APPENDIX 14-1

LVIA METHODOLOGY

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1. LANDSCAPE AND VISUAL IMPACT ASSESSMENT (LVIA) METHODOLOGY

1.1 Scope and Definition of LVIA Study Area

Chapter 14 follows the naming conventions and definitions detailed in Section 1.1.1 of Chapter 1 of this EIAR: *Introduction*. In Chapter 14, where the 'the Site' is referred to, this relates to the primary study area for the EIAR, the immediate environment in which the Proposed Development is located including both the proposed Wind Farm Site and Grid Connection. The Site is delineated by a green line labelled as the 'EIAR Site Boundary' in the A0 baseline map in Appendix 14-4: *LVIA Baseline Map*, as well as other mapping figures shown in Section 14.4 'Landscape Baseline' of Chapter 14. Where the 'Wind Farm Site' is referred to in this Chapter, this refers to the upland areas where the proposed turbines and associated wind farm infrastructure are located. The Wind Farm Site is shown in Figure 1-1a of Chapter 1.

The Guidelines for Landscape and Visual Impact Assessment 3rd Edition (hereafter, GLVIA3) (Landscape Institute [LI] & Institute of Environmental Management and Assessment [IEMA], 2013) guidance refers to the identification of the area of landscape that is to be covered while assessing landscape and visual effects. The guidelines state:

> *'The study areas should include the site itself and the full extent of the wider landscape around it which the Proposed Development may influence in a significant manner'.*

Landscape and visual baseline mapping and viewpoint selection are based on wider study areas referred to as the 'LVIA Study Area'. The geographical parameters for this LVIA were determined by desktop study, survey work undertaken and the professional judgement of the assessment team, as well as experience from other relevant projects and policy guidance or standards, including:

- *Appendix 3* of the 'Wind Energy Development Guidelines for Planning Authorities' (hereafter, WEDGs) (Department of the Environment, Heritage and Local Government [DoEHLG], 2006), including reference to the Draft Revised WEDGs Department of Planning, Housing and Local Government (DoHPLG), 2019;
- GLVIA3 (LI & IEMA, 2013).

1.1.1 LVIA Study Area for Effects on Landscape and Visual Receptors: 20km Radius

The distance at which a Zone of Theoretical Visibility (ZTV) map is set from a proposed wind farm development usually defines the parameters of the LVIA Study Area. In this chapter, the LVIA Study Area was chosen as 20km for landscape and visual effects, as is suggested by guidance (WEDGs, DoEHLG, 2006, p.94; Draft Revised WEDGs, DoHPLG, 2019, p.152):

> *'For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate'.*

1.1.2 LCA Study Area for Effects on Designated Landscape Character Areas: 15km Radius

Through extensive experience conducting LVIA for other wind energy development projects, the assessment team determined that no significant effects on landscape character are likely to arise beyond distances of 15km from the proposed turbines. The turbines of a wind farm are unlikely to significantly impact the key characteristics of an LCA beyond a distance of 15km, even for the most sensitive designated LCAs. Therefore, a study area of 15km, hereafter referred to as the 'LCA Study Area', is deemed appropriate for effects on landscape character in relation to the assessment of effects upon designated Landscape Character Areas.

1.1.3 Topics Scoped out of Assessment

On the basis of desk studies and survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects and policy guidance or standards, the following topic areas have been scoped out of the assessment:

- Effects on landscape and visual receptors that have minimal or no theoretical visibility (as predicted by ZTV mapping) and are therefore unlikely to be subject to 'Significant' effects;
- Effects on designated landscape receptors beyond a 20 km radius (LVIA Study Area) from the proposed turbines, from where it is judged that potential 'Significant' effects on key characteristics and/or special qualities, or views are judged unlikely to occur;
- Effects on landscape character and designated LCAs beyond a 15km radius (LCA Study Area) from the proposed turbines, where it is judged that potential 'Significant' effects on landscape character are unlikely to occur;
- Effects on visual receptors beyond a 20km radius (LVIA Study Area) from the proposed turbines, where it is judged that potential 'Significant' effects are unlikely to occur;
- Cumulative landscape and visual effects beyond a 20km radius (LVIA Study Area) from the proposed turbines, where it is judged that potential 'Significant' cumulative effects are unlikely to occur.

1.2 Essential Aspects of LVIA

Guidance for LVIA from the GLVIA3 (LI & IEMA, 2013) states that:

> *'It is important to make sure that the project description provides all the information needed to identify its effect on particular aspects of the environment. For LVIA, it is important to understand, from the project description, the essential aspects of the scheme that will potentially give rise to its effect on the landscape and visual amenity'.*

The tall, vertical nature of the proposed turbines make them the most prominent elements of the Proposed Development from a landscape and visual perspective and have the most potential to give rise to 'Significant' landscape and visual effects. In this regard, the proposed turbines are deemed to be the 'essential aspect' of the Proposed Development which will give rise to effects on the landscape and visual amenity and therefore a primary focus of the LVIA conducted in Chapter 14.

Other elements of the Proposed Development are not deemed to be as visually prominent as the proposed turbines; however, they do also have the potential to give rise to localised landscape and visual effects. Although these elements are not the primary focus of the LVIA, they are given due consideration throughout Chapter 14.

