

Chapter 3: Site Selection and Design Strategy

Chapter 3

Site Selection and Design Strategy

Introduction

3.1 This chapter provides details of the approach that has been taken to design An Càrr Dubh Wind Farm (the 'Proposed Development'). Details of how and why the turbine layout and associated infrastructure have been modified during the iterative Environmental Impact Assessment (EIA) process are provided to explain how the Proposed Development described in **Chapter 4: Project Description** was designed. This chapter also outlines the site selection process that was undertaken by Car Duibh Wind Farm Ltd ('the Applicant') in identifying the Site as a suitable location for a wind farm. The chapter therefore considers the 'reasonable alternatives' which were considered by the Applicant in designing the Proposed Development, as required in The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, including why the application layout was chosen, taking account of environmental effects¹.

3.2 The key design changes are illustrated on **Figure 3.1a-d** and **Figure 3.2**, and specific examples of changes made to the design are also illustrated on images below. The chapter should also be read with reference to the **Design and Access Statement** which is provided in support of the application for the Proposed Development.

Site Selection and Design Strategy

Site Characteristics

3.3 Key characteristics of the Site that make it suitable for a wind farm include the following:

- The Site has an excellent wind resource and is available for wind energy development.
- There are no international or national designations for landscape or nature conservation within the Site.
- With the exception of some small pockets of Ancient Woodland located along the Site access, there is no forestry within the Site, and very limited felling required.
- Knowledge of the Site's conditions show that there are no key environmental constraints that would preclude development, or which cannot be avoided through design.
- The size of the Site allows for good opportunities to explore and provide extensive habitat management and enhancement, particularly for degraded peatland habitats thus also providing carbon sequestration benefits. Further details are set out in **Appendix 8.5: Outline Restoration and Enhancement Plan (OREP)**.
- The closest turbines are located over 2.5 kilometres (km) from the nearest residential receptors thereby avoiding unacceptable noise and residential visual amenity effects.
- The closest settlements of Dalavich, Inverinan and Inveraray are approximately 4.5km, 5.3km and 5.5km away from the nearest turbines respectively.
- The surrounding landscape is, in part, defined by the existence of the nearby wind farms including the operational An Suidhe Wind Farm to the south-west, and the consented Blarghour Wind Farm to the north.
- There are no planning policies which, in principle, preclude wind energy development.
- There is a feasible grid connection available, as advised by the network operator SSEN. The grid connection will be the subject of a separate application by SSEN.
- The Site is accessible for construction traffic and turbine deliveries from the trunk road network.

¹ As required by Regulation 5 (2) (d), the EIA Report must include "a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment". Also set out in Part 2 of Schedule 4 of the Regulations.

Planning Policy Context

3.4 National Planning Framework 4 (NPF4) was approved by the Scottish Parliament on 11th January 2023, and was adopted and published on 13th February 2023. However, the site selection exercise was undertaken under the planning policy in force at the time (i.e. Scottish Planning Policy (SPP) (June 2014) which provided support for wind development in principle, and encouraged local authorities to guide development towards appropriate locations within their boundaries. Paragraph 161 of SPP highlighted the requirement for planning authorities to define a "spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms" based on the following criteria (set out in SPP Table 1, Page 39):

- Group 1: Areas where wind farms will not be acceptable.
 - National Parks and National Scenic Areas.
- Group 2: Areas of significant protection.
 - Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.
 - Group 2 areas include World Heritage Sites; Natura 2000 and Ramsar sites; Sites of Special Scientific Interest; National Nature Reserves; Sites identified in the Inventory of Gardens and Designed Landscapes; Sites identified in the Inventory of Historic Battlefields; areas of wild land as shown on the 2014 Scottish Natural Heritage (SNH) map of wild land areas; carbon rich soils, deep peat and priority peatland habitat; and an area not exceeding 2km around cities, towns and villages identified on the local development plan.
- Group 3: Areas with potential for wind farm development.
 - Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.

3.5 SNH's (now NatureScot) Guidance 'Siting and Designing Wind Farms in the Landscape'² states that "Developers and those involved in wind farm design should also refer to the Spatial Frameworks being developed by planning authorities in response to Scottish Planning Policy (SPP). When considering an individual application, the adopted development plan, relevant supplementary guidance, wind energy capacity studies and SPP provide the framework within which the application should be considered".

3.6 The statutory Development Plan for the Proposed Development comprises The Argyll and Bute Local Development Plan ('the LDP') (adopted April 2015); and The LDP Supplementary Guidance (SG) (Adopted March 2016). The SG includes the Spatial Framework for Onshore Wind Energy (Adopted March 2016)³ to provide further information and detail in respect of the main wind energy related policy of the LDP. The Spatial Framework for Onshore Wind Energy identifies the Site as being located within an area of significant protection (Group 2) due to the presence of carbon rich soils, deep peat and priority peatland habitat.

3.7 It should be noted that the next LDP (LDP2) was put forward for examination by the Scottish Government in May 2022 and is expected to be adopted in Spring 2023. In LDP2, the Site is located in a 'Remote Countryside Area' and 'Policy 02 – Outwith Settlement Areas' states that, within these areas, only specific categories of development are considered appropriate, including renewable energy related development.

3.8 In line with the identification of the Site as a Group 2 area under the now superseded SPP, the presence of peat and peatland habitat has formed a key consideration in the design process as detailed further below. However, it is considered that by avoiding deeper peat areas through the design, by application of embedded mitigation and good practice during construction, and by implementation of the Outline Habitat and Landscape Restoration Management Plan (OHLRMP) (see **Appendix 8.5**), significant effects on peat can be largely overcome (see **Chapter 7: Geology, Hydrology, Hydrogeology and Peat**).

² Scottish Natural Heritage (2017) Siting and Designing Windfarms in the Landscape (Version 3a)

³ Argyll and Bute Council (2016) Argyll and Bute Local Development Plan Draft Supplementary Guidance: Renewable Energy

3.9 It should also be noted that Policy 5 c) ii) of NPF4 explicitly supports renewable energy on peatland, carbon rich soils and priority peatland habitat for “*The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets*”. The Policy goes on to set out the requirements of assessments for development on peatland, all of which have been undertaken for the Proposed Development (i.e. identifying the baseline depth, habitat condition, quality and stability of carbon rich soils; identifying the likely effects of the Proposed Development on peatland, including soil disturbance; and identifying the effects on climate emissions and loss of carbon). These aspects are considered within **Chapter 7** and **Chapter 14: Other Issues**.

3.10 It should be noted that, in relation to NPF4, the Site is not located within either a National Park or National Scenic Area, which are the only areas where NPF4 states explicitly that proposals for wind farms will not be supported (Policy 11). Further details in relation to the planning policy context associated with the Proposed Development are set out in **Chapter 5: Statutory and Policy Framework**. Compliance with planning policy is discussed in the Planning Statement which accompanies the application for consent.

The Design Strategy

3.11 The design strategy sets out the overall approach to the progression of the design of the Proposed Development. It describes the starting point of the Proposed Development’s design, and subsequent alterations to the layout that were made in response to landscape and visual, hydrological, archaeological, ecological, ornithological, wind yield and ground condition considerations, as information emerged through the EIA process.

3.12 The design strategy for the Proposed Development aimed to provide a balance between achieving the maximum energy yield possible from the Site and creating a layout which relates to the landform and scale of the Site and surrounding area, and has a positive relationship with the adjacent wind farms.

3.13 The starting point for the design was to maximise the potential output from the Site, which was then subsequently informed by landscape and visual considerations, therefore considering landform, scale, land use (including cumulative wind farm context) and key visual receptors. These factors will influence how the Proposed Development will be perceived by people within the surrounding area, and to what extent the landscape is capable of accommodating the Proposed Development (including in comparison with the adjacent operational and consented wind farms). The design strategy also comprised a number of design objectives which are set out below. The design of the Proposed Development has aimed to meet the guidance contained within NatureScot’s Siting and Designing Wind Farms in the Landscape⁴, as far as possible.

3.14 During each design iteration, careful consideration was given to minimising effects on environmental features, whilst maximising renewable energy generation potential of the Site and maintaining the objectives of the design strategy.

3.15 The design strategy for the Proposed Development was also informed by the key landscape and visual sensitivities identified in the decision of the 2015 appeal (DPEA Reference: PPA-130-2045) for the proposed Ardchnonnel Wind Farm which was proposed at the same site by RWE. As such, whereas the Ardchnonnel layout was designed so that when viewed together with An Suidhe from key viewpoints, they appear as one relatively compact group of turbines, the design of the Proposed Development has sought to increase the separation between the two wind farms. The difference in the scale of the turbines and rotational speeds of their blades is therefore less obvious, and the Proposed Development appears coherent in its own right.

The Site and Surrounding Area

3.16 The Site is located on the plateau between Loch Awe to the north-west and Loch Fyne to the south-east within the Argyll and Bute Council (ABC) administrative area as shown on **Figure 1.1**. The Site rises to a height of 526 metres (m) Above Ordnance Datum (AOD) at Ben Bhreac adjacent to the southern boundary of the Site. The Site is located within the ‘Craggy Upland – Argyll Landscape Character Type’ (LCT 40) and the ‘Plateau Moor and Forest – Argyll’ LCT (LCT 39)⁵, whereby the area where turbines are proposed to be sited comprises undulating moorland plateau with rocky outcrops, orientated north-east to south-west, with frequent lochans in lower lying areas. The ground cover is mainly moorland heath and heather, with exposure limiting tree cover.

3.17 Large areas of forestry are found adjacent to the Site, extending down the lower slopes to the east, south and west, with the access to the Site also passing through an area of forestry to the west of Inveraray.

3.18 Settlements nearby are generally located within the glens and between adjacent lochs, with the closest settlements to the Site comprising Inveraray (located to the east approximately 5.5km from the closest turbine), Dalavich (located to the west, on the other side of Loch Awe, approximately 4.5km from the closest turbine) and Inverinan (located to the north, approximately 5.3km from the closest turbine). A number of small clusters of residential properties are found scattered along the shores of Loch Awe, with the closest properties to the Site located at Ardchnonnel and Blarghour, both of which are located over 2.5km from the closest turbines.

3.19 As noted above, carbon rich soils, deep peat and priority peatland habitat are present within the Site. The SNH (now NatureScot) Carbon and Peatland mapping indicates the majority of the Proposed Development lies in Class 2 priority peatland⁶. The Site is an upland area, where local topography varies considerably within the Site, which affects the peat distribution. The topography of the Site is shown on **Image 3.1**. Higher linear ridges are separated by low lying depressions, where watercourses, lochs and areas of deeper peat are present. Extensive peat surveys undertaken across the Site found that the peat depths showed significant variation across short distance, which has formed a key constraint and challenge for the design of the scheme.

3.20 The Site is located within the Kames River, Allt Blarghour, River Aray and Douglas Water catchments. The Kames River and Allt Blarghour catchments drain in a westerly direction towards Loch Awe. The River Aray and Douglas Water catchments drain in an easterly direction towards Loch Fyne. There are many watercourses and lochans within the Site, including the Eas an Amair (a tributary of the Allt Blarghour), the Erallich Water and Allt Bail’ a Ghobhainn (tributaries of the River Aray), and numerous smaller named and unnamed tributaries.

3.21 The eastern extents of the Site are located within the West Loch Fyne Coast Area of Panoramic Quality (APQ) and also within the Inveraray Castle Garden and Designed Landscape (GDL), however no turbines are located in this part of the Site. There are a number of other designated landscapes within the wider Study Area, including the Loch Lomond and the Trossachs National Park (LLTNP), National Scenic Areas (NSAs), Areas of Panoramic Quality (APQs), Special Landscape Areas (SLAs), and Gardens and Designed Landscapes (GDLs). Designated landscapes beyond 15km of the Site boundary are unlikely to be significantly affected by the Proposed Development as detailed further in **Chapter 6**. Given the relatively close proximity of some of these designated landscapes, and the extent of theoretical visibility of the Proposed Development from within them, an assessment of potential effects on specific relevant special qualities of the national and locally designated landscapes are included in **Chapter 6**. Potential effects on GDLs are considered in the cultural heritage assessment, as set out in **Chapter 10: Cultural Heritage**.

