

2. The Environmental Impact Assessment

2.1 Environmental Impact Assessment

Overview

2.1.1 Environmental Impact Assessment (EIA) is a systematic procedure that must be followed for certain categories of project (see Section 2.1.5 and 2.1.6) before they can be given development consent. It aims to assess a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects and the scope for reducing effects are properly understood by the public and the relevant determining authority before it makes its decision.

2.1.2 The information on the development and its environmental effects are presented in an Environmental Impact Assessment Report (EIA Report). The EIA process that culminates in the submission of the EIA Report has a number of key characteristics:

- It should be systematic, comprising a sequence of tasks defined both by regulation and by practice;
- It should be analytical, requiring the application of specialist skills from the environmental sciences;
- It should be impartial, its objective being to inform decision-making rather than to promote the project;
- It should be consultative, with provision being made for obtaining information and feedback from interested parties including local authorities, members of the public and statutory and non-statutory agencies; and
- It should be iterative, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

2.1.3 Typically, a number of design iterations take place in response to environmental constraints identified during the EIA process (in effect, incorporating mitigation measures to avoid, reduce or compensate for identified adverse effects). Further details of such measures in this case are presented in the corresponding environmental topic chapters. A summary of design iterations is included at the end of **Chapter 3 'Description of the Proposed Development'**.

EIA regulations

2.1.4 The Town & Country Planning Act (Environmental Impact Assessment) (Scotland) Regulations 2017 will apply to the Proposed Development.

2.1.5 Schedule 1 of the EIA Regulations lists those developments for which an EIA will always be required. Schedule 2 of the EIA Regulations lists developments for which the need for an EIA is determined on a case-by-case basis (i.e. if significant environmental effects are likely), whilst Schedule 3 describes indicative thresholds to be used to determine if a Schedule 2 development is an "EIA development". Where an EIA is required, environmental information must be provided by the applicant in an EIA Report. Schedule 4 specifies the information that must be provided in the EIA Report.

- 2.1.6 Most wind energy developments fall within Schedule 2 and where the need for EIA is not certain the developer can apply to the determining authority for a screening opinion. It is clear that the potential size of the proposed Lochluichart Wind Farm Extension II (hereafter referred to as 'the Proposed Development') means that an EIA would be needed. It is recognised that the EIA process can play an important role in developing the design of proposals to minimise adverse environmental effects and to realise environmental benefits.
- 2.1.7 While it has been determined that the proposal has the potential for significant environmental effects, this does not mean that a significant effect is the ultimate conclusion of the EIA. The EIA process identifies the potential for adverse effects and then encourages environmental measures (mitigation) to be incorporated into the design of the development, or the method of construction and operation that may reduce or eliminate any negative effects or further enhance positive effects.

Topics to be addressed

- 2.1.8 Schedule 4 of the Regulations specifies that the EIA Report should describe those "...aspects of the environment likely to be significantly affected by the development, including, in particular population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter relationship between the above factors."
- 2.1.9 Establishing which aspects of the environment and associated issues are relevant for a particular project is captured in an EIA scoping process. For the Proposed Development this is described in more detail in **Sections 2.1.10, 2.1.11 and 2.4.**

The environmental impact assessment scoping process

- 2.1.10 Scoping is the process of identifying those aspects of the environment and associated issues that need to be considered when assessing the potential effects of a particular development proposal. This recognises that there may be some environmental elements where there will be no significant issues or likely effects resulting from the development and hence where there is no need for further investigation to be undertaken.
- 2.1.11 Scoping is undertaken through consulting organisations and individuals with an interest in and knowledge of the site, combined with the professional judgement and experience of an EIA team. Scoping takes account of published guidance, the effects of the kind of development under consideration and the nature and importance of the environmental resources that could be affected.

Spatial scope

- 2.1.12 In its broadest sense, the spatial scope is the area over which changes to the environment would occur as a consequence of the development. In practice, an EIA should focus on those areas where these effects are likely to be significant.
- 2.1.13 The spatial scope varies between environmental topic areas. For example, the effect of a proposed wind energy development on the landscape resource and visual amenity is generally assessed within a zone of up to 35km from the centre of the site (70km for cumulative effects), whilst noise effects are assessed within a much smaller area encompassing the worst affected properties close to the site.

2.2 Assessment methodology

2.2.1 Following the identification of the scope of the EIA, individual environmental topics are subject to survey, investigation and assessment, and individual topic chapters are prepared for the EIA Report. The assessment methodologies are based on recognised good practice and guidelines specific to each topic area, and details are provided in the appropriate chapter.