1.3 Guidelines

While the legislation and general guidance on Environmental Impact Assessment is set out in Chapter 1 of this EIAR, only the guidance specifically pertaining to LVIA are outlined below.

Ireland signed and ratified the European Landscape Convention (ELC) in 2002, introducing a pan-European concept which centres on the quality of landscape protection, management and planning. In

2015, the Department of Arts, Heritage and the Gaeltacht published a National Landscape Strategy for Ireland. The strategy aims to ensure compliance with the ELC and contains six main objectives, which include developing a national Landscape Character Assessment and Developing Landscape Policies.

In 2000, the Department of the Environment and Local Government published 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities', which recommended that all Local Authorities adopt a standardised approach to landscape assessment for incorporation into development plans and consideration as part of the planning process. However, at the time of writing this report, the DoELG 2000 guidance remains in draft form.

The LVIA of this chapter was primarily based on the GLVIA3 (LI & IEMA, 2013). Ten additional guidelines also informed the preparation of this LVIA, as follows:

- WEDGs (DoEHLG, 2006) and Draft Revised WEDGs (DoHPLG, 2019);
- 'Visual Assessment of Wind Farms: Best Practice' (Scottish Natural Heritage [SNH], 2002);
- 'Visual Representation of Wind Farms: Version 2' (hereafter, SNH Guidance v.2) (SNH, 2014);
- 'Visual Representation of Wind Farms: Version 2.2' (hereafter, SNH Guidance v.2.2) (SNH, 2017);
- 'Siting and Designing Wind Farms in the Landscape, Version 3a' (hereafter, SNH Guidance v.3a) (SNH, 2017);
- 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (Nature Scot, 2021; includes methodology from SNH, 2012);
- 'Visual Representation of Development Proposals' (Landscape Institute Technical Guidance Note 06/19, 2019) (hereafter, LI TGN 06/19);
- 'Spatial Planning for Onshore Wind Turbines: Natural Heritage Considerations' (SNH, 2015);
- 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities' (DoEHLG, 2000);
- 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency of Ireland [EPA], 2000).

1.4 Visibility Mapping: Zone of Theoretical Visibility (ZTV)

The ZTV represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM), overlain on a map base. The DTM is a three-dimensional computerised visual representation of a piece of topography, in the form of a digital model. The associated ZTV Map, constructed based on the details of the DTM, indicates the following:

- Broad areas where visibility of a wind energy development is most likely to occur;
- How many of the proposed turbines of the wind energy development are theoretically visible in those areas (using different coloured bands for different numbers of turbines); and
- The extent and pattern of visibility.

The production of ZTV maps is usually one of the first steps of LVIA, determining (i) the boundaries of the LVIA Study Area in which impacts will be considered in more detail, and informing (ii) the identification of sensitive vantage points (SNH Guidance v.2.2, 2017).

1.4.1 ZTV Methodology

The ZTV maps presented in the EIAR show visibility of the proposed turbines using the half blade height of the wind turbines as points of reference. The WEDGs (DoEHLG, 2006 p.94) and Draft Revised WEDGs (DoHPLG, 2019 p.152) note that:

> *"It is recommended that the Zone of Theoretical Visibility should assess the degree of visibility based on the numbers of turbines visible to half the blade length in addition to hub-height".*

Furthermore, as well as per the guidance, a Half-Blade ZTV is considered more appropriate and useful than a Full-Blade ZTV for analysing visibility of the proposed turbines and scoping receptors in and out for assessment, particularly when using an elevation model representing a bare earth scenario. The decision to use a Half-Blade ZTV is based upon the guidance as well as the professional judgement and the extensive experience the assessment team have ground truthing ZTVs against the reality of turbine visibility within landscapes where turbines already exist.

The area covered by the ZTV maps in Chapter 14 have a radius of 20km from the outer-most proposed turbines.

The WEDGs (DoEHLG, 2006) require that:

> *'in areas where landscapes of national or international renown are located within 25 km of a proposed wind energy development, the Zone of Theoretical Visibility should be extended as far (and in the direction of) that landscape'.*

A mapping investigation determined that no landscapes of National or International renown are located between 20 to 25km from the proposed turbines, thus the extension of the ZTV beyond 20km from the outer-most proposed turbine is not warranted in the case of this LVIA. Therefore, as explained above in Section 1.1 '*Scope and Definition of LVIA Study Area*', 20km was deemed a sufficient and appropriate study area for the Proposed Development and any assessment of landscape and visual effects, as is determined in the WEDGs (DoEHLG, 2006, p.94) and Draft Revised WEDGs (DoHPLG, 2019, p.152):

> *'For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate.'*

ZTV maps assume a worst-case or 'bare ground' scenario, i.e. no land-cover. They represent the theoretical visibility of the proposed wind farm in the absence of all natural and manmade features from the landscape, including vegetation, houses, and other buildings. In reality, such features restrict or limit visibility of the wind turbines, due to the visual screening effects of vegetation; for example, forestry and road-side hedgerows and trees, and buildings, particularly within towns and villages.

