents between the Applicant and the appointed construction contractor.

Site Environmental Management

4.6.4 The appointed contractor would have overall responsibility for environmental management on the site. As noted previously, the CEMP provided in Appendix 4.1 would be updated by the Applicant to accommodate any specific measures required by the Conditions of Consent and any further information obtained during detailed ground investigations and pre-construction surveys. The services of specialist advisors e.g. Ecological Clerk of Works would be retained as appropriate to be called on as required to advise on specific issues. The appointed contractor and the Applicant would ensure construction activities are carried out in accordance with the mitigation measures outlined in this ES.

4.6.5 In order to ensure all mitigation measures outlined within this ES are carried out on site, contractors would be required to develop the following documents for adherence to throughout the construction process:

- CEMP; and
- Traffic Management Plan.

4.6.6 Contractors would be required to adhere to the following in order to reduce or mitigate the environmental effect of the construction process:

- conditions stated in the consent;
- relevant environmental regulations, including requirements of SEPA; and
- any other relevant mitigation measures identified in this ES.

4.6.7 A copy of any Conditions of Consent would be incorporated into tender documents and CEMP as appropriate. The selection criteria for the construction contractor would include their record in dealing with environmental issues, and provision of evidence that they have incorporated all environmental requirements into their method statements.

Waste Management

4.6.8 Waste management is addressed in detail in the CEMP (refer to Appendix 4.1). Wherever possible, excavated stone or soils would be reused on site, primarily for reinstatement of disturbed ground. Any materials to be removed from site (packaging etc.) would be segregated on site and removed to suitable recycling facilities or disposed of to a suitably licensed waste management facility, in accordance with current waste management regulations.

4.6.9 Demolition material removed from site during decommissioning would also be disposed of as above, and recycled where possible. All material would be disposed of in accordance with the waste regulations and best practice applicable at the time.

4.6.10 A Waste Management Plan would be provided by the Contractor as part of the CEMP.

Health and Safety and Related Issues

4.6.11 Health and safety would be initially addressed as part of the Pre-Construction Information Pack prepared by the Principal Designer for the project under the Construction (Design and Management) Regulations 2015. The contractor would be required to prepare a Construction Phase Health and Safety Plan and forward information to the Principal Designer during the works to enable the Health and Safety File to be completed.

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

4.6.13 In accordance with the Land Reform Act 2003, chapter 2 section 6(1) (g), general public access rights are removed throughout the construction working area for health and safety reasons.

4.6.14 An Operations and Maintenance Manual for the design life of the wind farm would be prepared, which would cover all operational and decommissioning procedures.

Site Reinstatement

4.6.15 Reinstatement works are generally undertaken during construction (and immediate post-construction phase) and aim to address any areas of ground disturbance and changes to the landscape as part of the construction works. Reinstatement is undertaken as soon as practical following the construction works in each area, such as the re-dressing of road and track verges and turbine bases (and other areas that may be disturbed as a result of the construction process).

4.6.16 The works would involve the reinstatement of areas disturbed during the construction works. This would be undertaken to provide a natural ground profile with non geometric surfaces and tie-ins with existing undisturbed ground levels to prevent the collection of surface water. It would in all instances be undertaken at the earliest opportunity to minimise storage of turf and other materials and to provide completed reinstatement at the earliest opportunity. Typical reinstatement works are outlined in Section 15 of the draft CEMP (see Appendix 4.1).

4.6.17 Site tracks and hardstanding areas at each turbine location would be retained for use in ongoing maintenance operations (including component replacement) and decommissioning of the wind farm. The edges would as far as possible be blended to the adjacent contours, natural vegetation being allowed to re-establish.

4.6.18 Any other temporary hardstanding areas would be re-graded with peat or soil to a natural profile and reinstated as appropriate.

4.6.19 All construction equipment and other temporary infrastructure would be removed from site and the temporary storage areas would be reinstated. All waste would be removed from site for safe disposal at a suitable facility in accordance with current waste management regulations.