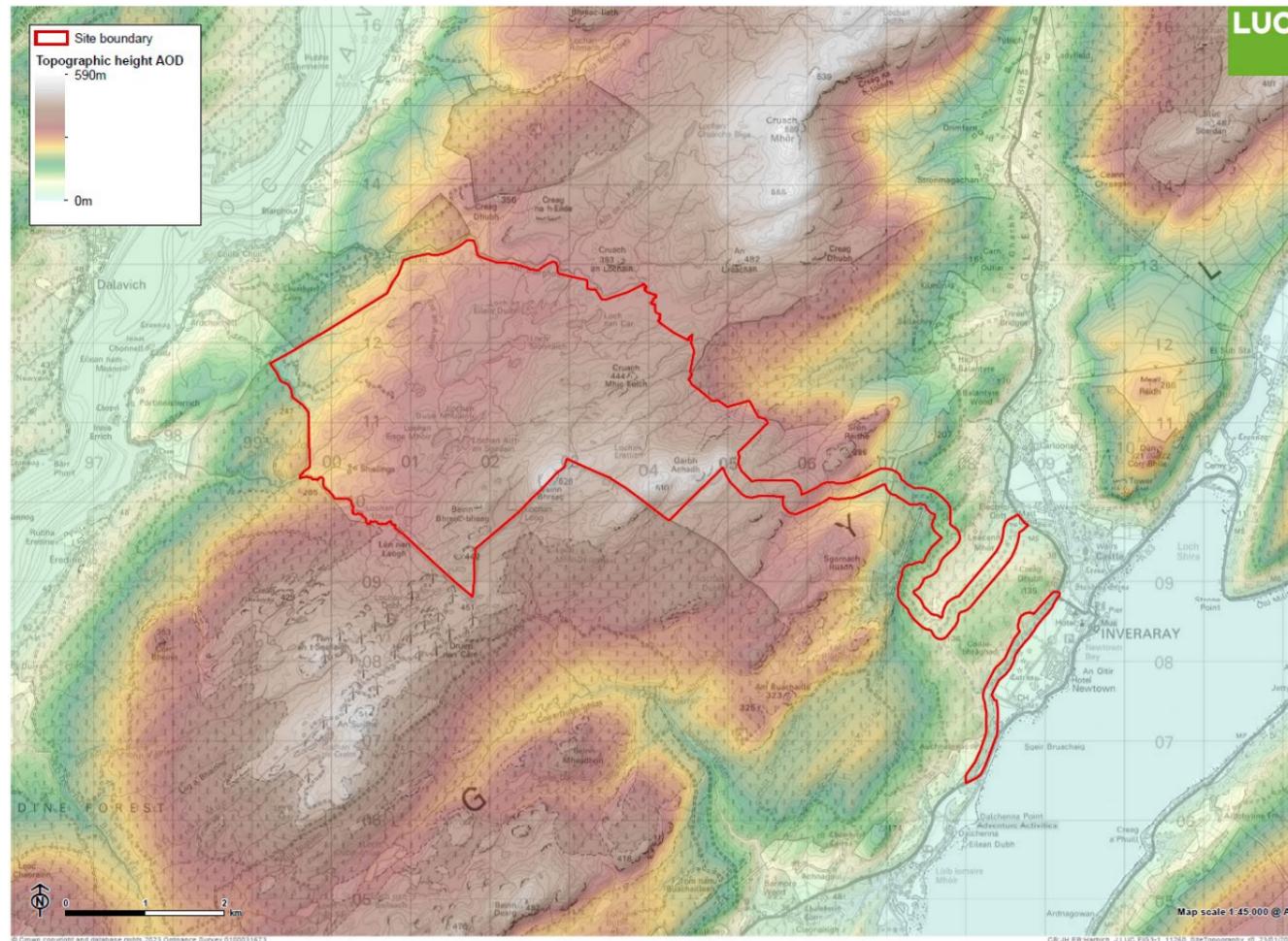
⁴ Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape Guidance (Version 3a)

⁵ Scottish Natural Heritage (2019) Scottish Landscape Character Types Map and Descriptions [online]. Available at: <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions>

⁶ Class 2 peatland is defined as being nationally important carbon-rich soils, deep peat and priority peatland habitat (i.e. land covered by peat-forming vegetation or vegetation associated with peat formation, and areas of potentially high conservation value and restoration potential). Where Class 2

peatland is identified as being present, a detailed site survey is required as has been undertaken for the Proposed Development. NatureScot (2016) Carbon and Peatland 2016 map [online]. Available at: <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map>

Image 3.1: Site topography



The 'Do-Nothing' Scenario

3.22 The 'do-nothing' scenario can be considered as the existing conditions, taking account of only clearly foreseeable changes over the lifespan of the Proposed Development. Effects have been assessed relative to this baseline in each of the topic chapters. If the Proposed Development does not proceed, it is reasonable to assume that the management of the Site will continue as present, largely an area used for grazing, occasional recreational shooting and commercial forestry operations.

Objectives of the Design Strategy

3.23 The objectives of the design strategy were:

- To maximise the potential energy yield of the Site whilst ensuring a cohesive and sensitive layout which will be legible in key views in the surrounding area, including from the settlements of Dalavich, Inverinan and Strachur, and key locations within Loch Lomond and the Trossachs National Park (LLTNP);
- To produce a layout and use a turbine size that relates to the landscape scale of the Site;

- To develop a layout that relates to other existing and proposed wind farms within the vicinity of the Site, including the adjacent operational An Suidhe Wind Farm and the adjacent consented Blarghour Wind Farm which is at Scoping stage (previously consented at a lower tip height)⁷, and achieves good overall composition with these schemes within the landscape and from key views;
- To ensure all elements of the Proposed Development infrastructure (including tracks, borrow pits etc.) are considered in terms of locational and design choice to minimise visual effects, especially from nearby and sensitive visual receptors;
- To explore opportunities within the Site to restore and enhance landscape and biodiversity; and
- To develop a layout that fulfils the above objectives whilst respecting other environmental and technical constraints including ecological, ornithological; hydrological and ground conditions (including peat) related constraints identified during the EIA process.

3.24 During the design process, computer modelling was used as a tool to aid design. In particular, Zone of Theoretical Visibility (ZTV) models were generated and used to aid understanding of potential visual effects, including cumulative visual effects of the Proposed Development with other wind farms within the surrounding area. Wireframes were generated to illustrate views from key locations around the Site and to illustrate the cumulative effects with other nearby wind farm developments. Wireframes were also generated alongside photomontage visualisations to illustrate changes to views. Photomontages involved overlaying computer-generated perspectives of the Proposed Development over the photographs of the existing situation to illustrate how the views will change against the current baseline.

3.25 The main components of the Proposed Development considered in the initial design iterations were the turbines. The location of other infrastructure components was largely dictated by the positioning of the turbines, and designed around onsite environmental constraints. Later iterations to the turbine layout, following detailed engineering review, involved further alterations to turbine and infrastructure locations, which were reviewed against all constraints. For example, opportunities were taken to re-position turbine hardstandings and access tracks in areas where detailed peat probing has identified deeper peat deposits, to reduce the likelihood of peat disturbance onsite.

Site Design Principles and Constraints

3.26 As part of the design strategy, a number of environmental characteristics have been identified as key environmental considerations during the EIA process and have led to the evolution of the application design layout. This has been informed by site survey, consultation and the experience and professional judgement of the Applicant and the EIA team. The key constraints identified from an early stage included:

- Key landscape and visual considerations as noted above in relation to the overall design strategy.
- Peat (avoiding deeper (>0.5m) peat where possible).
- Hydrology and the presence of Groundwater Dependent Terrestrial Ecosystems (GWDTEs), including distance to watercourses (maintaining a 50m buffer where possible).
- Ornithology (buffers of 500m around breeding locations for protected or notable species, including black grouse (lekking sites), red-throated divers and scarce raptors). The turbine layout has also been informed by the results of Golden Eagle Topographical (GET) modelling for golden eagle.
- Ecology (avoidance of most ecologically important habitats and protected species resting sites, including buffers where appropriate).
- Cultural Heritage, including designing to avoid known heritage assets, and considering intervisibility with key assets in terms of their setting.
- Residential properties (maintaining at least a 2km buffer between turbines and inhabited and non-involved properties).
- Topography (including avoiding slope angles of more than 14 degrees and reducing the need for significant cut and fill engineering works) (Image 3.1 shows the topography of the Site).

⁷ In May 2022, a request for Scoping with a view to submit a Section 36c application was submitted for Blarghour Wind Farm to increase the maximum blade tip height from 136.5m to 180m.

3.27 Once the Site was established as a potential location for a wind farm, it was identified at an early stage as having a number of topographical and environmental sensitivities which had to be balanced to develop a layout that is environmentally sensitive, suitable from a construction perspective, and which remains economically viable. Some of the key constraints and considerations which fed into the design process are detailed below, including an explanation of where some of these compromises had to be made to design a viable scheme. It should be noted that this information is simply intended to provide some illustrative examples of the changes made to the Proposed Development through the extensive design work undertaken and is not an exhaustive list. It provides a 'snapshot' of the design work and numerous modifications made in light of the constraints onsite which were identified as the EIA progressed, and which were discussed by the relevant members of the team at a number of design workshops held throughout the EIA process.

Landscape and Visual Amenity

3.28 The landscape and visual effects formed a key element of the design process and overall design strategy as noted above. A key aim of this process was to minimise potentially significant landscape and visual effects of the Proposed Development, whilst avoiding other key constraints onsite including those relating to peat, ornithology, hydrology, and ecology.

3.29 Views from the settlement of Dalavich on the west side of Loch Awe were an important consideration during the design process. The main aim was to create a layout which appears evenly spaced, avoids the stacking of turbines and the isolation of outlying turbines, and is set back from Loch Awe. The layout sought to locate turbines behind the foreground ridge enclosing the loch, to prevent the appearance of turbines encroaching down the enclosing slopes, and to help maximise the perceived sense of separation between the Proposed Development and Dalavich/Loch Awe. Furthermore, the layout was designed to avoid high landform within the Site, which was particularly challenging given the variation in topography within the Site as noted above. The objective behind this was to remove visibility of hubs above the ridge skyline in views from the east, around Loch Fyne, such as at the small settlements of St. Catherines and Strachur.

3.30 Additionally, the interactions and compatibility with nearby existing and proposed wind farms was a key consideration during design, and care was given to selecting an appropriate wind turbine for the Site (i.e. in terms of tower height and rotor diameter). The Proposed Development was designed to be compatible with the adjacent Blarghour Wind Farm (Scoping stage; previously consented) and whilst the Proposed Development was originally scoped with turbines up to 200m to blade tip, the final candidate turbine selected is up to 180m to blade tip, which is the same height as the turbines proposed at Blarghour Wind Farm. Given the difference in scale between the Proposed Development and An Suidhe wind farm, the layout sought to maximise the separation between these two developments. This help ensure they appear as distinctly separate developments and avoids visual confusion arising from differences in rotational speeds of their blades.

3.31 From designated landscapes such as the LLTNP and Ben Lui Wild Land Area, the iterative design process sought to achieve a layout which does not sit above the horizon in distant views, and makes use of intervening landform to provide additional screening of the Proposed Development. The layout of the Proposed Development achieves this by appearing backclothed by distant landform in views from popular hill summits within these designations. Detailed assessments of the effect of the Proposed Development on LLTNP and Ben Lui Wild Land Area are provided in **Appendix 6.2** and **Appendix 6.3** respectively.

3.32 To illustrate the changes that were made to the design of the Proposed Development and how this relates to potential effects on landscape and visual amenity, comparative wireframes are provided at the end of this chapter for five key layouts as detailed below (**Image 3.8a-e** to **3.12a-e**). The wireframes are presented from the following five key viewpoints (VPs) which are assessed in detail in **Chapter 6**⁸:

- VP2: Dalavich Jetty
- VP4: Folly at Dùn na Cuaiche (Inveraray Castle Garden and Designed Landscape)
- VP7: Core Path above Inverinan
- VP14: A886 at Strachur
- VP16: B840, east of Ford

Peat

3.33 Phase 1 and Phase 2 peat surveys were undertaken across the Site, and then specifically at the infrastructure locations, in line with good practice guidance⁹. This confirmed that the peatland conditions are particularly complex, with numerous hagged and eroded areas present, and highly variable peat depths across relatively small distances, as evidenced in initial Phase 2 peat probing undertaken at 10m intervals. Given the variability of the peat depths identified during initial Phase 2 peat probing, it was decided to increase the separation distance between the probes from 10m to 20m for the majority of the Phase 2 peat probing. This was to allow a larger area to be covered at the infrastructure locations therefore giving more flexibility in the options for the final infrastructure locations. This is considered to be a robust approach which has provided a comprehensive data set to inform the final design. Furthermore, Scottish Environment Protection Agency (SEPA) did not raise any concerns in relation to this approach at the Gate Check consultation undertaken at the end of 2022. **Figure 7.7** in **Chapter 7** shows the design freeze layout overlaid on the peat depth data that was collected across the Site and clearly illustrates the variability in peat depths across the Site.