2.2.2 In general terms, the technical studies undertaken for each topic area and chapter include:

- Collection and collation of existing baseline information about the receiving environment and original surveys to fill any gaps in knowledge or to update any historic information, along with identification of any relevant trends in, or evolution of, the baseline;
- Consultation with experts and relevant consultees to define the scope of the assessment and study area and subsequent consultation in response to emerging study findings;
- Consideration of the potential effects of the development on the baseline, followed by identification of design changes to seek to avoid or reduce any predicted adverse effects;
- Engagement with other technical topic specialists and engineers / designers in a design iteration process seeking to optimise the scheme for the differing environmental effects and identify any appropriate mitigation measures;
- Assessment of the final scheme design and evaluation of significant effects, together with an evaluation of any residual significant effects after mitigation measures have been implemented; and
- Compilation of the EIA Report chapter.

2.2.3 In reality, many of the effects are relevant to more than one environmental topic area, and careful attention has been paid to interrelationships to avoid overlap or duplication between topic chapters. For example, the assessment of effects on cultural heritage features will be aided by the assessment in the landscape and visual chapter. Similarly, secondary effects on ecological resources arising from hydrological change would be considered in the ecology chapter with a cross-reference to the relevant direct effect in the hydrology and hydrogeology chapter.

2.2.4 The following format has been adopted for the presentation of information within the EIA Report. In some cases, technical data and analysis has been moved to a Technical Appendix that is bound separately from the main EIA Report in **Volume 3**:

- Summary – A short summary of each technical chapter is included at the outset, this text also forms the basis of that included in the Non-Technical Summary that accompanies the EIA Report;
- Introduction and overview – setting the scene for the topic, the nature of the receptors to be considered, and how the proposals might cause change;

- Methodology – describing how receptors were identified through a scoping process, along with the specific methods used for data gathering, predicting levels of effects and evaluating significance of effects;
- Baseline information – describing the current state and circumstances of the receptors and changes that might be expected to arise in advance of the development being implemented as well as those that might arise regardless of the development;
- Topic specific design evolution – identifying where there was potential for an effect and how the scheme (in terms of the location of elements and their scale) has been developed to address that potential;
- Predicted effects of the scheme – the effects predicted to arise as a result of implementing the final design of the project;
- Mitigation and enhancement measures – identification of non-embedded ‘design’ measures which may be necessary to control or manage identified potentially significant effects or provide enhancements;
- Assessment of residual effects – an assessment of any effects remaining after non-embedded mitigation measures have been employed; and
- References.

2.3 Defining significance of effects

- 2.3.1 Development proposals affect different environmental elements to differing degrees and not all of these are of sufficient concern to warrant detailed investigation or assessment within the EIA process. The EIA Regulations identify those that warrant investigation as those that are “*likely to be significantly affected by the development*”. These are identified through a scoping process as described in **Section 2.4**.
- 2.3.2 Conclusions about significance are derived with reference to available information about the project description and the environmental receptors (or ‘receiving environment’), and to predictions about the potential changes that the proposed development would cause to the affected receptors.
- 2.3.3 In each of the environmental topic chapters, professional judgement is used in combination with relevant guidance to assess the interaction of the receptor’s sensitivity (this may be defined in terms of importance, value, rarity, quality) against the predicted magnitude of change to identify a level of effect. In general terms, and in order to assist consistent interpretation of the final results of the EIA, receptor sensitivity, magnitude of change and level of effect for each environmental topic are categorised as shown in **Table 2.0**.
- 2.3.4 The type of categorisation illustrated in **Table 2.0** provides a guide only, and may be moderated by the professional that undertakes the assessment in accordance with judgement and experience. In particular, the divisions between categories of receptor sensitivity, magnitude of change, and level of effect should not be interpreted as definitive (and indeed different definitions for each category may be applied by different professionals), and the lines that represent the boundaries between categories should in many cases be considered as ‘blurred’. In some cases, the judgement can be guided by quantitative values, whilst in other cases qualitative

descriptions are used. The significance of the effect may also need to be qualified with respect to the scale over which it may apply (e.g. local, regional, national, international).

Table 2.0 Establishing the level of effect

		Sensitivity of receptor			
		HIGH	MEDIUM	LOW	NEGLIGIBLE / NONE
Magnitude of change	LARGE	VERY SUBSTANTIAL	SUBSTANTIAL	SLIGHT / MODERATE	NEGLIGIBLE
	MEDIUM	SUBSTANTIAL	MODERATE	SLIGHT	NEGLIGIBLE
	SMALL	MODERATE	SLIGHT	NEGLIGIBLE / SLIGHT	NEGLIGIBLE
	NEGLIGIBLE / NONE	NO EFFECT	NO EFFECT	NO EFFECT	NO EFFECT

2.3.5 Having defined a level of effect, professional judgement in combination with guidance and standards are then applied to identify which of those levels of effect are then considered to be equivalent to significant effects when discussed in terms of the EIA Regulations.