Consultations with the Local Community during Construction

4.6.20 Consultation with the local community during the construction of the Development would be an important consideration for the Developer and the successful contractor. At Gordonbush Wind Farm, a community liaison group was set up which provided the local community with information about key construction activities and a mechanism by which concerns from within the local community could be shared and discussed. A similar working group would be established during the construction of the Development.

Site Operation and Maintenance

4.6.21 Once commissioned, it is expected that the development would have an operational life of 25 years and would require the continued use of the current existing infrastructure within the site boundary.

4.6.22 Routine maintenance and servicing would be carried out on each turbine as required at the Development, including gear box oil changes and blade inspections. Appropriate maintenance works would be carried out immediately following any unexpected events on site, such as failure of a generator or gearbox.

Track Maintenance

4.6.23 Frequency of track maintenance depends largely on the volume and nature of the traffic using the track, with weathering of the track surface also having an appreciable effect. Heavy plant is particularly wearing and on-going track maintenance would be undertaken as necessary throughout the year. Safe access would be maintained all year round, as is the case at Gordonbush Wind Farm.

4.6.24 There would be no public vehicular access to the site.

4.7 Habitat Management Plan

4.7.1 As part of the Gordonbush Wind Farm development, a Habitat Management Plan (HMP) was designed and implemented to deliver a range of long-term mitigation and enhancement measures on Gordonbush Estate. The HMP was secured by means of an agreement under Section 75 of the Town and Country Planning Act.

4.7.2 The overall aim of the HMP is to provide mitigation for any potential adverse effects on the wind farm on golden eagle, merlin and golden plover both by deterring species from the wind farm site ('push' factors) and attracting them elsewhere on the estate ('pull' factors) by enhancement of peatland, woodland and grassland habitats, which are being met via the implementation of a number of methods and specific plans, including the following, and which are described further in Chapter 8: Ecology and Nature Conservation.

- Reduction in deer on the Estate to promote heather moorland;
- Removal of coniferous forestry plantations to restore peatland habitats;
- Improved moorland and heather management;
- Blocking of drains on peatland;
- Native woodland management; and
- Low-intensity cattle grazing.

4.7.3 The Development site boundary overlaps a small part of the HMP area. The Ecological Impact Assessment (EcIA) within Chapter 8: Ecology and Nature Conservation of this ES has included the HMP area as a baseline receptor by considering each of the HMP Objectives. The EcIA concluded that none of the HMP Objectives in terms of habitat management and enhancement would be compromised by the Development.

4.8 Site Decommissioning

4.8.1 The decommissioning period for a wind farm of this size is estimated to be 12 months.

4.8.2 Detailed decommissioning proposals would be established and agreed with relevant authorities prior to commencement of decommissioning activities.

4.8.3 Following the 25 year period of wind farm operation dismantling of the wind farm would be undertaken. This is anticipated to involve:

- dismantling and removal of the turbines and site substation;
- removal to 1m below ground level of the turbine foundations;
- removal of substation building foundations; and
- re-instatement of all land affected, in accordance with best practice at the time.

4.8.4 It is not anticipated that the access tracks/spine road or underground cabling would be removed.

4.8.5 The turbines would be dismantled and removed from the site in a manner similar to that of their erection. Cranes would be used to split the turbines into sections, which would then be transported, from the site.

4.8.6 It is anticipated that turbine foundations would be broken out to a level of 1m below the final ground level. Typically this would involve the removal of the upstand plinth to the top surface of the main foundation base. All material arising from demolition would be disposed of responsibly and in accordance with relevant waste management regulations prevailing at the time.

4.8.7 All buildings and equipment would be removed including removal of fencing and of building foundations. All material arising would be disposed of responsibly as described above.

4.9 References

CIRIA (2005). Construction Industry Research and Information Association (CIRIA) (2005): C650: Environmental Good Practice on Site

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Construction (Design and Management) Regulations (CDM) (2015). www.legislation.gov.uk

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The Town and Country Planning (General Permitted Development) (Scotland) Order 1992. www.legislation.gov.uk

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