On each ZTV map, separate colour bands are used to indicate the number of turbines which will potentially be visible to half-blade height, i.e. only half of one blade may be visible over the topography, as opposed to seeing a full turbine. The legend on each map shows the number of visible turbines for each corresponding colour, as follows:

- Yellow: 1–3 turbines theoretically visible;
- Teal: 4–6 turbines theoretically visible;
- Navy: 7–9 turbines theoretically visible.

As detailed in Section 14.1.2.3 of Chapter 14, the turbine model used for the generation of ZTVs in the Chapter includes the 'Maximum Tip Height, Maximum Hub Height, Minimum Rotor Diameter' which represents the greatest visual exposure for a Half-Blade ZTV within the range of turbine dimensions proposed.

1.4.2 Limitations of ZTV Mapping

The 2017 SNH Guidance v.2.2 acknowledge the following limitations inherent to the use of theoretical visibility mapping:

- The ZTV presents a 'bare ground' scenario, i.e. visibility of the proposed turbines in a landscape without screening structures or vegetation. This includes trees, hedgerows, buildings and small-scale landform or ground surface features. The ZTV also does not take into account the effects of weather and atmospheric conditions, and therefore can be said to represent a 'worst-case' scenario, that is where the wind turbines could potentially be seen given favourable weather conditions and no intervening obstructions;
- The ZTV indicates areas from where a wind farm may be visible, but cannot show how it will look, nor indicate the nature or magnitude of visual impacts. The visibility of the turbines decreases with increasing distance from which they are viewed, but this is not accounted for in the ZTV. Figure 1-1 below provides an illustration of the differences in view relative to the distance from a turbine:

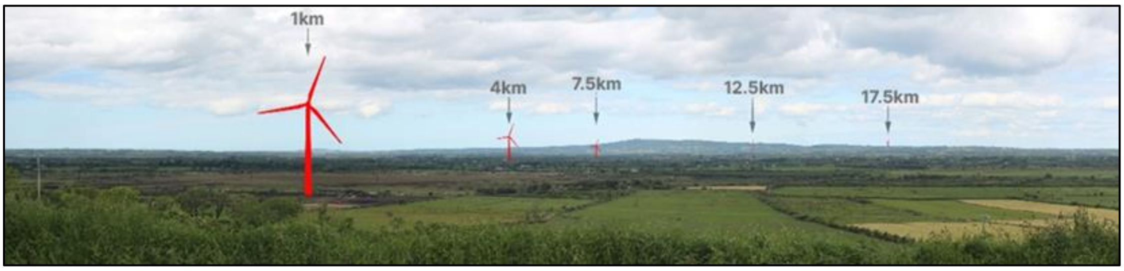

Figure 1-1 Effect of Distance on Visibility of Wind Turbines (Illustrative Purposes Only)

- A ZTV is only as accurate as the data on which it is based. It is not easy to test the accuracy of a ZTV in the field, although some verification does occur during the assessment of viewpoints;
- In order to handle large areas of terrain, the DTM data are based on information that does not allow detail to be distinguished below a certain level of resolution. There are also differences in the way that the software package 'interpolates' between heights in the calculations made.

1.4.3 On-Site Visibility Appraisal: Route Screening Analysis (RSA)

As the ZTV does not account for localised undulations in topography and other screening factors, the actual visibility is often far less than is indicated by the ZTV. Therefore, whilst the ZTV is a useful tool to aid analysis of likely visibility of the proposed turbines and scope out areas where impacts will not occur, the LVIA in Chapter 14 is also informed by visibility appraisals conducted from sensitive receptors throughout the LVIA Study Area.

During site visits conducted during 2022 and 2023, the likely visibility of the proposed turbines was appraised from receptors where the ZTV indicated theoretical visibility. This included an analysis of visibility looking towards the proposed turbines from the local road network immediately surrounding the Site during an exercise called 'Route Screening Analysis' (RSA), a methodology developed by MKO.

1.4.4 Route Screening Analysis (RSA) Methodology – Roads

In order to comprehensively demonstrate the varying characteristics of visual screening existent on roads, proximate to the Wind Farm Site and to record the actual visibility of the proposed turbines in comparison to the theoretical visibility, the RSA methodology was developed by MKO. RSA was undertaken from all public roads within 3km of the proposed turbines. Where roads continued beyond 3km from the proposed turbines, the RSA survey continued to record the screening until reaching an appropriate termination point or junction. For this LVIA, visual screening along the R471, R462, R465 and R471 regional roads were recorded to a distance of 5km as these are a relatively prominent and well-trafficked transport routes in close proximity to the Site.

As its name suggests, RSA considers the actual visibility of the proposed wind turbines from its immediate surrounding road network. In this LVIA, the road network surrounding the Wind Farm Site follows a network of weaving narrow valleys which navigate the marginal upland terrain and the wider landscape comprises rolling agricultural land including a network of trees and hedgerows. In general, the RSA is undertaken in order to gain a clearer understanding of visibility and visual screening, and to bridge the gap for the assessor between the computer-generated ZTV maps and the actual nature of visibility of the proposed turbines in proximity to the Site.