2.3.6 A definition of how the terms are derived for each topic is set out in the corresponding chapter along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant in terms of the EIA Regulations.

Type of effect

2.3.7 The EIA Regulations (Schedule 4, Part 1) require consideration of a variety of types of effect, namely direct/indirect, secondary, cumulative, positive/negative, short/medium/long-term, and permanent/temporary. In this EIA Report, effects are considered in terms of how they arise, their valency (i.e. whether they are positive or negative) and duration. Each will have a source originating from the development, a pathway and a receptor.

2.3.8 Most predicted effects will be obviously positive or negative, and will be described as such. However, in some cases it is appropriate to identify that the interpretation of a change is a matter of personal opinion, and such effects will be described as 'subjective'.

2.3.9 The temporal scope of environmental effects is stated where known. Effects are typically described as:

- Temporary – these are likely to be related to a particular activity and will cease when the activity finishes. The terms 'short-term' and 'long-term' may also be used to provide a further indication of how long the effect will be experienced; and

- Permanent – this typically means an unrecoverable change.

2.3.10 Effects are generally considered in relation to the following key stages of the development:

- Construction – effects may arise from the construction activities themselves, or from the temporary occupation of land. Effects are often of limited duration although there is potential for permanent effects. Where construction activities create permanent change, the effects will obviously continue into the operational period;
- Operation – effects may be permanent, or (as is typical with wind power developments) they may be temporary, intermittent, or limited to the life of the development until decommissioning; and
- Decommissioning - effects may arise from the decommissioning activities themselves, or from the temporary occupation of land. The effects would generally be temporary and of limited duration and additional permanent change would normally be unlikely unless associated with restoration.

2.4 The scope of the environmental impact assessment for the Proposed Development

Screening

2.4.1 Formal screening was not undertaken, as it was recognised at an early stage that due to the size of the Proposed Development an EIA would be required.

The scoping request and scoping opinion

2.4.2 The content of the EIA Report and the identification of receptors requiring assessment for the proposed development were determined through the advice provided to the Applicant through a Scoping process. A Scoping Report (Appendix 2.A) was submitted on 12th April 2017 to the Energy Consents Unit (ECU) of the Scottish Government to define the information to be provided in the EIA Report. The environmental disciplines included in the Scoping Report are listed below:

- Landscape and Visual Impact;
- Non-Avian Ecology;
- Avian Ecology;
- Ornithology;
- Geology and Peat;
- Hydrology and Hydrogeology;
- The Historic Environment;
- Traffic and Access;
- Air Quality;
- Climate Change Impact Assessment;
- Noise and Vibration;

- Aviation and Radar;
- Telecommunications;
- Shadow Flicker; and
- Socio-Economic, Recreation and Land Use;
- Health & Safety.

2.4.3 The ECU duly issued a formal Scoping Opinion on 13th of June 2017 and this is presented in full in **Appendix 2.B**. The scoping responses and where they are addressed in the EIA Report are summarised in **Table 2.1** below.

Table 2.1 Scoping responses

Consultee	Summary of Main Issues	How Addressed in EIA Report
The Highland Council	<p><u>Planning</u> - THC expects supporting document included with the ES to include specific relevant policies of the Scottish Government and Highland Council. This should include newly adopted Onshore Wind Energy Supplementary Guidance, including an assessment of the ten criteria that relate to siting and design in particular. <u>Landscape and Visual Impact</u> - the applicant, as noted in the Scoping Report, should follow guidance as set out in GLVIA13. Council should be involved in viewpoint selection, forming part of the LVI Assessment. Viewpoints should be clearly identified within the ES. Applicant should ensure visualisations provided as part of ES to be undertaken in accordance with The Council's Visualisation Standards for Wind Energy Development. .</p> <p>Transport - Council has a locus at the port of Invergordon, intended port of entry for delivery. The use of this port, if larger turbines are being proposed, may require the route to site to be reassessed.</p> <p><u>Noise</u> - Simplified noise criterion will be applied, consideration will need to be given on how this will operate within the cumulative context to achieve compliance.</p> <p><u>Private Water Supplies</u> - the Applicant will need to identify any private water supplies which may be adversely affected by the development and include mitigation where applicable.</p> <p>Cultural Heritage - all potential and indirect impacts should be clearly laid out in the EIA & appropriate mitigation should be devised.</p> <p>Environmental Report submitted should include three distinct elements:</p> <ol style="list-style-type: none"> 1. Environmental Effects Affected 2. Significant Effects on the Environment and <ul style="list-style-type: none"> • 3. Mitigation - clear summary table of all mitigation measures associated with the development proposal entitle draft Scheme of Mitigation. 	n/a
Scottish Natural Heritage (SNH)	<p>Key Issues - Applicant should examine history of the currently consented schemes of Lochluichart and Corriemoillie, particularly the evolution of their design, associated mitigation, and discussions leading towards consent. ES should clearly illustrate whether or not this proposal would undermine the mitigation and design built into these consented schemes. In addition, cumulative landscape issues with other wind farms and impacts on wild land areas need to be considered.</p> <ul style="list-style-type: none"> • Scoping Report includes all the topics that we wish to be covered in the EIA process. 	Chapter 9 LVIA