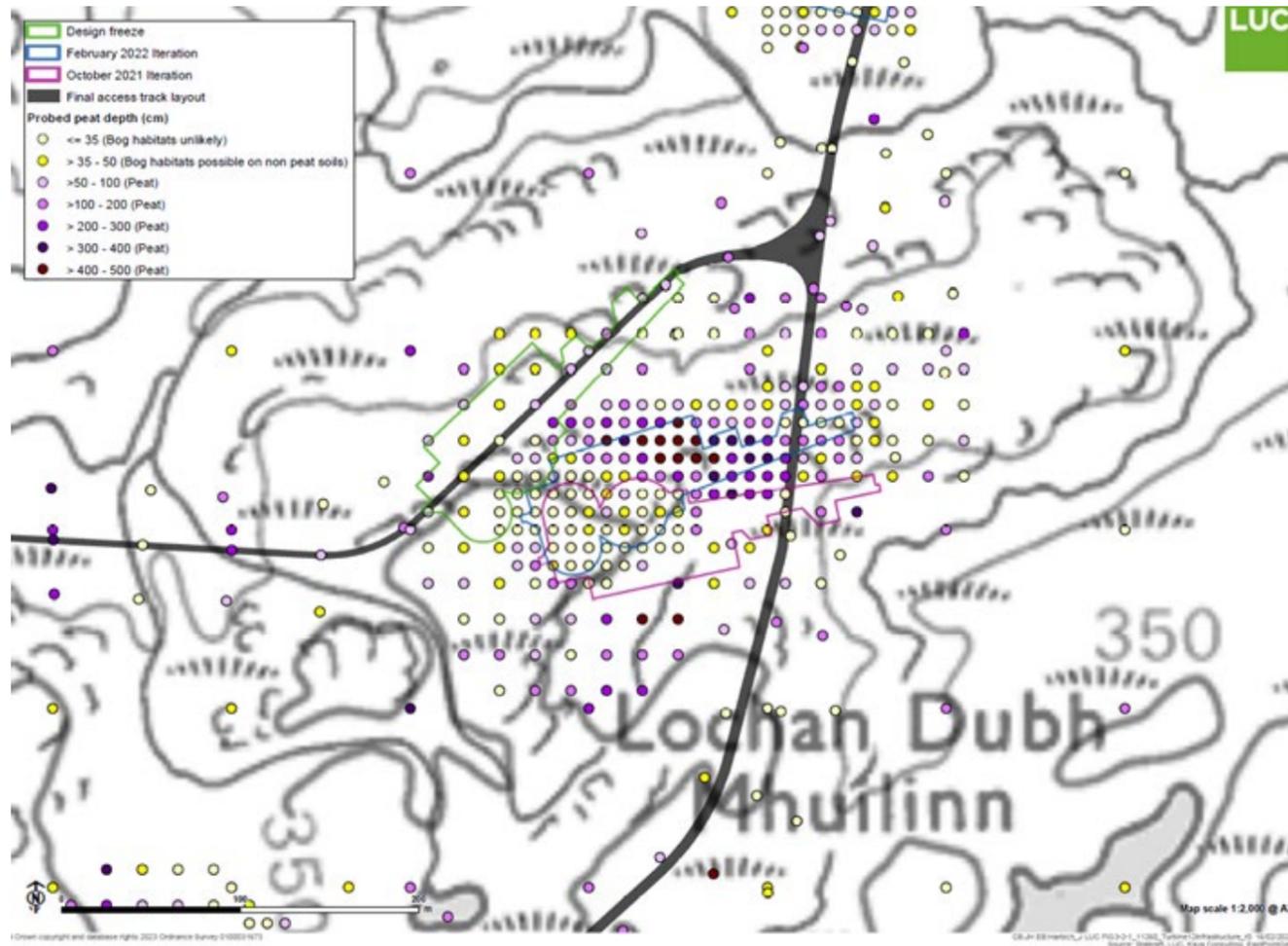
3.34 The final layout has taken into consideration the pockets of deeper peat (>0.5m) and has avoided siting turbines and associated infrastructure at these locations where feasible, although this has not been possible at all infrastructure locations due to the variability in peat depths and the need to consider other constraints. Extensive design work was undertaken to optimise the layout for peat, including adjustments to the locations of turbines, realigning tracks and flipping hardstandings. **Image 3.2** below shows turbine 12 overlaid on the peat data, illustrating where the hardstanding has been rearranged over several design iterations to minimise effects on peat following the detailed Phase 2 peat probing surveys.

⁸ In addition to the wireframes provided in support of this chapter, wireframes and photomontages for the application layout of the Proposed Development are also provided for each of these viewpoints in **Chapter 6**.

⁹ Scottish Government, Scottish Natural Heritage and SEPA (2017) Peatland Survey. Guidance on Developments on Peatland [pdf]. Available at: <https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot%3Adocument/Guidance%2Bon%2Bdevelopments%2Bon%2Bpeatland%2B-%2Bpeatland%2Bsurvey%2B-%2B2017.pdf>

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Image 3.2: Relocation of Turbine 12 infrastructure for peat depth



3.35 As noted above, a number of hagged, eroded and degraded areas of peat were identified through the peat surveys. To seek to improve these areas, and provide an environmental benefit and enhancement as part of the Proposed Development, an OREP for peat, biodiversity, landscape and forestry, has been prepared and is provided as **Appendix 8.5**. This identifies measures to benefit peat and habitats as well as ornithology and other ecological protected species where possible.

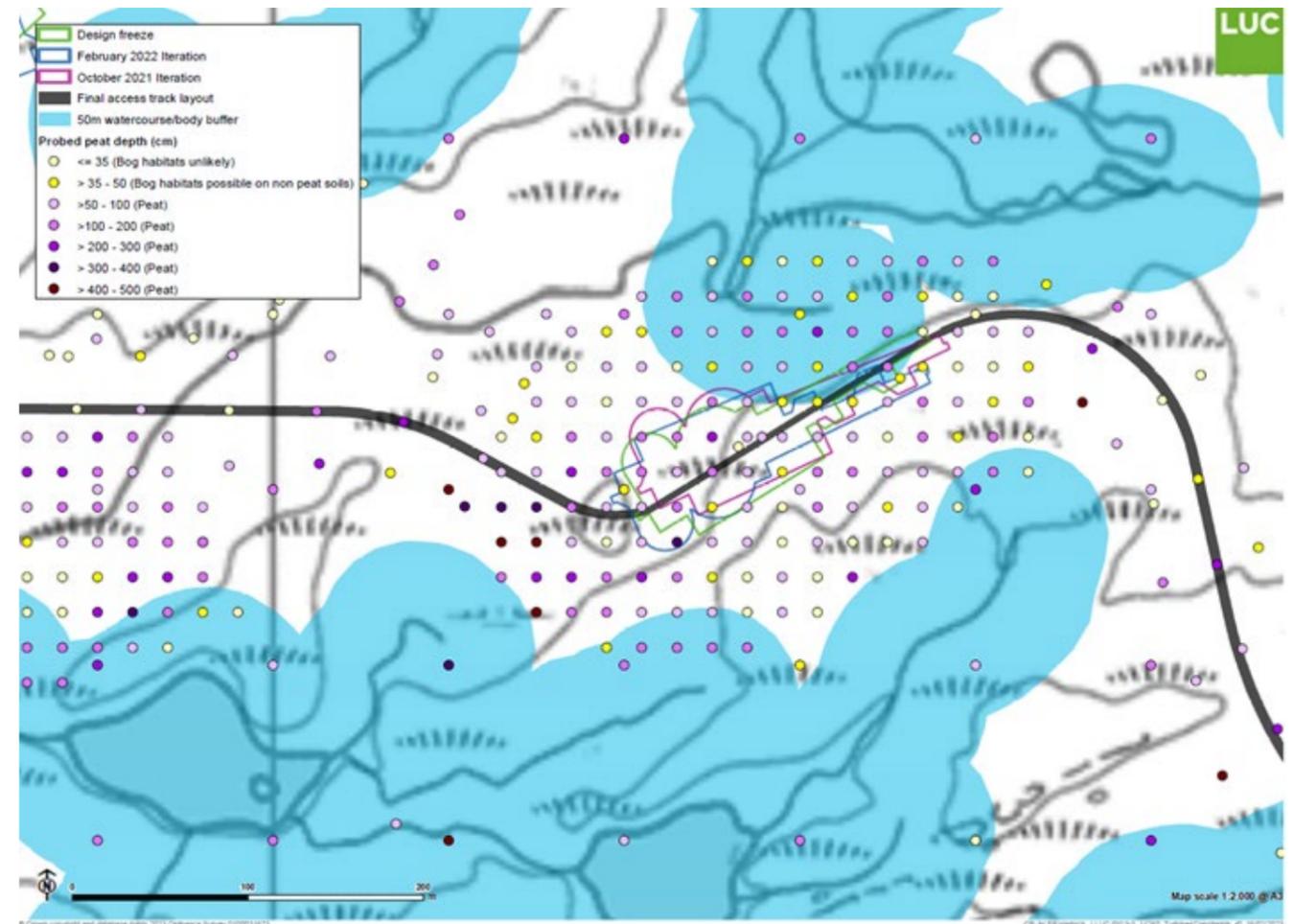
Hydrology

3.36 As noted above, from the outset of the design process, a 50m buffer was applied to all mapped watercourses and water bodies across the Site. Where possible, this has been maintained for the siting of all turbines and infrastructure (with the exception of watercourse crossings as shown on **Figure 7.2**, further details of which are also provided in **Appendix 7.1: Watercourse Crossings**). There are a number of locations where it has not been possible to maintain the 50m buffer due to the presence of other constraints on the Site; these locations are detailed in **Chapter 7**, and are also shown on **Figure 7.2**. Where considered necessary, additional mitigation is proposed in some of these locations to protect the watercourses as set out in **Chapter 7**. Details are provided below of two locations where it has not been possible to maintain the 50m watercourse buffer due to the presence of other constraints.

3.37 **Image 3.3** shows the approach to T4 which has resulted in a ~64m length of proposed track, temporary hardstanding and clearance area encroaching to within 31m of a small unnamed watercourse to the north due to other constraints (including localised areas of deep peat and engineering constraints associated with the alignment of the access track) (encroachment B). As it was considered that potential effects on the watercourse could be mitigated (**Chapter 7** confirms there are no significant effects on this

watercourse), it was agreed during the design process that avoiding the deeper area of peat and ensuring the ability to engineer and construct the track in this location would take priority over maintaining the 50m buffer.

Image 3.3: Hydrology and peat constraints on access approach to T4



3.38 **Image 3.4** below shows the location of watercourse encroachment C as detailed in **Chapter 7**. As explained in **Chapter 7**, the track has had to pass between the 50m watercourse buffer and a GWDTE (within the 100m buffer of M32 spring). In addition, the track had to avoid localised areas of deep peat identified through the peat probing survey. The competing constraints in this location made it particularly difficult to identify an alternative route for the access track. Furthermore, as embedded and additional mitigation will ensure no significant effects on either hydrology, peat or GWDTEs (as detailed in **Chapter 7**), this is considered an appropriate solution in this location.