All public roads within a 3km radius of the proposed turbines were driven. As the route is driven, the extent of roadside screening was recorded digitally on a tablet/GPS device. In addition, dashcam video footage was recorded along the routes to allow later confirmation of mapping, and to methodically record the views along the route. All routes were driven slowly. Using the tablet device, screening was logged as one of three categories:

- Little/No Screening – mainly open and with some very light vegetation;
- Intermittent/Partial Screening – light deciduous roadside vegetation and vegetation with short gaps which allowing intermittent or partial views;
- Dense/Full Screening – vegetation, topography and built structure which are dense enough to block views (e.g. coniferous forestry).

Visual screening between the Wind Farm Site and the relevant side of the road was recorded. In cases where the road travels directly towards the proposed wind farm or between the three turbine clusters, screening of the lowest classification was recorded (least amount of screening). The RSA surveys were conducted in June and August 2023. Care was taken to ensure that the recording of screening accounted for seasonal variation, particularly the condition of deciduous vegetation (lack of leaves and growth) in winter months. The visual screening data was then mapped and validated against the georeferenced dashcam footage.

1.5 Photomontage Visualisations

Photomontages are visualisations that superimpose an image of a proposed development upon a photograph or series of photographs from a specific location termed 'viewpoint'. They are intended as graphical representations of how a proposed development will appear in the existing landscape and are used as a tool in the LVIA process. A series of photomontages have been prepared as part of this assessment and are presented in a separate volume: EIAR Volume 2: *Photomontage Booklet* (hereafter, *Photomontage Booklet*), submitted as part of this EIAR.

The following two guidance documents are considered the industry benchmark for producing photomontages specifically for wind energy developments and were the standards adhered to during the production of photomontages for the *Photomontage Booklet*:

- LI TGN 06/19 (2019);
- SNH Guidance v.2.2 (2017).

The verified photomontages produced for this EIAR are classified as 'Type 4 Visualisations' in the LI TGN 06/19 (2019), meaning that the visualisations maintain the following qualities. The proposed turbines modelled in the photomontages are proportionately scaled within a topographic model from the specific locations where the photographic imagery is captured, i.e. the 'viewpoints'. The turbines and topographic model are then carefully positioned and scaled within the landscape view presented in each photomontage (to 90° and 53.5° horizontal fields of view, as prescribed by the SNH Guidance v.2.2 (2017) and LI TGN 06/19 (2019). The modelling of turbines in the topographical model (wireline) is generated by software using input co-ordinates of the turbine locations, viewpoint locations and the specific turbine specifications of the turbines presented.

The views presented in the *Photomontage Booklet* include a range of distances and geographic perspectives, and the images used for photomontages represent differing atmospheric conditions. Although it is not reasonable to control the weather, all images were captured when weather was sufficient to enable clear and long-ranging visibility in the direction of the proposed turbines from selected viewpoints.

The proposed turbines appear differently in the landscape depending on factors such as time of day, weather conditions and the location of the observer. The photomontages produced aim to realistically represent the proposed turbines while considering their contrast against the backdrop of the sky and landscape. The turbines presented in the photomontages have been coloured in such a way that ensures sufficient contrast for purposes of visual impact assessment, whilst at the same time balancing the intention to present the photomontages as life-like visualisations.

1.5.1 Photomontage Viewpoint Selection

The viewpoints or photo locations were selected following the WEDGs (DoEHLG, 2006), GLVIA3 (LI & IEMA, 2013) and SNH Guidance v.2.2 (2017). The selection of photo locations is designed to provide a representative range of views of the proposed turbines.

Viewpoints, the photo locations from which the photomontages are produced, were chosen after compiling the Visual Baseline (Section 14.5 of Chapter 14). The main purpose of establishing the visual baseline was to identify the key visual receptors that should be considered for viewpoint selection. To this end the following were identified:

- Designated Scenic Routes and Views;
- Viewing Points (e.g. marked on OSi Maps);
- Settlements;
- Recreational Routes:
  - Waymarked Walking Routes;
  - Cycle Routes;
  - Scenic Drives;
  - Tourist Routes;
- Recreational, Cultural Heritage and Tourist Destinations;
- Transport Routes;
- Residential Receptors.

These visual receptors are listed in tables under the sections identified above along with theoretical visibility at those locations indicated by the ZTV maps. After all key visual receptors were identified, a Visual Receptor Preliminary Analysis was carried out to eliminate selected visual receptors from further assessment due to the following reasons:

- Having no or very limited theoretical visibility according to ZTV mapping;
- Designated views and scenic routes, as well as OSi Viewing Points, that are not directed towards the proposed turbines;

- Visual receptors visited on-site where views towards the turbines were either entirely or substantially screened from view, and those for which the distance from the proposed turbines would mitigate any visual effects.

All other key visual receptors were selected as viewpoint locations. Viewpoints were chosen having regard to the SNH Guidance v.2.2 (2017) which advises that a range of views should be shown at a range of distances, aspects and varying elevations, and that images should illustrate instances where the proposed turbines will be completely visible as well as partially visible. Consideration was also given to ensure that photomontages captured other wind farm developments in the LVIA Study Area in order to assess cumulative landscape and visual effects.

1.5.2 Limitations of Photomontage Visualisation

Photographs, and therefore photomontages, are subject to a range of limitations, as stated in the SNH Guidance v.2 (2014):

- Visualisations provide a tool for assessment that can be compared with an actual view in the field; they should never be considered as a substitute to visiting a viewpoint in the field;
- Neither photographs nor visualisations can replicate a view as seen in reality by the human eye;
- Visualisations are only as accurate as the data used to construct them;
- Visualisations can only represent the view from a single location at a particular time and in particular weather conditions;
- Static visualisations cannot convey the effect of turbine blade movement.