Consultee	Summary of Main Issues	How Addressed in EIA Report
SEPA	<p>SEPA requested in their response to Scoping that the following key issues must be addressed in the EIA:</p> <p>a) Map and assessment of all engineering works within and near the water environment including buffers, details of any flood risk assessment and details of any related CAR applications.</p> <p>b) Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers.</p> <p>c) Map and assessment of impacts upon groundwater abstractions and buffers.</p> <p>d) Peat depth survey and table detailing re-use proposals.</p> <p>e) Map and site layout of borrow pits.</p> <p>f) Schedule of mitigation including pollution prevention measures.</p> <p>g) Borrow Pit Site Management Plan of pollution prevention measures.</p> <p>h) Map of proposed water abstractions including details of the proposed operating regime.</p> <p>i) Decommissioning statement.</p>	Chapter 13 Hydrology & Hydrogeology
Historic Environment Scotland (HES)	Consider that the proposals unlikely to raise significant issues for HES's interests, note change in turbine numbers from pre-application advice 23/11/16 & content this does not alter the view previously stated.	Chapter 10 Cultural Heritage
Forestry Commission Scotland	Outside of generic scoping report comments, FCS refer to Scottish Government Control of Woodland Removal Policy for any potential direct impacts on woodland including turbines, access tracks & connections.	Chapter 16 Forestry
Marine Scotland	Advise the applicant to undertake site characterisation surveys to assess the water quality and fish populations within and downstream of the proposed development site. Proposed mitigation measures and monitoring programmes should be outlined in the ES.	Chapter 11 Ecology
The Crown Estate	No response.	n/a
Defence Infrastructure Organisation (MOD)	No objection to the proposal, but may have concerns about the proposal which will be properly assessed at the planning application stage.	Await submission of planning application.
Mountaineering Council of Scotland (MCS)	Make note of Scottish Government's comments on original Lochluichart Extension scheme, and request justification for appropriateness of the proposal.	Chapter 9 LVIA
NATS Safeguarding	The proposed development has been examined from a safeguarding aspect and does not conflict with our safeguarding criteria. No objection.	n/a
Transport Scotland	<p>Noted that the proposal is an extension to an existing operational wind farm, and that it will follow the same delivery route. Confirmed no objection to the development in terms of environmental impacts on the trunk road network.</p> <p>However they request the following conditions are attached to any consent that may be issued:</p> <ul style="list-style-type: none"> Condition 1: Prior to commencement of deliveries to site, a Construction Traffic Management Plan including swept path analysis must be submitted for approval by Transport Scotland as trunk road authority to ensure that abnormal loads can be transported along the trunk road network safely. The complete report shall detail any accommodation measures required including the temporary removal of 	Chapter 7 Traffic & Transport

Consultee	Summary of Main Issues	How Addressed in EIA Report
	<p><i>street furniture, junction widening, traffic management etc. and show that the transportation will not have any detrimental effect on structures within the route path. Any accommodation works are thereafter to be implemented before delivery commences.</i></p> <ul style="list-style-type: none"> • <i>Condition 2: During the delivery period of the wind turbine construction materials any additional signing or temporary traffic control measures deemed necessary due to the size or length of any loads being delivered or removed must be undertaken by a recognised QA traffic management consultant, to be approved by Transport Scotland before delivery commences.</i> 	
Cromarty Firth Fishery Board	Will comment at application/addendum stage only.	n/a
Civil Aviation Authority	No response.	n/a
Highland and Islands Airports Limited	Objection based on proposal for 200m tip height turbines, potential for interference with Inverness Radar. Line of Sight drawings to be provided by applicant to ensure no conflict.	LOS drawings supplied, still awaiting formal response.
Scottish Water	No Scottish Water drinking water abstraction sources or wider drinking water catchments in the area that are likely to be affected by the development and this advice for the proposed development remains unchanged. Further generic advice is provided on a range of water related matters.	n/a
The Joint Radio Company (JRC)	In the case of the proposed development JRC does not foresee any potential problems based on known interference scenarios and the data provided. However, if any details of the wind farm change, particularly the distribution or scale of any turbine(s) it will be necessary to re-evaluate the proposal.	n/a
Visit Scotland	<p>VisitScotland state that given the importance of Scottish Tourism to the economy, and of Scotland's landscape in attracting visitors to Scotland, they would strongly recommend any potential detrimental impact of the proposed development on tourism, whether visually, environmentally and economically – be identified and considered in full. This includes when taking decisions over turbine height and number.</p> <p>VisitScotland would also like consideration of the effect any perceived proliferation of developments may have on local tourism and in turn the economy.</p>	Chapter 6 Socio Economic
ScotWays	Notes that Right of Way 4.301 (HR46) is different according to CROW records, than that stated in Scoping Report. Society is particularly concerned that cumulative impact is taken into account in application.	n/a
RSPB	<p>RPSB identify the following bird species occurring within or close to the proposal site including golden eagle, hen harrier, merlin, red-throated diver and dotterel. Other important species include golden plover and black grouse.</p> <ul style="list-style-type: none"> • If tree felling forms part of the proposal, potential additional foraging habitat for protected species. A detailed Habitat Management Plan is requested as forming part of the planning application. Potential Cumulative Impacts within this Natural Heritage Zone need to be considered. 	Chapter 12 Ornithology