Image 3.4: Hydrology and GWDE constraints on access between T5 and T6

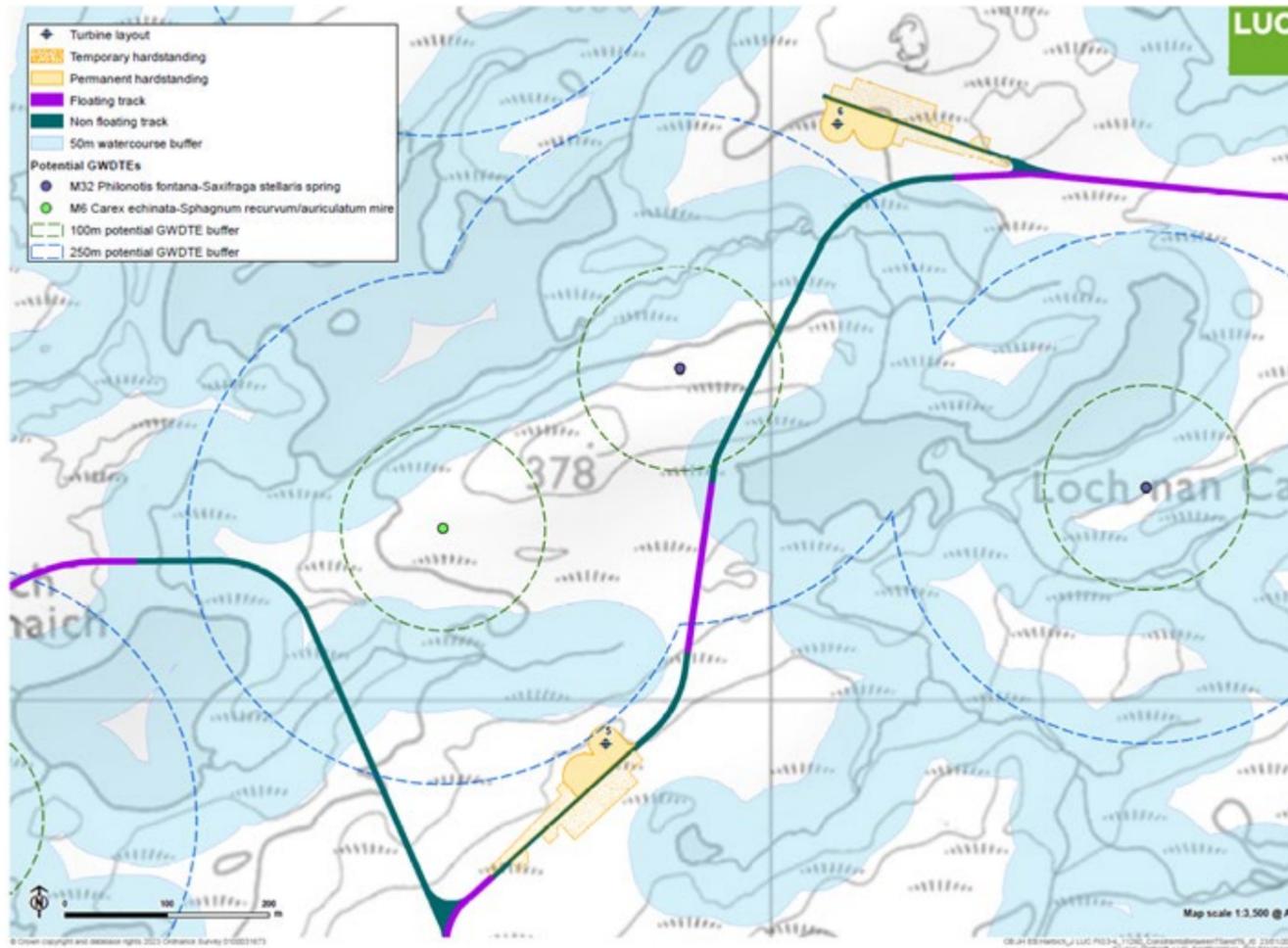
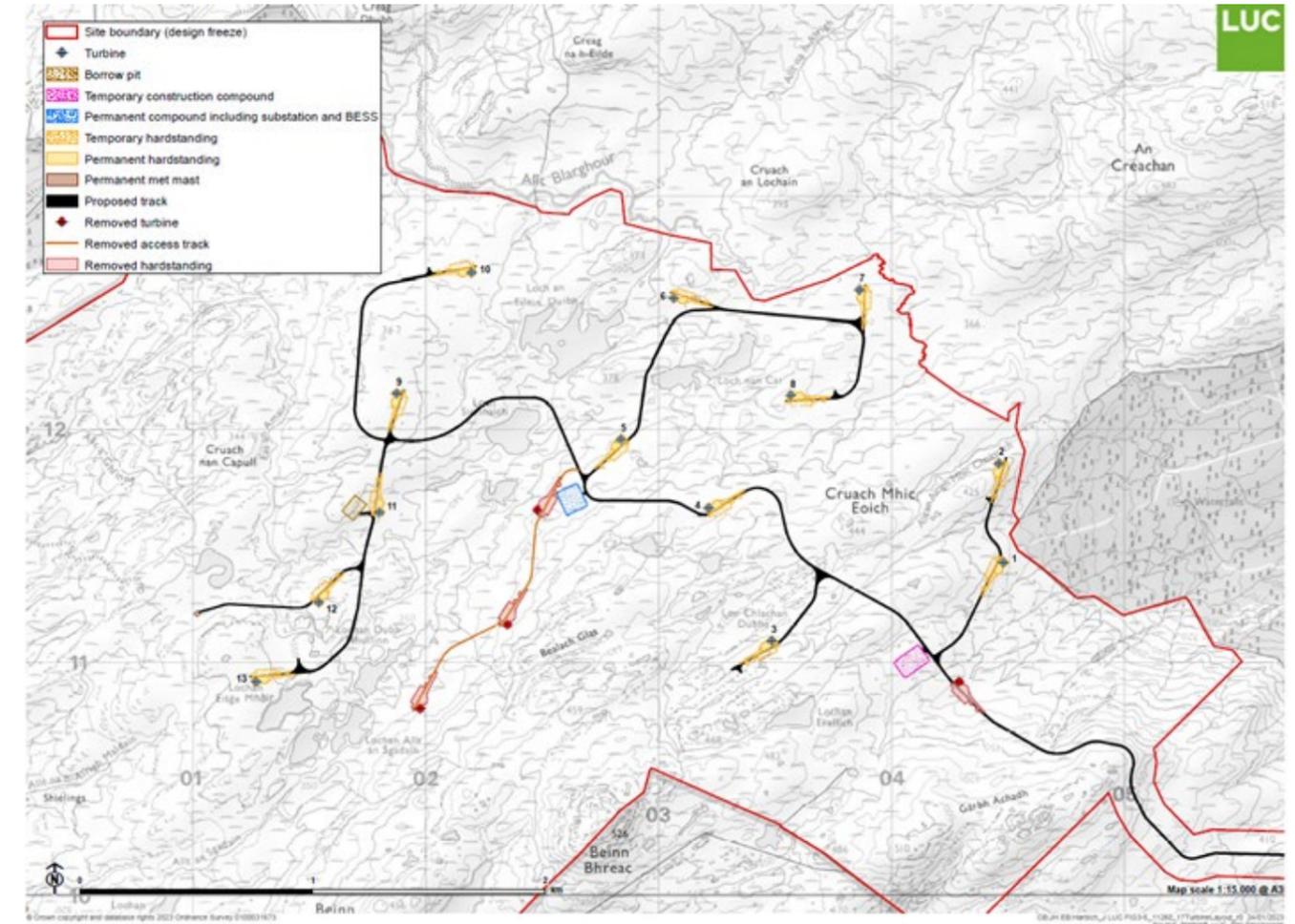


Image 3.5: 17 turbine layout prior to removal of T1, T10, T11 and T12



Ornithology

3.39 Ornithological surveys were undertaken between February 2019 and August 2021 and comprised three breeding seasons and two non-breeding seasons. Further surveys were also undertaken during the 2022 breeding season along the access track. The surveys included flight activity surveys, upland breeding bird surveys, moorland breeding bird surveys, breeding raptor and owl surveys, black grouse surveys and breeding diver surveys. All surveys were undertaken in accordance with NatureScot guidance and good practice species specific methodologies and were discussed and agreed with NatureScot.

3.40 As a result of findings from these surveys as noted above, and based on the findings of initial GET modelling, several areas of the Site were identified as 'no go' areas for turbines at an early stage due to the presence of preferred golden eagle habitat. These areas were maintained free from turbines throughout the design process. Further changes were also made to the layout prior to finalising the design, based on the final calculations of the GET model, resulting in the loss of four turbines, and associated tracks and infrastructure, to give the final up to 13 turbine scheme which is being taken forward to the application. This is illustrated on **Image 3.5** below.

3.41 Full details of the bird surveys and findings are provided in **Chapter 9: Ornithology**, with confidential information on breeding bird locations provided to NatureScot, Royal Society for the Protection of Birds (RSPB) and the Scottish Government only.

Image 3.5: 17 Turbine Layout Prior to removal of T1, T10, T11 and T12

GWDEs

3.42 During the Phase 1 habitat surveys undertaken by the ecology team, it was identified that there are a number of GWDEs located across the site. As such, a specific survey was undertaken by the hydrology team in October 2021 to visit key GWDE locations identified during the Phase 1 habitat surveys to establish the level of ground water dependency associated with each one. As a result of the survey, a number of adjustments were made to the turbine locations to take into account the presence of GWDEs. Where possible, the 250m buffer has been avoided for siting turbines and borrow pits, and 100m buffer has been avoided for siting tracks and trenches, as per SEPA guidance. However, it has not been possible to avoid these in all locations as detailed above and shown on **Image 3.4**, which provides an example of a location where it hasn't been possible to adhere to the required buffers in siting infrastructure.

3.43 **Chapter 7** provides a detailed assessment of potential effects on GWDEs, the location of which are shown on **Figure 7.3**. Despite the need to site some infrastructure within the 100m and 250m buffers as noted above, the assessment concludes there will be no significant effects on any GWDEs.

Cultural Heritage

3.44 There are a number of non-designated heritage assets within and immediately surrounding the Site and care has been taken to avoid these where possible. Design modifications include realignment of the access track to avoid crossing over possible shieling huts

at Allt Bail' A' Ghobhainn identified in the Historic Environment Record (HER) (WoSAS 44193)¹⁰ as illustrated on **Image 3.6** below, and a slight adjustment to the track to avoid direct effects on the North Cromalt, memorial cairn to Gertrude Canning, WRN (WoSAS 66814)¹¹ as illustrated on **Image 3.7** below. Further details on both of these assets are provided in the Historic Environment Assessment provided as **Appendix 10.2 Historic Environment Assessment**.

3.45 Further consultation has also been undertaken with Historic Environment Scotland (HES) regarding the use of the Inveraray bypass to access the site which is located within the Inveraray Castle Inventory-listed Garden and Design Landscape, and where a number of heritage assets are located which were surveyed in detail by the project cultural heritage specialist. Design feedback was also provided in terms of movement and/or deletion of turbines to avoid effects on Inveraray Castle, specifically in the view from the Aray Bridge, which accorded with similar efforts to reduce landscape and visual effects from a viewpoint at the same location.

3.46 Further consultation has also been undertaken with HES in terms of setting effects and to agree the final list of visualisation locations for assets assessed in **Chapter 10**.

Image 3.6: Realignment of access track to avoid cultural heritage feature (Sheiling Huts)

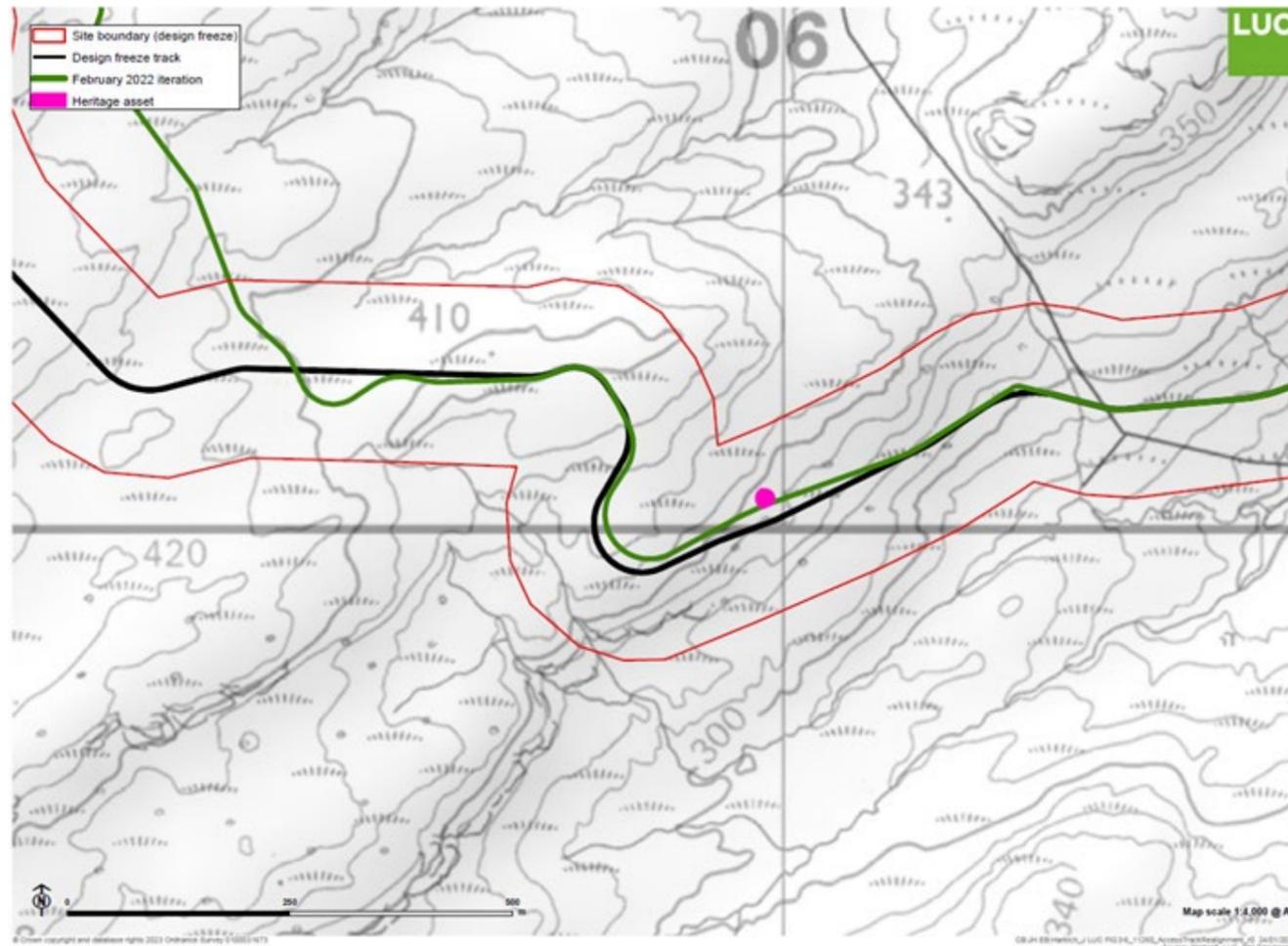
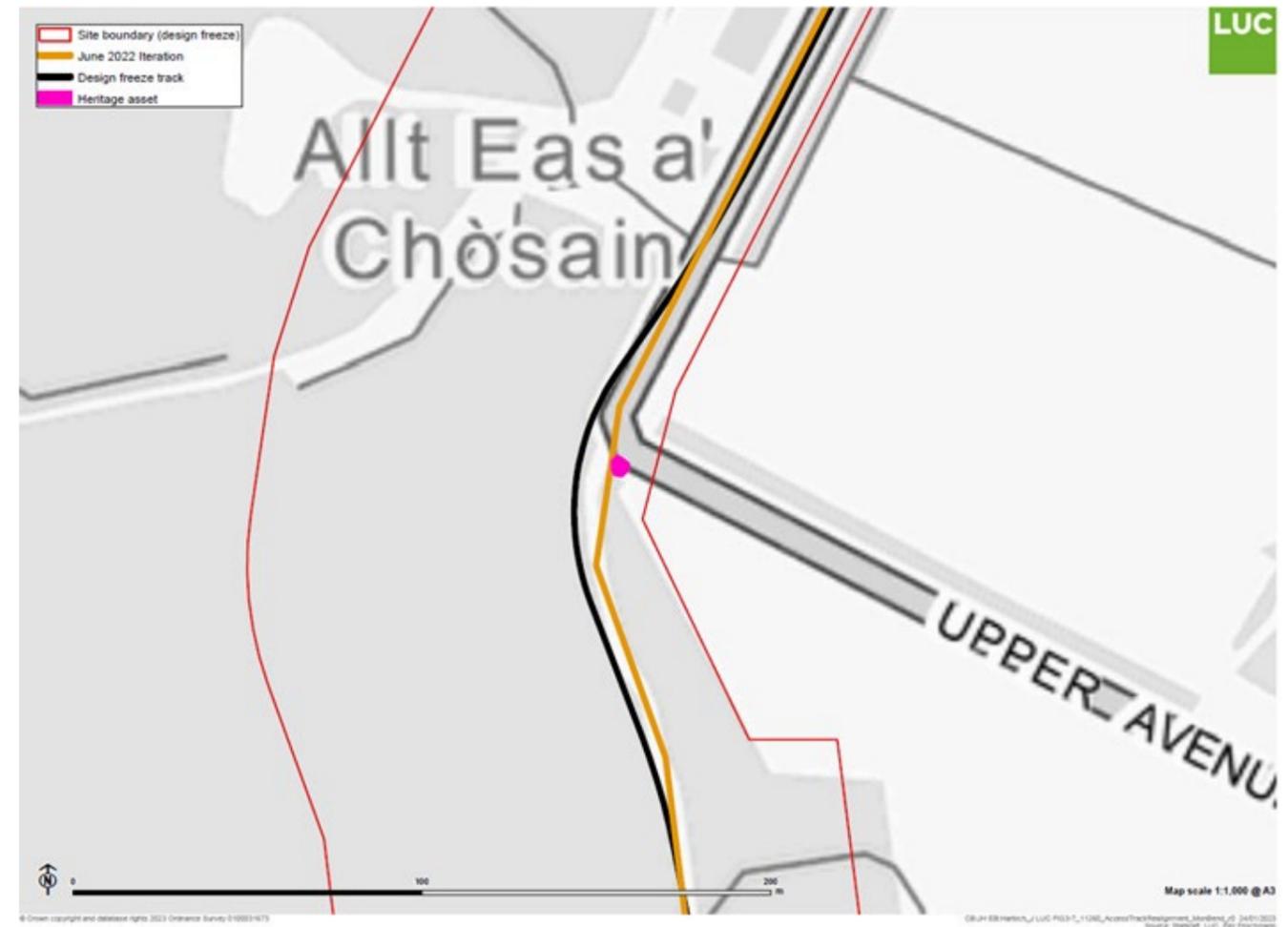