Although the scale, siting and geometry of photomontages are based on technical data, the other qualities of the image are open to judgement. The guidance also notes that interpretation of visualisations must be taken into account as well as additional information including variable lighting, the movement of turbine blades, seasonal differences and the movement of the viewer through the landscape. However, accepting these limitations, the SNH Guidance v.2 (2014) and v.2.2 (2017) state that photomontages are useful tools in the visual impact assessment of wind turbines.

Furthermore, with regard to the representation of cumulative visual effects, the photomontages were produced to also show existing, permitted and proposed turbines. The representation of existing turbines relies on the existing turbines as seen within the photographic imagery captured on-site, while permitted and proposed turbines are images of turbines that have been modelled and rendered into the image. As such, there can be a discrepancy in the lighting and sharpness between these two different representations.

Photomontages ('Type 4 Visualisations' of Development Proposals according to the LI TGN 06/19, 2019) are 2D representations of 3D views and thus cannot convey the actual perspective or depth of view when seeing the objects with the naked eye. One of the ways in which this limitation affects the assessment of cumulative visual effects is where turbines have been proposed to be cited in front or behind existing or permitted turbines. In the field, this physical separation may be obvious, while in the photomontage, the turbines may appear as one collective wind farm.

1.5.3 Photomontage Presentation

The photomontage visuals contained in the *Photomontage Booklet* are devised to be viewed at arm's length. The existing views, photomontages and wireline views are panoramas presented on banner sheets of paper of size 'A1'. More specifically, the horizontal field of view presented in the visualisations are spread across 84.1cm, the equivalent of the maximum horizontal field of an A1 sheet of paper. In line with best practice guidance for the production of photomontages for wind energy development

(SNH Guidance v.2.2, 2017 and LI TGN 06/19, 2019) the A1 banners present the proposed turbines enlarged to fit within a 53.5° horizontal field of view.

The viewpoints presented in the *Photomontage Booklet* show several views from each viewpoint location. These include:

1. **Overview Sheet –** Viewpoint details include location description, grid reference, distance from nearest turbine and technical data in relation to photography. Three maps at various scales show the viewpoint location. A 120-degree existing-view image without any proposed and permitted turbine is called the 'Key Image'. Existing turbines visible in the landscape may appear within this image, and the horizontal extent of the 90-degree and 53.5-degree image to be presented in subsequent images is also framed;
2. **Existing View at 90° –** A 90-degree visual baseline image without any proposed or permitted turbines and a matching wireline image of the same view which includes any existing turbines visible in the landscape. If turbines are already existing in the landscape, these will be visible on the photograph and are rendered in the wireline view;
3. **Proposed Knockshanvo Photomontage at 90°** – A 90-degree photomontage image with the proposed wind farm and all other existing wind farms within the view. A matching wireline image shows the turbines of all proposed Knockshanvo turbines and existing wind farms individually coloured and labelled for ease of identification;
4. **Proposed Knockshanvo Photomontage at 53.5°** –A photomontage image of the proposed Knockshanvo turbines and any existing turbines in a 53.5-degree horizontal field of view;
5. **Proposed Knockshanvo Wireline at 53.5°** - A wireline image of the proposed Knockshanvo turbines and any existing turbines in a 53.5-degree horizontal field of view. The Proposed Development turbines and any other existing wind farms are individually labelled for ease of identification;
6. **Proposed Photomontage with Cumulative at 90°** – A 90-degree photomontage image with the proposed wind farm and all other existing, permitted and proposed wind farms within the view. A matching wireline image shows the turbines of all proposed, permitted and existing wind farms individually coloured and labelled for ease of identification;
7. **Proposed Photomontage with Cumulative at 53.5°** –A photomontage image of the proposed turbines and any existing, permitted and proposed turbines in a 53.5-degree horizontal field of view;
8. **Proposed Wireline with Cumulative at 53.5°** - A wireline image of the proposed turbines and any existing and permitted turbines in a 53.5-degree horizontal field of view. The Proposed Development turbines and any other existing, permitted and proposed wind farms are individually labelled for ease of identification.

1.5.4 Presentation of Wireline Views

The SNH Guidance v.2.2 (2017) suggests that all turbine blades should be presented in the same orientation when presented within a wireline view with one blade completely vertical. The rationale for this method proposes that the singular vertical blade will show the greatest turbine tip height for all turbines. Using this method, the orientation of the turbine blades does not match what is presented in the corresponding photomontage. Conversely, guidance in the WEDGS (DoEHLG, 2006, p. 97) and Draft revised WEDGs (DoEHLG, 2006, p. 97) state the following in relation to wirelines (they refer to wireframes – equivalent of a wireline):

> *"Related to the above, the photomontage should be accompanied by a wire frame computer generated perspective view of the landscape, or shaded-relief model, illustrating all theoretically visible turbines. These wire frame diagrams may also be used to indicate turbines that are not visible in whole or in part due to*

screening, simply to prove that point. ***Wire frames and photomontages should be at the same scale and presented in unison so that direct comparison/correlation can be made"*.**