Further evolution in the scope

- 2.4.4 The process of completing topic specific investigations inherently involves further discussions with consultees. Any topic specific refinements to scope and the detailed assessment methods employed are provided within each of the relevant chapters of the EIA Report.

2.5 Consideration of alternatives

- 2.5.1 National planning and energy policy makes it clear that there is no requirement for renewable energy developments to demonstrate an overall need for new renewable generation or a need to be located in a specific location. Nevertheless, **Section 2.7** does describe the site identification process and design criteria. In EIA terms, the requirement is only to report on alternatives that have been considered. The examination of alternatives in this EIA Report is therefore restricted as appropriate to alternative design solutions that were considered for the site in question in terms of factors such as site layout/design/turbine height and turbine numbers, and the environmental effects of the options considered.

2.6 Selection of the site

- 2.6.1 The Proposed Development was progressed to the detailed EIA and project design stage because it exhibited attributes that include the following:
- the site does not lie within a landscape designation;
 - the site does not lie within an ecological designation;
 - due to the topography of the site is well contained in visual terms, particularly from nearby residential properties;
 - the distances from the nearest residential properties are such that potential noise impacts can be minimised;
 - the land lies near a trunk road and there is good access to the site;
 - the land on the site itself has been heavily grazed, and in parts agriculturally improved and artificially drained;
 - there are existing electricity lines near the site that can be used to make a grid connection;
 - the average wind speed at the site is above 7 m per second (m/s) at a height of 45 m;
 - the site adjoins the consented Lochluichart and Lochluichart Extension wind farm schemes (the 'Operational Schemes') and therefore the Proposed Development will be seen in the context of existing turbines; and,
 - the EIA undertaken on the Operational Schemes established that the extension site is relatively free of environmental constraints

2.7 Selection of the strategic access route

- 2.7.1 Most of the turbine components (blades, tower sections and nacelle) are categorised as abnormal loads for road transportation purposes, so a number of strategic routes

for the delivery of these components were identified and assessed during the initial stages of the EIA for the Operational Schemes.

2.7.2 It was established during the process of achieving the consent for the Operational Schemes, that the turbine components would be delivered by sea to the local port at Invergordon.

2.7.3 The possibility of transport by rail was investigated at an early stage. This confirmed that there is not suitable rail stock in this country to transport the turbine components.

2.8 Selection of the access track route

2.8.1 The access track included in the original application was selected because it would require fewer bends and cuttings and have less significant visual and ecological impacts than other options.

2.8.2 The access track route forming part of the Operational Schemes did not receive any adverse comments from key consultees. It was therefore decided to utilise the same access track route for Proposed Development, with new access tracks being designed to connect wind farm infrastructure being as required.

2.8.3 The requirement for new access tracks was minimised by utilising existing access tracks and where possible connecting up proposed turbines with existing tracks.

2.9 Selection of the borrow working area locations

2.9.1 As explained in more detail in **Chapter 3**, it is estimated that approximately 91,500 tonnes of crushed rock will be required to construct the wind farm. It is calculated that importing crushed rock from the nearest off-site active quarry would result in over 5,000 lorry movements (this figure is an estimate of the total number of loads) on the highway network. Were the rock to be procured from the Achility quarries near Contin, for example, each lorry movement would involve a journey of 50 km (total round trip). The use of on-site borrow workings therefore represents the best environmental option.

2.9.2 During the EIA for the Operational Schemes a comprehensive process was followed to decide upon the preferred locations for borrow pits, from which material was won from.