Image 3.7: Realignment of access track to avoid cultural heritage feature (Memorial to WREN Gertrude Canning)



Engineering Considerations

3.47 Due to the complex ground conditions at the Site, careful consideration has been given to the engineering constraints associated with the design. This has included avoiding slope angles of more than 14 degrees, reducing the need for significant cut and fill engineering works and, where possible, designing tracks to follow the contours of the Site. Several areas of 'floating' track have been identified to minimise the amount of peat excavation required, where peat depths are continuously over 0.5m. The location of the floating tracks is shown on **Figure 4.1**.

Site Infrastructure

Turbines

Turbine Scale

3.48 It is recognised by the Scottish Government that there is a pressing need to produce considerably more energy from renewable sources. As such, there is a need to plan for considerably larger scale wind energy development, as well as other forms of renewable energy. With the need to 'think big', comes the need to think where development of such a scale could be accommodated. In addition,

¹⁰ West of Scotland Archaeology Service (2020) WoSAS Pin: 44193 [online]. Available at: http://www.wosas.net/wosas_site.php?id=44193

¹¹ West of Scotland Archaeology Service (2020) WoSAS Pin: 66814 [online]. Available at: http://www.wosas.net/wosas_site.php?id=66814

the scale of the Proposed Development's turbines has been dictated partly by the size of turbines available to be obtained from manufacturers, who are producing larger turbines in line with advances in technology.

3.49 As noted above, consideration has also been given to the pattern of development and the scale of the other wind farms proposed in the wider area, including at the adjacent Blarghour Wind Farm, which is also proposed at 180m to turbine blade tip. In this way, the extent of the Proposed Development and the size of turbines has been driven by the overarching design objective of achieving a positive relationship with other nearby schemes.

Turbine Colour

3.50 SNH guidance² states that "As a general rule for most rural areas of Scotland, a single colour of turbine is generally preferable ... a light grey colour generally achieves the best balance between minimising visibility and visual impacts when seen against the sky ... paint reflection should be minimised ... for multiple windfarm groups or windfarm extensions, the colour of turbines should generally be consistent". The turbines proposed for the Proposed Development are to be a non-reflective pale grey colour, to be consistent with adjacent schemes and as per industry standard.

Aviation Lighting

3.51 One of the key considerations from a landscape and visual amenity perspective was designing an appropriate aviation lighting scheme which both satisfies the requirements of aviation policy and reduces the visual effects of such lighting at nearby receptors. Further details on the requirements for aviation lighting are provided in **Chapter 4**, and details of the proposed lighting scheme for the Proposed Development are set out in **Appendix 14.2: Aviation Lighting Report**. In summary, seven of the 13 wind turbines are proposed to have medium intensity (minimum of 2000cd) visible lighting mounted on the turbine hubs but no intermediate low intensity lights (32cd) on the turbine towers. Infrared lights (invisible to the naked eye) will be installed on all of the 13 turbines. This reduced lighting scheme has been agreed with the CAA and MoD through pre-application consultation. Further details on anticipated effects on landscape and visual amenity are set out in **Appendix 6.4: Aviation Lighting Night Time Assessment**.

Ancillary Infrastructure

3.52 As noted above, the infrastructure required was designed and arranged in such a way as to avoid the identified onsite constraints. Numerous infrastructure layouts have been progressed as the scheme evolved, with some minor iterations to turbine locations were necessary to facilitate the optimum onsite infrastructure requirements and respond to civil engineering constraints, such as topography. Access track routes in particular have been designed to minimise watercourse crossings and to avoid constrained areas within the Site, including steep slopes and deeper peat.

Modifications to Design

3.53 The development of the layout has evolved through a number of design iterations. The process has been summarised as five discrete layout iterations (as can be seen in **Figure 3.1**), although a number of refinements have been made in between which have been subject to careful scrutiny by the project team at a number of design workshops, particularly in relation to engineering, hydrology and peat considerations.

3.54 The layouts presented are:

- Layout 1: Scoping Layout and First Public Exhibition; (26 turbines, 200m to tip);
- Layout 2: Second Public Exhibition Layout; (21 turbines, 180m to tip);
- Layout 3: Interim Layout; (18 turbines, 180m to tip);
- Layout 4: Interim Layout (17 turbines, 180m to tip); and
- Layout 5: Final Layout (layout on which the EIA and Section 36 application have been based) (13 turbines, 180m to tip) (**Figure 3.2**).

3.55 Wireframes for each of these layouts are presented below in **Images 3.8a-e** to **3.12a-e** for the five key viewpoints detailed above (i.e. VP2: Dalavich Jetty; VP4: Folly at Dùn na Cuaiche (Inveraray Castle Garden and Designed Landscape); VP7: Core Path above Inverinan; VP14: A886 at Strachur; and VP16: B840, east of Ford).

Layout 1: Scoping Layout and First Exhibition Layout

3.56 The Scoping Layout consisted of 26 turbines at a maximum blade tip height of 200m. The purpose of the layout was to develop a design which would maximise generating capacity with higher yielding turbines reflecting current trends in wind turbine technology. The Scoping Layout was designed prior to undertaking the full suite of environmental surveys at the site, but was nevertheless informed by known environmental constraints as well as technical considerations, including:

- Separation distances of 5 x 4 rotor diameters between turbines, assuming a south-westerly prevailing wind to reduce issues associated with turbulence;
- A 50m buffer to known watercourses and waterbodies to reduce the likelihood of effects as a result of pollution events, principally during construction; and
- A 2km buffer to residential properties, with turbines sited outside of this area.

3.57 The Scoping Layout is shown in **Figure 3.1** and was presented at online public exhibitions which took place in June and July 2021. Illustrative wireframes of this layout are shown below.

Layout 2: Second Public Exhibition Layout

3.58 Layout 2 consisted of 21 turbines at a maximum blade tip height of 180m and was used at in-person public consultation events that took place in November 2021. The design of the layout was predominantly driven by wind yield but took the following environmental factors into account:

- A reduction in the number of turbines from 26 to 21 to accommodate ornithological constraints, predominantly associated with golden eagle use of the site as informed by initial GET modelling and tagged golden eagle data;
- A reduction in tip of all turbines from 200m to 180m to reduce their prominence within the landscape, and in keeping with the adjacent Blarghour Wind Farm proposals;
- A relocation of turbines to avoid priority peatland habitat and the presence of known areas of deep peat, where possible, informed by the Phase 1 peat probing data undertaken at 100m grid across the site; and
- Repositioning of turbines to maximise the predicted available wind resource.

3.59 Interim Layout 2 is presented in **Figure 3.1**. Illustrative wireframes of this layout are shown below.

Layout 3: Interim Layout

3.60 Interim Layout 3 consisted of 18 turbines at a maximum blade tip height of 180m. The design was reviewed by the project landscape architect and sought to improve the composition of the scheme from several key viewpoints. This included the removal of three turbines (T6, T14 and T19) in addition to taking account of the environmental constraints noted above and feedback from consultees and the public. All remaining turbines were either microsited or moved further to improve the design of the scheme. This included moving T8 and T22 east and south-east respectively to increase the separation from Dalavich. Three turbines were also moved to increase distance from GWDTEs (T9, T13 and T20).

3.61 Interim Layout 3 is presented in **Figure 3.1**. Illustrative wireframes of this layout are shown below.

Layout 4: Interim Layout (Optimised)

3.62 Interim Layout 4 consisted of 17 turbines at a maximum blade tip height of 180m and was further optimised to take into consideration the environmental constraints identified during the surveys and feedback provided by the Applicant and project engineers in terms of engineering and construction. This included consideration of the results of further detailed peat survey, site walkovers by the project civil engineering team and the Applicant's construction team, and consideration of wind yield. Consideration was also given to the possibility of oversail of turbine blades outside of the Site boundary, which resulted, ultimately, in the loss of T7 of Layout 3, which could not be moved due to the proximity of environmental constraints and water crossings, resulting in a 17 turbine layout.

3.63 Interim Layout 4 is presented in **Figure 3.1**. Illustrative wireframes of this layout are shown below.

Layout 5: Final Layout

3.64 A number of design iterations took place between Layout 4 and Layout 5, the Final Layout. This included the consideration of the results from the final GET modelling, informed by further satellite tag data obtained in the intervening period. This resulted in the removal of T1, T10, T11 and T12 to reduce potential effects on golden eagle. **Image 3.5** above shows the locations of the four turbines (T1, T10, T11 and T12) and the section of associated track that was removed.

3.65 A location for the permanent meteorological mast was also established after taking into consideration the environmental constraints identified, including those associated with hydrology and peat, landscape and visual amenity and ornithology. This was informed by the need to maintain a suitable distance from the closest 'paired' turbine, and the need to avoid interference from other wind turbines. The turbines were also renumbered at this stage.

3.66 The Final Layout incorporates the following infrastructure elements:

- Up to 13 turbines of up to 180m maximum blade tip height.
- Foundations supporting each turbine.
- Associated crane hardstandings at each turbine location.
- A network of onsite access tracks and associated watercourse crossings.
- A network of underground cables to connect the turbines to the onsite substation.
- Onsite passing places and vehicle turning heads.
- The creation of one temporary borrow pit and the reopening/use of two existing borrow pits.
- One temporary construction compound.
- One permanent compound which will include the onsite control building, substation and an energy storage system, designed to complement renewable energy generation.
- A permanent meteorological mast, up to 102.5m in height, and associated track.
- Junction widening and upgrades on the A83 and A819, and an upgraded access off the A83 into the Site.
- Felling of forestry to facilitate access during construction. This is limited to an area of 3.77ha along the access to the Site, comprising a mix of mature broadleaved trees to immature conifers which will be retained once the Proposed Development is operational. Further details on forestry are provided in **Appendix 4.1: Forestry**.