This LVIA has been cognisant of the guidance from both sources (WEDGS (DoEHLG, 2006) and Draft revised WEDGs (DoHPLG, 2019); and SNH v.2.2 (2017). However, it is considered that that the guidance in the WEDGs and Draft revised WEDGs is a preferable option. Wireline views showing the turbines in irregular orientation with each other, but in unison with the corresponding photomontage is an optimal method of presentation for the following reasons:

- Enables direct correlation and comparison with the photomontages;
- If all turbines are oriented the same way this is an unnatural and unrealistic representation, there is no scenario where this would occur in reality;
- Although the single vertical blade shows greatest tip height, it doesn't necessarily show the greatest visual exposure of turbines in the landscape, as there could potentially be two blades (instead of one) seen above a feature of the landform when using a non-regular orientation;
- Non-regular orientations are preferable and optimal for demonstrating turbine range with comparative wireline views when they are required – See Section 1.5.6 below.

For the reasons outlined above, the turbines in the wireline views within the *Photomontage Booklet* are presented in unison with the orientation of the turbines in the photomontages, in line with the WEDGs and Draft Revised WEDGs guidance.

1.5.5 Photowires (Early-Stage Draft Photomontages): Alternative Viewpoints

All imagery captured from viewpoints for the LVIA (a total of 44 No. VPs) were progressed to a draft stage called - 'Photowires'. Photowires are early-stage photomontage visualisations (classified as 'Type 3 Visualisations' in the LI TGN 06/19, 2019). Photowires are a combination of photographic images and a 'wireline'. A wireline is the model of the proposed turbines accurately scaled and positioned within a digital elevation model (topography) as seen from a viewpoint. Photowires are produced by positioning and overlaying the wireline on top of the stitched photographic imagery captured from a viewpoint location.

16 No. viewpoints were selected for inclusion in the *Photomontage Booklet*. Imagery captured from the other 28 viewpoints for this LVIA are presented as Photowires in Appendix 14-5. Photowires are used as tools both to pick the best viewpoints for the *Photomontage Booklet*, and then also to demonstrate as part of discussion in the LVIA chapter the locations where very limited visibility might occur. A photowire might not have been selected for the *Photomontage Booklet* as another nearby viewpoint was felt to be a better representation of views from receptors in a particular area or represented a greater number of sensitive receptors.

The photowire imagery in Appendix 14-5 are draft, therefore:

- No rendering is applied to the imagery to make the turbines photorealistic – hence the orange colour;
- Photowires do not include cumulative – modelling and rendering of other permitted and proposed wind farms;
- The wireline element of the Photowire only accounts for screening from topography in the elevation model;
- Th wireline overlaid the photograph is shown in front of above ground elements of the landscape e.g. vegetation screening and the built environment. Therefore, the photowire shows where the turbines are located relative to the viewpoint but are seen

in front of above ground features which would visually screen them in reality on the ground.

The 28 No. photowires are presented within Appendix 14-5 and are useful visual aids for the discussion of visual effects included in Section 14.7 of Chapter 14: *Likely Significant Landscape and Visual Effects*. The location of photowire viewpoints in Appendix 14-5 are marked as orange icons in Figure 14-23 and Figure 14-24, labelled as 'PW' (e.g., PW-A to PW-R).

It should be emphasised that photowires are useful visual aids to inform the impact assessment; however, they do not include modelling of other existing, permitted, or proposed wind energy developments and are therefore not used for the assessment of cumulative effects.

1.5.6 Turbine Range Assessment: Comparative Wirelines

Additional photomontage visualisations are included in the photomontage booklet for Viewpoint 13, 14, 15 and 16. These have been produced for the purpose of assessing the potential effects arising as a result of the proposed turbine envelope range. For each viewpoint (VP13, VP14, VP15 and VP16), the proposed turbines are modelled using two other turbine envelope configurations comprising slightly different sized components than the specifications modelled for all other visualisations presented in the rest of the photomontage booklet (and photowires in Appendix 14-5). Two of the selected viewpoints are located in very close proximity to the proposed turbines where the turbine range is most likely to be perceptible - VP13 (800m) and VP16 (2.2km). VP14 and VP15 are slightly more distant in order to show a range of views. Section 14.1.2.3 in Chapter 14 details the differing turbine models assessed in Chapter 14 and which are included in the photomontage booklet for VP13, 14, 15 and 16.