2.9.3 The comprehensive process followed was centred on avoiding the following areas on site:

- parts of the site with relatively deep peat;
- sensitive catchments, such as those including watercourses with private abstractions;
- Golden Plover and Red Throated Diver nest sites;
- ecologically sensitive habitats, including Ground Water Dependent Terrestrial Ecosystems;

2.9.4 Based on this process, which was followed again for the Proposed Development, and following construction advice, initial discussions with the local planning officer and a visual inspection of the site during initial site surveys, four candidate potential borrow pit locations were identified for further investigation based on the finalised turbine layout for the Proposed Development, which included recommissioning a reinstated location previously used for the Operational Schemes.

- 2.9.5 A local contractor, together with a civil engineer who managed the process, then conducted trial pit excavations to establish the potential for winnable material at these which can be seen in **Appendix 2.C**.
- 2.9.6 Following these site investigations, two preferred locations for the Proposed Development were selected as appropriate, Borrow Pits in the north and south of the site as shown in **Figure 3.1**.

2.10 Selection of the construction compound locations

- 2.10.1 The location of the construction compound, adjoining the access track and the substation compound, was selected for the following reasons:
- it is beneficial to have the compound near the wind farm access route so that delivery vehicle trip length can be reduced and deliveries can be managed effectively;
 - the land is flatter than the other land available near the access route;
 - the depth of peat in this location is less than other areas near the access route;
 - the land is geologically suitable for a borrow working, thereby enabling a compound and working to be designed in an integrated way to reduce impacts;
 - the proximity of the compound to the borrow pit would shorten on-site haulage because crushed rock will be used in the production of concrete at a batching plant within the compound;
 - there are burns nearby which are suitable as a water supply for a concrete batching plant. At the same time, the location is large enough to enable 30 m buffer zones to be provided between the compound and these burns for pollution control purposes;
 - the land does not lie within a catchment where there is a public or private water supply abstraction;
 - the location minimises potential disruption to the on-site workforce (when blasting takes place at borrow pits, a safe distance is imposed which could lead to staff being evacuated from an area if located too close to a construction compound), and also minimises risk to the workforce;

2.11 Selection of the substation and control maintenance site

- 2.11.1 A site is required for a permanent electricity sub-station and it is considered appropriate to provide a wind farm control and maintenance building in the same location. The location for the substation control and maintenance building shown was selected for the following reasons:
- a location in the centre of the site reduces the overall length of site cabling required and is therefore better in terms of electrical efficiency;
 - the location lies within a lower part of the extension site thereby reducing its visibility;
 - the location does not lie within an ecologically sensitive area;
 - the peat at the location is not particularly deep.

2.12 The evolution and design of the wind farm

2.12.1 The remainder of this part of the EIA Report explains the design evolution of the ancillary development such as internal access tracks. The Design Evolution of the Proposed Development is outlined in **Chapter 9: LVIA** of the EIA Report.

Design Evolution

2.12.2 Based on the anemometer data collected during the development of Lochluichart and Lochluichart Extension Wind Farms (the Operational Schemes), it was determined that the site considered suitable for the Proposed Development offered a very good wind speed, and had the potential to work financially in a non-subsidy operating environment. Early studies, based on an assessment of landscape and visual capacity of the Proposed Development and what was then considered the restriction on grid capacity, determined that the site was suitable for up to 8 turbines.

2.12.3 The initial 8 turbine layout incorporated turbines of 150m tip height, but this was not considered appropriate in landscape capacity terms and design principle to fit with the existing Operational Schemes and Corriemoillie Wind Farm. Based on this, a turbine of 133m tip height was then considered. A circular separation of 3 x rotor diameters was used rather than the more usual elliptical layout, as the wind conditions at the site exhibited a significant spread around the compass. The resulting 8 turbine layout was submitted with the scoping request.

2.12.4 The scoping layout for the original proposal was optimised based on modelling wind characteristics obtained from historical wind data collected at the site. Some minor revisions were also made at this point to avoid environmental constraints such as watercourses and Groundwater Dependant Terrestrial Ecosystems (GWDTEs) and turbines were considered appropriate at the time to be sited in the Loch na Salach corridor, based on up to date data from Red Throated Diver movements.

2.12.5 In addition, for a Scoping Report layout for the Proposed Development, a review of key viewpoints from around the area was then undertaken in order to determine the acceptability of the wind farm design in relation to landscape and visual effects, to determine if any further revisions were necessary.

2.12.6 As a result of feedback from the Scoping Report, and from the Pre-Application Process with Highland Council (see Appendix 2.D), further revisions were made to the turbine layout for the Proposed Development. This included removing all turbines from the Loch na Salach corridor due to the Red-Throated Diver constraint, completion of baseline data for the Proposed Development led to further micro-siting of turbines due to peat depth surveys, slope gradient and drainage features. In addition, Computational Fluid Dynamics, a form of wind resource modelling, further refined the turbine layout in terms of maximising wind resource capture. This layout was presented at the Community Open Days to gather feedback from local residents.