3.67 The Final Layout is provided in **Figure 3.2**, including all infrastructure. Illustrative wireframes of this layout are shown in **Images 3.12a-e** below, and are included with photomontages in **Chapter 6**.

Design Conclusion

3.68 The final layout as presented in **Figures 3.2** and takes into account the design aspirations outlined above. The Site is complex, with a number of competing technical and environmental constraints which have been considered in the iterative design process, and have guided the positioning of both turbines and associated infrastructure. The inherent nature of wind turbines as tall, modern structures means that the form of the Proposed Development as a whole is important, and a clear design strategy is necessary. The overall aim of the design strategy was to create a wind farm with a cohesive design that relates to its landscape context (including other schemes) in line with appropriate published guidance, and balanced against the need to minimise potential effects on peat, GWDTEs and ornithology in particular. The following key views were considered in the design, and illustrative wireframes from these locations are provided below (the Proposed Development is shown in red, in the centre of each image):

- VP2: Dalavich Jetty (**Images 3.8a-e**);
- VP4: Folly at Dùn na Cuaiche (Inveraray Castle Garden and Designed Landscape) (**Images 3.9a-e**);
- VP7: Core Path above Inverinan (**Images 3.10a-e**);
- VP14: A886 at Strachur (**Images 3.11a-e**); and
- VP16: B840, east of Ford (**Images 3.12a-e**).

3.69 A number of iterations were considered throughout the design evolution, to develop a layout that fulfils the overarching objectives whilst maximising energy yield and respecting other technical and environmental constraints including ecological, ornithological, hydrological, cultural heritage and ground conditions identified during the consultation and EIA process.

3.70 Overall, the adverse effects of the Proposed Development have been minimised, with the residual significant adverse effects being limited to effects on landscape and visual amenity. The result of the design process is the final application layout, comprising up to 13 turbines not exceeding 180m to blade tip, with associated ancillary infrastructure, both permanent and temporary, which has been carefully sited and designed to reflect economic, technical and environmental sensitivities.

Illustrative Wireframes from Viewpoint 2: Dalavich Jetty

Image 3.8a: Layout 1 – Scoping layout and first public exhibition (26 turbines, 200m to tip)

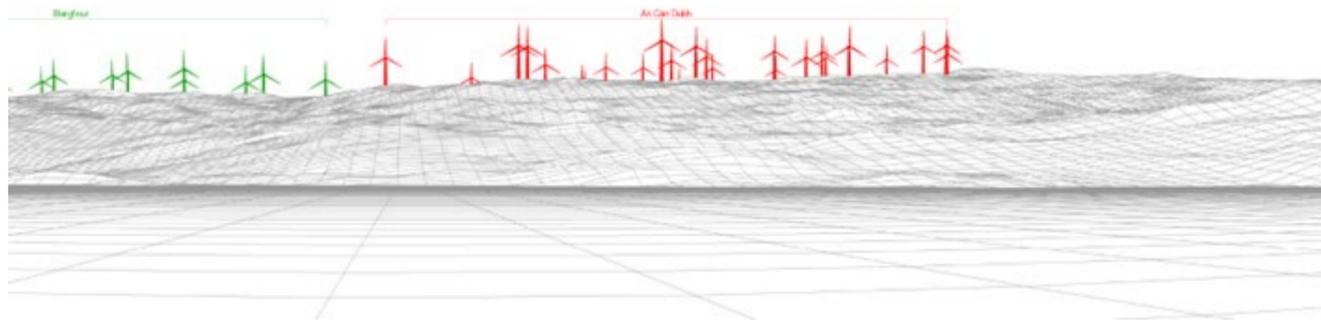


Image 3.8b: Layout 2 – Second public exhibition layout (21 turbines, 180m to tip)

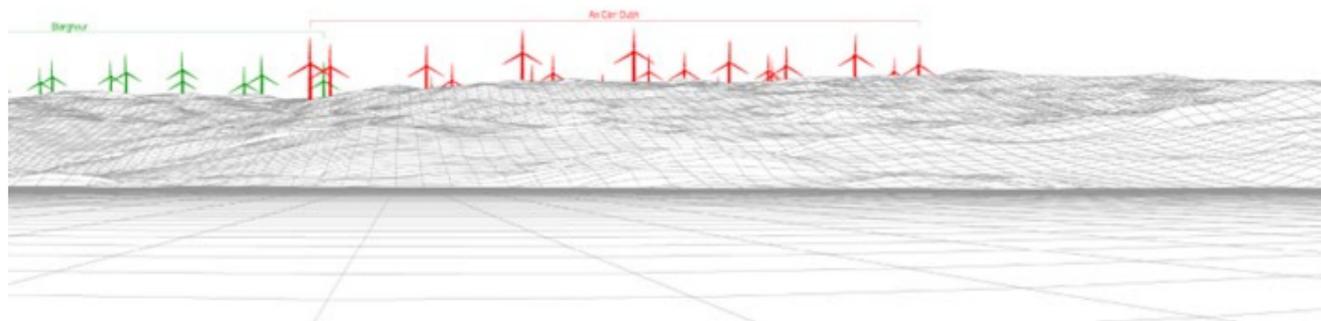


Image 3.8c: Layout 3 – Interim layout (18 turbines, 180m to tip)

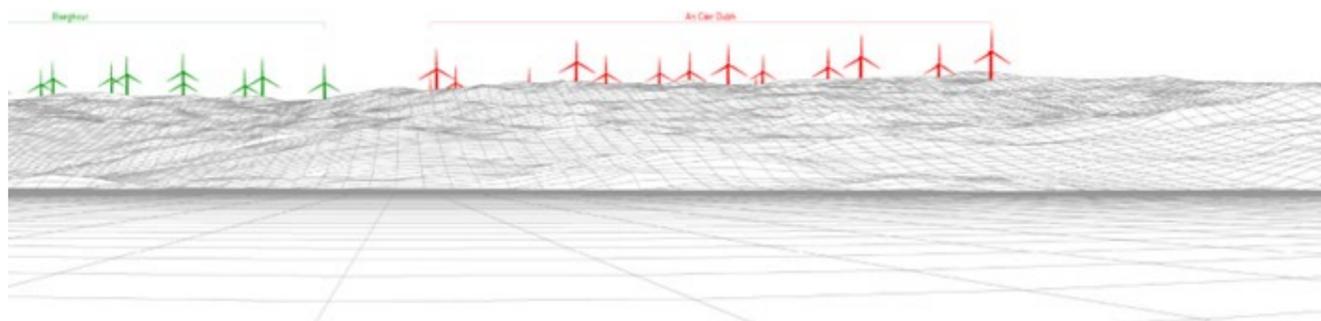


Image 3.8d: Layout 4 – Interim layout (17 turbines, 180m to tip)

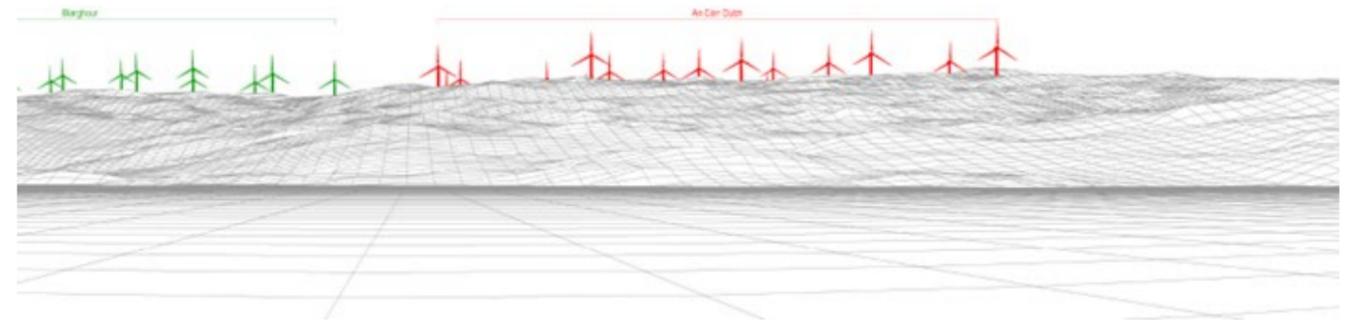
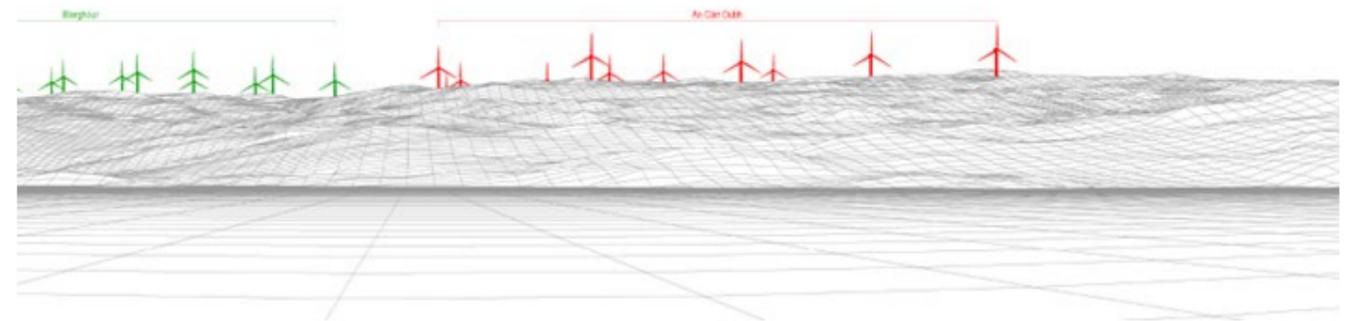


Image 3.8e: Layout 5 – Final layout (13 turbines, 180m to tip)



Illustrative Wireframes from Viewpoint 4: Folly at Dun na Cuaiche (Inveraray Castle GDL)

Image 3.9a: Layout 1 – Scoping layout and first public exhibition (26 turbines, 200m to tip)

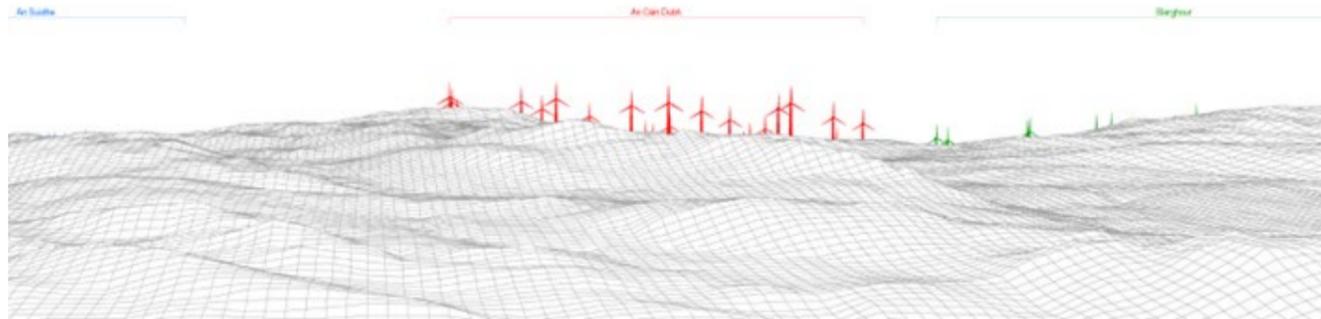


Image 3.9d: Layout 4 – Interim layout (17 turbines, 180m to tip)

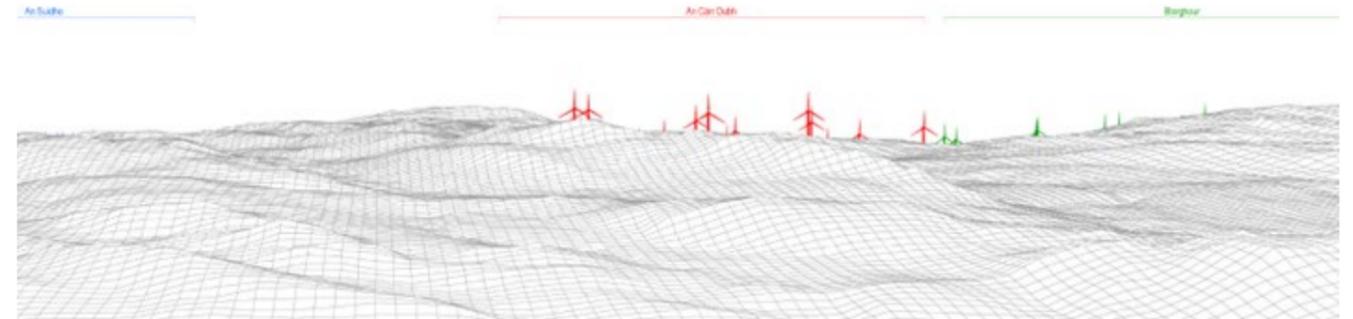


Image 3.9b: Layout 2 – Second public exhibition layout (21 turbines, 180m to tip)