Considering the very minimal difference in scale of the range for the Proposed, and the scale of the proposed turbines when viewed within the landscape, it is unlikely that differences in the range are perceptible when comparing one photomontage with another. Comparative wireline views are provided in order to provide a visual aid for the reader and assessor to truly understand the visual difference between the differing turbine models presented as part of the range. The comparative wireline is presented at 53.5° after each photomontage and shows the wireline of the alternative turbine envelope ('Intermediate Hub Height and Maximum Rotor Diameter', or, 'Minimum Hub Height and Intermediate Rotor Diameter' overlaid the 'Maximum Tip Height, Maximum Hub Height, Minimum Rotor Diameter' wireline (used for all Viewpoints) to facilitate a clear visual comparison between the turbine ranges. The three turbine envelope specifications as defined in Chapter 1 of the EIAR and assessed in Chapter 14 and their respective wireline colours for VP14 and VP15 are as follows:

- Green Wireline – 'Maximum Tip Height, Maximum Hub Height, Minimum Rotor Diameter': Presented for all Viewpoints in the photomontage booklet:
    - Maximum Tip Height – 185 metres;
    - Maximum Hub Height – 110.5 metres;
    - Minimum Rotor Diameter – 149 metres.
- Red Wireline – 'Maximum Tip Height, Intermediate Hub Height, Maximum Rotor Diameter Maximum': Presented for VP13, 14 15 and 16 in the photomontage booklet:
    - Maximum Tip Height – 185 metres;
    - Intermediate Hub Height – 103.5 metres;
    - Maximum Rotor Diameter – 163 metres.
- Brown/Yellow Wireline - 'Minimum Tip Height, Minimum Hub Height, Intermediate Rotor Diameter': Presented for VP13, 14 15 and 16 in the photomontage booklet:
    - Minimum Tip Height – 179.5 metres;
    - Minimum Hub Height – 102.5 metres;
    - Intermediate Rotor Diameter – 154 metres.

1.6 Landscape and Visual Impact Assessment Methodology

In line with the GLVIA3 (LI & IEMA, 2013) guidance, the potential impacts on landscape and visual receptors are assessed separately. This section details the methods used to determine the likely significant landscape effects of the Proposed Development on landscape receptors and then the likely significant visual effects of the Proposed Development on visual receptors.

1.6.1 Assessing Landscape Effects

The methodology for assessing landscape effects uses qualitative methods in order to arrive at an overall impact assessment, based on the 'Landscape and Landscape Assessment' (DoEHLG, 2000) guidance as well as the GLVIA3 (LI & IEMA, 2013) and WEDGs (DoEHLG, 2006).

Here, 'landscape effects' are described as changes which affect the landscape as a resource. This includes how the Proposed Development will affect the physical elements that make up the landscape, as well as its aesthetic and perceptual aspects and its landscape character. Landscape effects also relate to changes in the structure of the landscape. Under the GLVIA3 (LI & IEMA, 2013), the assessment of likely significant effects on landscape receptors includes a judgement on both the 'sensitivity' of the receptor as well as the 'magnitude of change'.

Identification of Landscape Receptors

Section 14.4: *Landscape Baseline* of Chapter 14 reports relevant policy pertinent to the LVIA along with a description of the receiving landscape of the Site and its wider setting. As well as establishing the key sensitivities and key characteristics of the baseline landscape, this part of the LVIA focusses on identifying the key sensitive landscape receptors assessed later in Chapter 14. The following landscape receptors were identified in the landscape baseline:

- Landscape Designations based on:
  - Clare County Development Plan 2023–2029 (CCDP);
  - Tipperary County Development Plan 2022–2028 (TCDP);
  - Limerick Development Plan 2022–2028 (LDP);
- Landscape Character of the Site and its immediate environment based on:
  - Site surveys undertaken throughout 2022 and 2023;
  - Landscape Character Types identified in Section 6.9 '*Landscape Character Types as a Basis for Guidelines*' of the WEDGs (DoEHLG, 2006) and the Draft Revised WEDGs (2019);
- Landscape Character of the LVIA Study Area based on:
  - Clare County Landscape Character Assessment (hereafter, LCACC) (ERM Ireland Ltd., 2004);
  - Chapter 6 '*Environmental, Heritage, Landscape and Green Infrastructure*' of the LDP;
  - Volume 3 '*Tipperary Landscape Character Assessment and Schedule of Views and Routes*' of the TCDP;
  - Site surveys undertaken throughout 2022 and 2023.

After all landscape receptors were identified, the Landscape Receptor Preliminary Analysis was carried out to eliminate the landscape receptors where no or very limited theoretical visibility was indicated by ZTV mapping. All other landscape receptors were selected for further assessment of landscape effects.

The assessment of landscape effects considers landscape sensitivity balanced with the magnitude of the effect to determine the significance of effects. Mitigating factors are then taken into consideration to arrive at a residual landscape effect. Residual landscape effects are graded upon an 'impact assessment classification of significance' scale, as defined by the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' of the Environmental Protection Agency of Ireland (EPA, 2022), included in Table 1-5.

1.6.1.2 Landscape Sensitivity: Value & Susceptibility to Change

Landscape Sensitivity is described in the GLVIA3 (LI & IEMA, 2013) as a combination of the landscape's 'susceptibility to change' as well as the 'value' attached to the landscape.

Landscape susceptibility to change is described as the ability of the landscape receptor (either the overall character, quality of the landscape or a particular landscape feature) to accommodate the proposed turbines without undue consequences for the maintenance of the baseline (existing) landscape and/or the aims of landscape planning policies and strategies. Table 1-1 below presents differing description criteria for susceptibility to change.

Table 1-1 Description Criteria for Landscape Susceptibility to Change

Susceptibility of Landscape Receptor to Change	Description and Example Criteria
'High'	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a high susceptibility to change considering its inherent characteristics and where the landscape receptor has a low ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, and where such change is not in compliance with planning policies/strategies.
'Medium'	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a medium susceptibility to change considering its inherent characteristics and where the landscape receptor has a moderate ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, with consideration given to planning policies/strategies.
'Low'	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a low susceptibility to change considering its inherent characteristics and where the landscape receptor has a Strong ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, and where such change may be in compliance with planning policies/strategies.