2.12.7 Since the Scoping Report was issued, the available grid capacity to connect to the local grid was updated allowing for a potentially larger MW capacity site. A further, final set of revisions were made to the layout to improve design from a landscape and visual perspective and following Phase 2 Peat Depth surveys, to arrive at a final 9 turbine design freeze.

2.12.8 Once the final turbine layout was achieved, internal track layout was designed maximising the use of the existing in place for the Operational Schemes, and minimising the requirement for new access tracks. Borrow Pit locations were finalised following ground investigations by a local contractor, which included a proposal to reopen a location used for the Operational Schemes. The location of sub-station,

control building, battery storage facility and construction compound was guided by technical requirement and from experience of constructing the Operational Schemes.

2.12.9 The Proposed Development comprises nine additional turbines to the north of Lochluichart Wind Farm Extension. The sensitivity of this area to the potential landscape and visual effects of wind farm development is recognised. As a result, a rigorous and lengthy iterative design process has been undertaken to ensure that the Proposed Development will minimise the potential effects through successful integration with landscape character and the layout and appearance of the Operational Wind Farms. This process has highlighted the remaining capacity for wind farm development in the area to the north of the Operational Wind Farms.

The Proposed Development

2.12.10 The principal action in the mitigation of the potential effects has been carried out through the iterative design of the layout. This involved identifying the key visual receptors across the Study Area that would be especially sensitive to the appearance of the Proposed Development. These locations were used to test subsequent iterations at a Design Workshop held on 11 August 2017 to ensure effects were being mitigated as best as was practically possible, having regard to other environmental, technical and performance constraints.

2.12.11 The most sensitive visual receptors were considered to be represented by the following viewpoints:

- Viewpoint 1: A835, Aultguish Inn;
- Viewpoint 2: A835, Black Bridge;
- Viewpoint 3: Old Drover's Road, Corriemoillie;
- Viewpoint 5: Ben Wyvis; and
- Viewpoint 8: Beinn a Chaisteil.

2.12.12 A large number of iterations were made to the layout during and after the design workshop, each seeking to improve on the previous one in terms of reducing the potential landscape and visual impact whilst at the same time respecting the technical and environmental constraints of the Site.

2.12.13 The key principles guiding this iterative process are outlined below:

- Identify those visual receptors that are key to the assessment and understand the extent of the area over which potential effects may occur, so that when testing iterations, the full extent of the area is being tested.
- Consider the cumulative effects with the adjacent Operational Wind Farms, with the aim to achieve consistency in appearance through the use of similar sized and proportioned turbines, arranged following a similar layout and contained in the same landscape.
- Ensure the Proposed Development fits as an extension to the existing group, avoiding incidents of overlap and cluttering between the existing and proposed turbines, reducing the occurrence of outliers and ensuring an even appearance in terms of the horizontal spacing and vertical elevation of the turbines.
- Ensure the Proposed Development follows the pattern set by the Operational Wind Farms and remains contained in the Lochluichart LCU of the Rounded Hills LCT that lies between the A832 to the south and the A835 to the north.

- Consider the effects on the sensitive landscapes surrounding the Site. Special consideration has been given to reduce the potential effects on the landscape and visual receptors representing the Ben Wyvis SLA and Fannichs, Beinn Dearg and Glen Calvie SLA, as well as the Rhiddoroch-Beinn Dearg-Ben Wyvis WLA and Fisherfield-Letterewe-Fannichs WLA. The location of the turbines to the north, rather than the west of the Operational Wind Farms has prevented visibility extending further across the sensitive Sgurr Mor range to the west.
- Reduce the potential effects of infrastructure. While the effects of the turbines have been the primary concern in the design process, the effects of infrastructure have also been considered, in particular, the effects of the tracks which can be highly visible over long distances. Attempts have been made to route the tracks in the more discreet parts of the landscape, avoiding more visible exposed slopes and using the screening effect of the surrounding landform and enclosing forestry where possible.
- In addition, sections of existing tracks have been utilised and while these will need to be widened, they will not be seen as new features in the landscape. The visual influence of the new tracks across the slopes of Meallan Teth and Meallan Caoruinn will be contained owing to the east facing orientation of the landform, while the other new tracks will be contained with the forestry, albeit low and scrubby. The northern borrow pit, substation and control building will also be contained in the scrubby forestry while the southern borrow pit will benefit from the enclosure of the valley landform and screen of scrubby forestry to the immediate north.