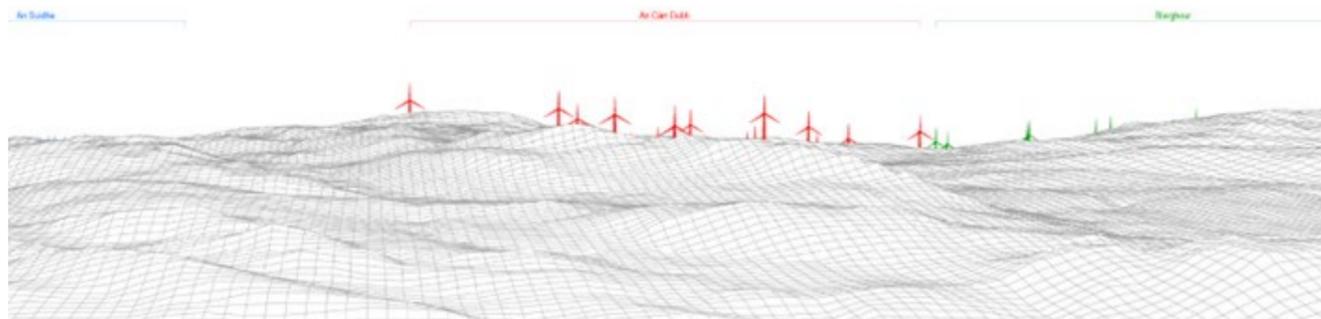


Image 3.9e: Layout 5 – Final layout (13 turbines, 180m to tip)

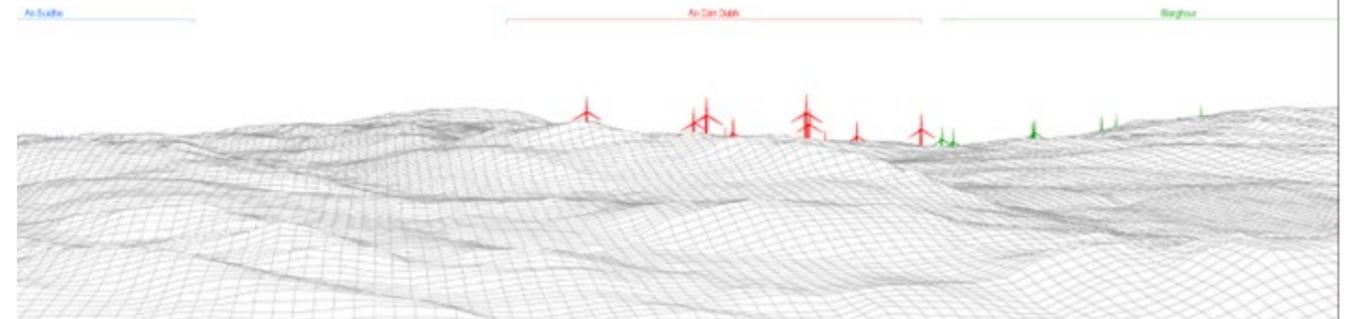
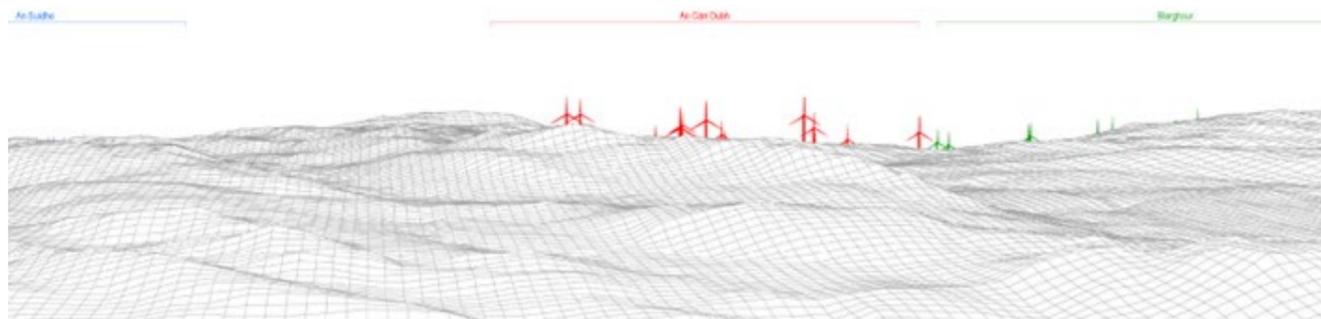


Image 3.9c: Layout 3 – Interim layout (18 turbines, 180m to tip)



Illustrative Wireframes from Viewpoint 7: Core Path Above Inverinan

Image 3.10a: Layout 1 – Scoping layout and first public exhibition (26 turbines, 200m to tip)

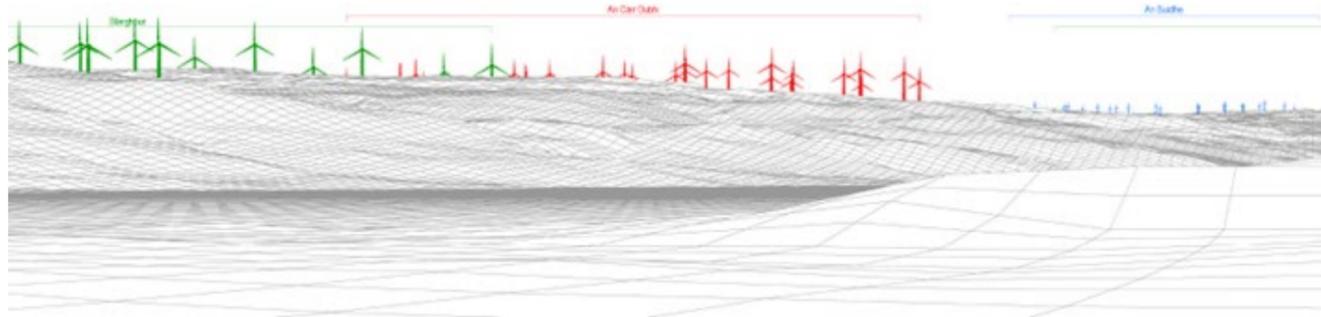


Image 3.10b: Layout 2 – Second public exhibition (21 turbines, 180m to tip)

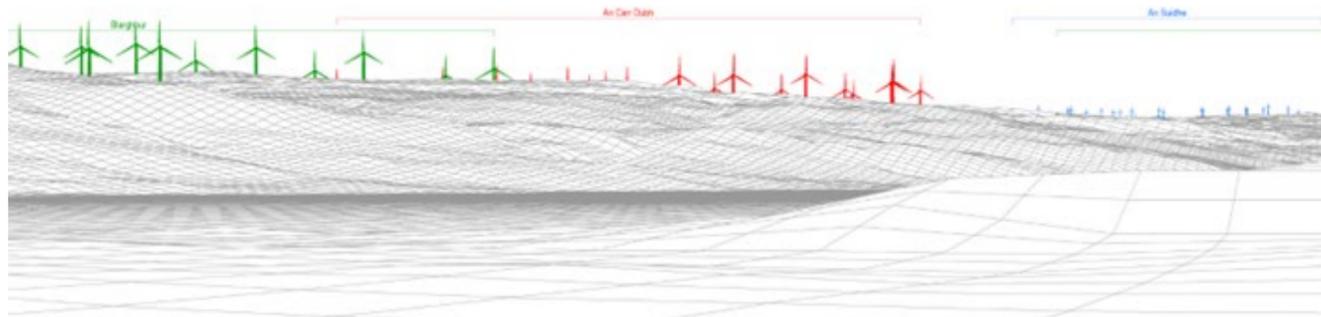


Image 3.10c: Layout 3 – Interim layout (18 turbines, 180m to tip)

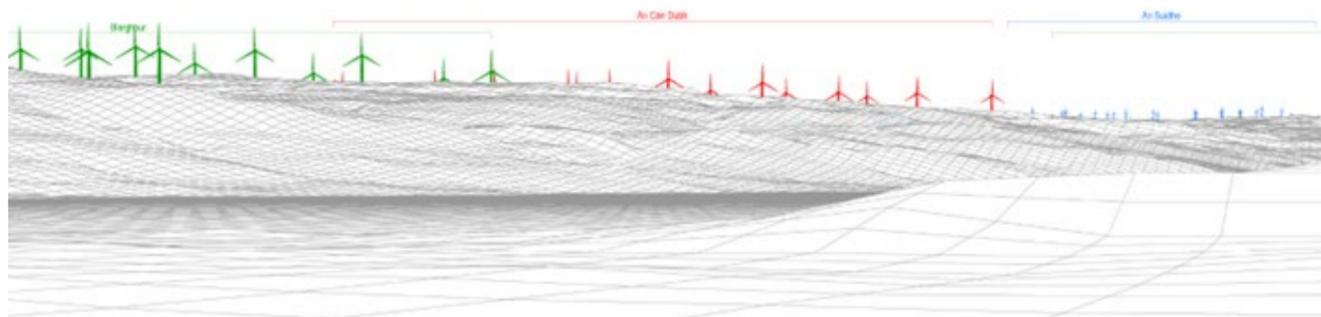


Image 3.10d: Layout 4 – Interim layout (17 turbines, 180m to tip)

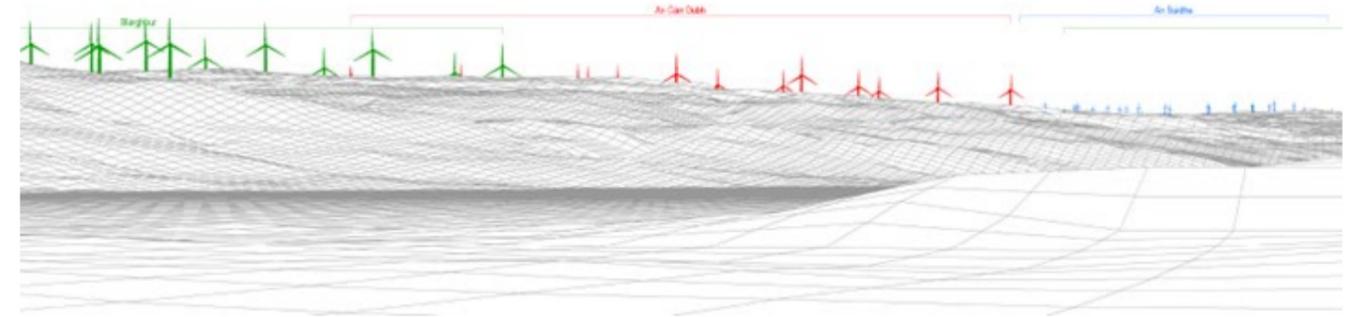
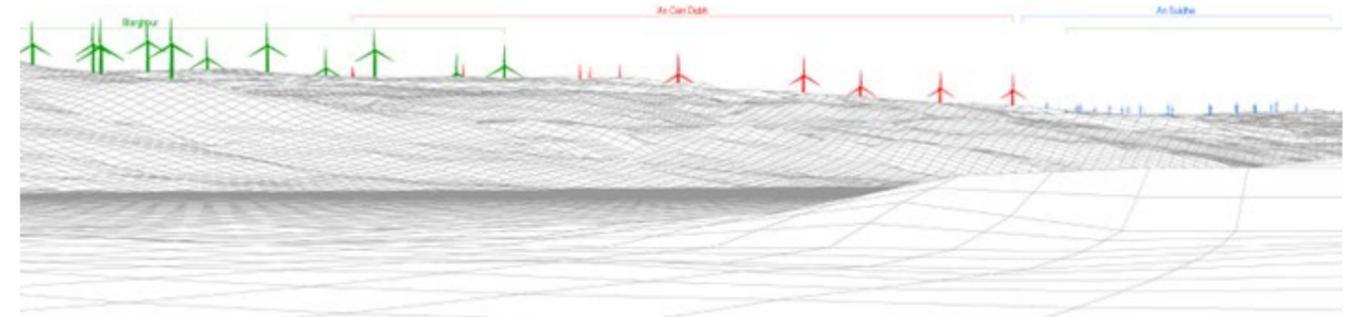


Image 3.10e: Layout 5 – Final layout (13 turbines, 180m to tip)



Illustrative Wireframes from Viewpoint 14: A886 at Strachur

Image 3.11a: Layout 1 – Scoping layout and first public exhibition (26 turbines, 200m to tip)

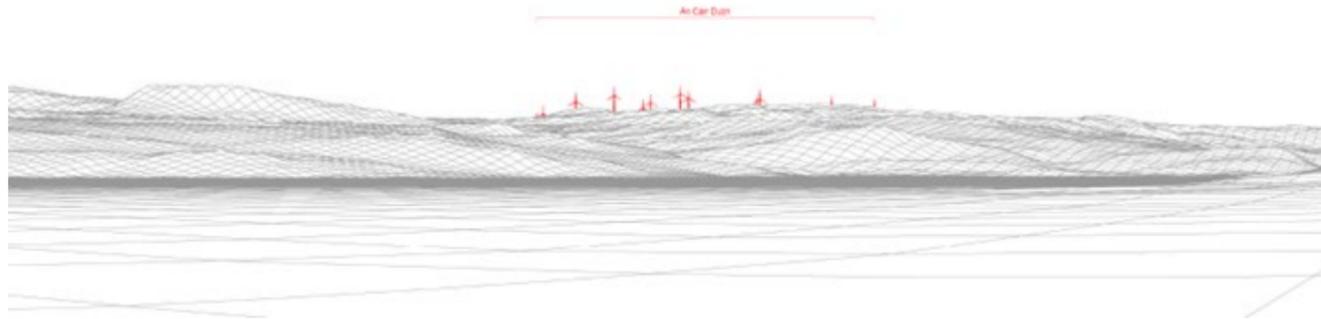


Image 3.11b: Layout 2 – Second public exhibition layout (21 turbines, 180m to tip)

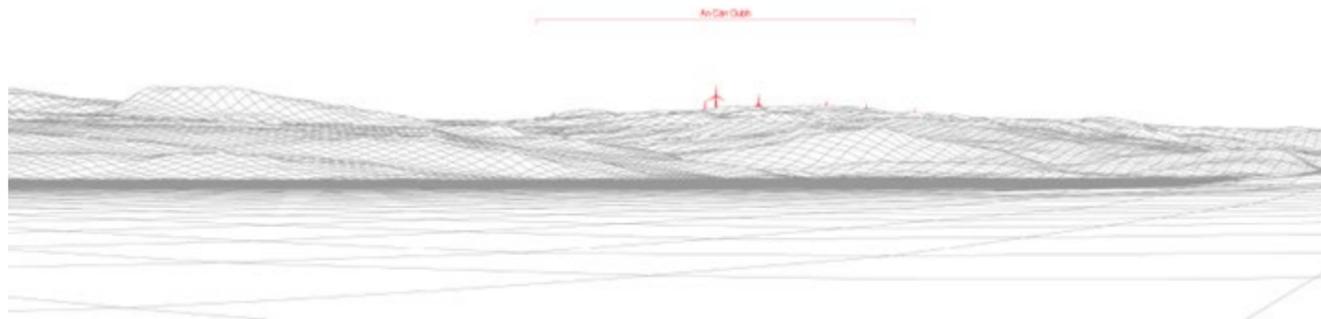


Image 3.11c: Layout 3 – Interim layout (18 turbines, 180m to tip)

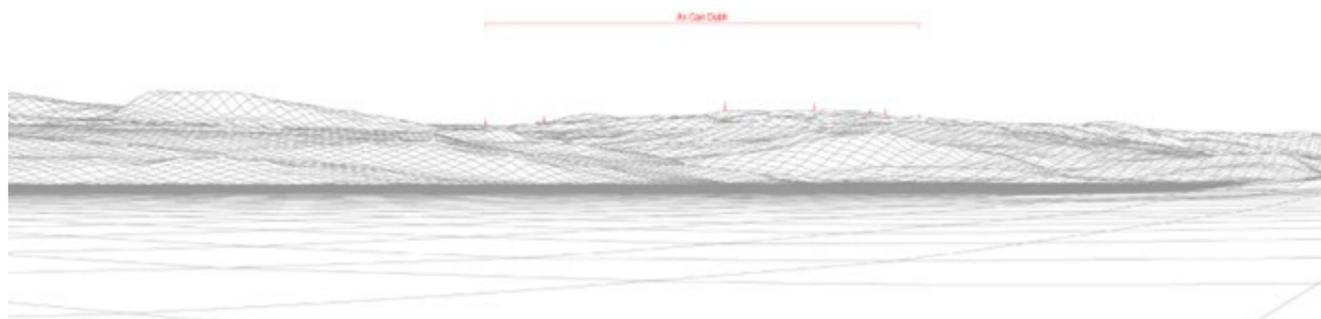


Image 3.11d: Layout 4 – Interim layout (17 turbines, 180m to tip)

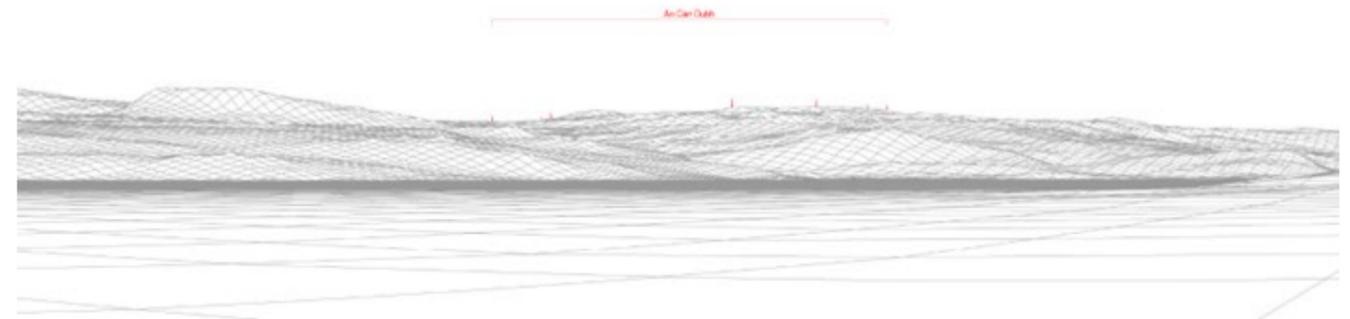
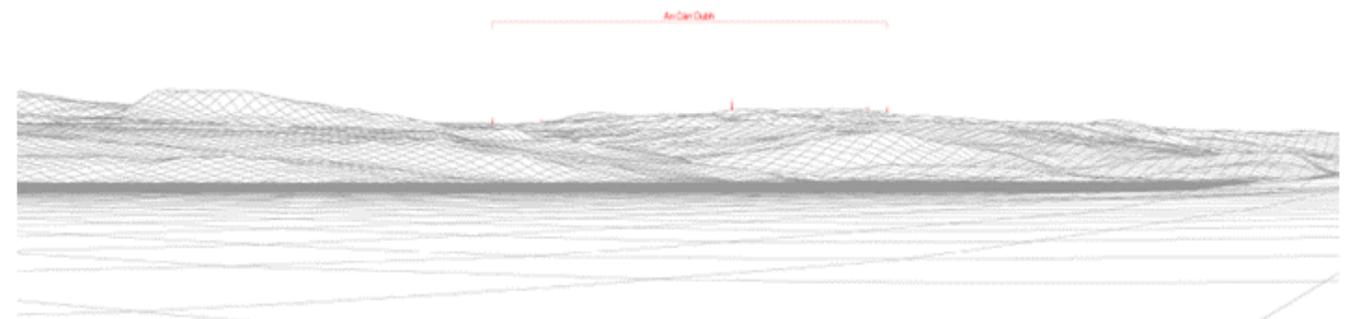


Image 3.11e: Layout 5 – Final layout (13 turbines, 180m to tip)



Illustrative Wireframes from Viewpoint 16: A840, East of Ford

Image 3.12a: Layout 1 – Scoping layout and first public exhibition (26 turbines, 200m to tip)

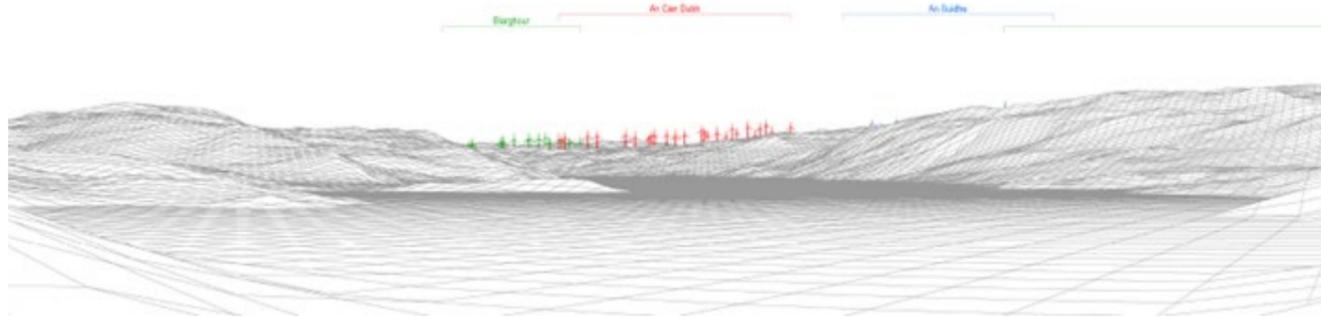


Image 3.12b: Layout 2 – Second public exhibition layout (21 turbines, 180m to tip)

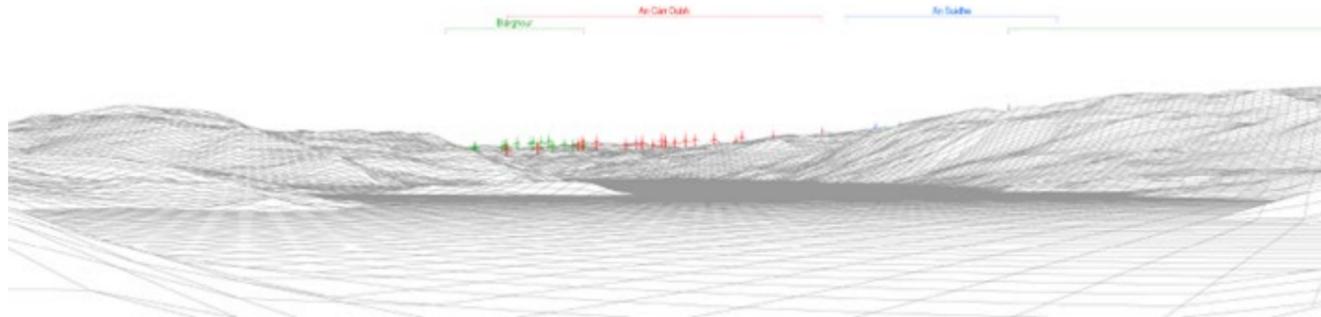


Image 3.12c: Layout 3 – Interim layout (18 turbines, 180m to tip)

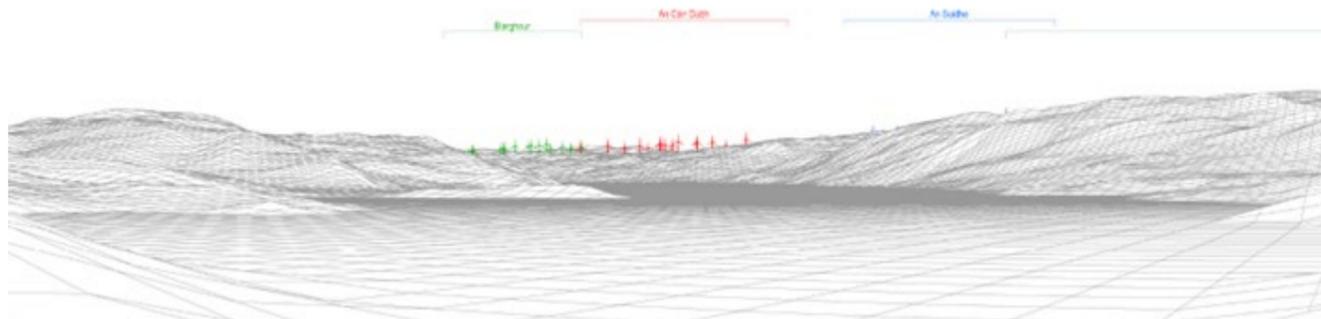


Image 3.12d: Layout 4 – Interim layout (17 turbines, 180m to tip)

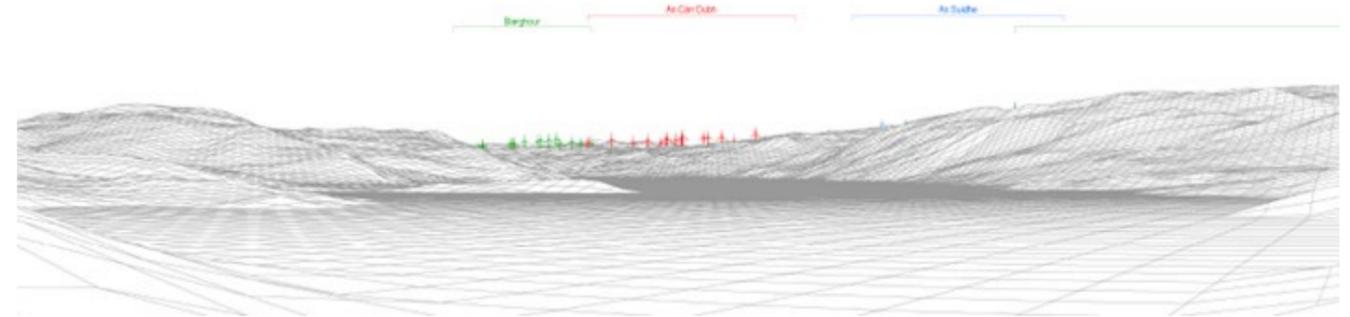


Image 3.12e: Layout 5 – Final layout (13 turbines, 180m to tip)