2.12.14 The final design of the original proposal that arose through the design evolution process described above and presented in more detail in **Table 2.2** below, is the wind farm design that has been adopted for the proposed development described in this EIA Report. The main design iterations are shown in **Figure 2.1**.

Table 2.2 Summary of Design Iterations

Issue Addressed	Detail of Change
Starting Point following site identification process by Infinergy (based on a limited environmental constraint mapping)	Feasibility work centred on landscape capacity, identified that 8 turbines with a blade tip height of up to 150m could be potentially accommodated.
Telecommunication links	No telecommunication links or infrastructure has been identified within the site boundary.
Watercourses and waterbodies	Proposed turbines have been located at least 50m from larger watercourses (greater than 2m wide) and waterbodies (e.g. ponds) located within the site. Access tracks have been located at least 50m from watercourses, except at watercourse crossings. Track design minimises watercourse crossings to those that are essential (with the result that there are only 2 proposed). The design avoids standing freshwater bodies, ensuring that a minimum 50m buffer is maintained between all proposed construction work and watercourses and waterbodies. Marshy grassland has been avoided where possible to avoid impacts on GWDTE.
Flood risk areas identified by SEPA	No infrastructure related to the Proposed Development has been located in these areas.
Forestry	Tree felling would be carried out on a key-holing basis rather than clear felling in order to comply with the Forestry Commission Scotland policy on woodland removal.

Issue Addressed	Detail of Change
Peat	<p>A comprehensive site Peat Management Plan (PMP) will be developed to ensure that peat excavated during construction is suitably re-used within the extent of the development site.</p> <p>Infrastructure where possible has been sited to avoid areas of deep peat. Installation of cables will aim to minimise disturbance to peatland habitats.</p>
Ecology	<p>Existing access tracks would be upgraded where possible to minimise habitat loss. The proposed alignment of access tracks, developed through consultation with the ecology team has sought to avoid identified constraints (areas of deep peat, waterbodies, water vole habitat etc).</p>
Separation distances	<p>It is necessary to ensure adequate separation distance perpendicular to, and in line with, the prevailing wind direction. Separation distances are necessary to minimise turbulent interaction (wake effect) between the turbines which would affect the power generation capacity of the wind farm. A circular (rather than the more usual elliptical) separation distance of 3 rotor diameters was used as the wind conditions at the site exhibit a significant spread around the compass. The layout is based on a turbine with a hub height of 76m with a 57m blade giving a tip height of 133m.</p>
Noise	<p>The initial design was refined through a series of iterations taking into account the results of a background noise survey at surrounding properties. This ensured that noise levels at any nearby residential receptors meet the limits derived from the approach set out in <i>ETSU-R-97 The Assessment and Rating of Noise from Wind Farms</i>. Noise levels are below 35dB at all locations, the lowest noise level which can be set following the above guidance.</p>
Landscape and visual amenity (including concerns raised by local residents during consultation)	<p>The iterative design process refined the original layout to help mitigate the potential effects of the Proposed Development on the landscape and visual receptors. Environmental constraints, relating to areas with special sensitivities in respect of ornithology and hydrology, have been taken into account in the design iteration and this has discounted areas from wind farm development. Further description of this process can be found in Chapter 2.</p>
End Point	<p>Nine turbines with blade tip heights of either up to 133m.</p>

2.13 Consultation with local residents

- 2.13.1 Community consultation is at the centre of Infinergy's approach to development, not only in the pre-application stage, but also throughout the life of the project. This is delivered through an online consultation website (www.lxxwindfarm.co.uk), a freephone telephone number (0800 316 8134), newsletters, two rounds of Community Open Days (CODs) and advertisements in local newspapers.
- 2.13.2 In September 2017 Infinergy distributed 178 newsletters to the local community, including residents, community, businesses and local authority councillors. The newsletter provided an overview of the proposed development and invited recipients to two community open days. The open days were also advertised in the two local newspapers. A second newsletter was distributed in April 2018.
- 2.13.3 The first round of CODs were held at Achnasheen Village Hall on 2nd October and Garve Village Hall on 3rd October 2017 and the second round, once the turbine layout for Proposed Development had been finalised, on 3rd April 2018 at Garve Village Hall. These events aimed to introduce the proposal and highlight some of the main issues which were being considered. In addition, members of Infinergy's project team were

on hand to answer any questions and gave members of the public an opportunity to make suggestions regarding the layout.

- 2.13.4 During each of the open days the attendees were invited to fill out a 'Voice Your Opinion' questionnaire. 8 responses were received from the 36 people who attended over the 3 days. In total, 54% of people were supportive of the scheme compared to 41% opposed. 5% remained undecided.
- 2.13.5 A Pre-Application Consultation Report has been provided to support the planning application for the Proposed Development.