Landscape value is a combination of values which are assessed in the Landscape Baseline, combining any formal landscape designations, and, where there are no designations, judgements based on individual elements of the landscape receptor, for example particular landscape features, notable aesthetic, perceptual or experiential qualities, and combination of these contributors. Notably, the GLVIA3 states that '*there should not be over-reliance on designations as the sole indicator of value*', and the assessments of landscape value undertaken in Chapter 14 included consideration of various elements that contribute to landscape value of specific receptors, using best practice standards and professional judgement. Where this occurred, landscape value was judged based on clearly stated criteria. Table 1-2 below presents differing description criteria for landscape value.

Table 1-2 Description Criteria for Landscape Value

Value Attached to Landscape Elements	Description and Example Criteria
'High'	Landscape receptors forming part of designations (e.g. areas of amenity, scenic routes/views) in the development plan, or at a national or international level, or landscape receptors not designated but where the receptor is judged to be of equivalent value using clearly stated criteria including wildness, naturalness, very strong cultural heritage or natural heritage associations and/or very high recreational value.
'Medium'	Landscape receptors where value is not formally designated but are of value as good examples of high quality, intact landscapes or landscape features and are deemed to be of relatively high scenic quality. Landscapes or landscape receptors that contain some rare elements, include areas or features which are wild or have a sense of naturalness, have strong cultural associations or which have recreational value.
'Low'	Landscapes that are not formally designated and considered as modified. Areas which do not have particularly scenic qualities, do not include rare elements or landscape features and do not have strongly evident cultural or heritage associations.

Section 14.4: *Landscape Baseline* of Chapter 14 describes and determines the 'landscape value' of the Site and its wider landscape setting in order to establish the capacity of the immediate landscape in which the proposed turbines will be built, as is prescribed by best practice guidance: *'as part of the baseline description the value of the potentially affected landscape should be established'* (GLVIA3, 2013, p.80). Comprehension of landscape value and its susceptibility to change enables determination of the sensitivity of the landscape at a micro-level.

In combining the assessment of the landscape value of a landscape receptor with the susceptibility to change of that receptor, it is noted here that a judgement of 'High' landscape value does not necessarily imply that this receptor has a 'High' susceptibility to change, and it is emphasised that this relationship can be complex. The combination of these to judgements, which determines the overall 'landscape sensitivity', is undertaken using professional judgement with the rationale for judgements clearly explained in the description of the assessment of effects or in the baseline study. On this basis, landscape receptors have been assigned one of the four following sensitivity ratings:

- Very High;
- High;
- Medium;
- Low.

No table is provided for the description of these different classifications of landscape sensitivity as the relationship between susceptibility to change and landscape value is inherently complex and not suitable to concise definitions. It is noted that sensitivity classifications are generally guided by local and national planning policy, particularly for LCAs and county policy in relation to these, as well as county wind energy policy. However, it is noted that in cases where local variations in landscape receptors merit a smaller-scale-focused assessment that may differ from the policy, this was undertaken using professional judgement and is clearly explained in the main body of the report.

Determination of Sensitivity of Designated Landscape Character Areas (LCAs)

Designated LCAs are comprehensively assessed in Appendix 14-2: *LCA Assessment Tables*. Ireland does not currently have a standardised nationwide Landscape Character Assessment. The LCAs scoped in for assessment in Chapter 14 are located in differing counties and each county uses a differing method, scale, hierarchy and naming convention to represent sensitivity of its individual LCAs. For the purposes of this LVIA and to provide consistency across the assessment of LCAs (Appendix 14-2), a rating of sensitivity was assigned to each LCA within the following classification scale:

- Very High;
- High;
- Medium;
- Low.

The sensitivity classification assigned to each LCA takes into account key characteristic and sensitivity descriptions (and where applicable, the sensitivity ratings) in the respective county development plans, as well as any relevant wind energy capacity designations and policy. A rationale for the sensitivity classification of each LCA is provided in the assessment tables included in Appendix 14-2. LCAs at the 'Very High' end of the scale would include very sensitive landscapes of national importance, whilst LCAs at the 'Low' end of the scale might be locally important landscapes, but those which do not comprise receptors or characteristics of unique or national value.

1.6.1.3 Magnitude of Landscape Change

The 'magnitude of change' in each landscape character area is a combination of the visual presence—that is, the size and scale—of the change, the extent of the area to be affected and the duration and reversibility of the effect. All LVIA guidance documents generally agree that windfarm developments themselves are considered 'reversable'. The magnitude of change for each landscape character area was assessed using the definitions outlined in Table 1-3 below.

Table 1-3 Magnitude of Landscape Change Assessment Criteria

Magnitude of Change	Description
'Substantial'	Where a landscape will experience the loss of key landscape features or the introduction of uncharacteristic additions over a large area. The changes to the landscape are prominent and large in scale. The level of change has an effect on the overall landscape character. The effects are likely long term and may be irreversible.
'Moderate'	A more limited loss of or change to landscape features over a medium extent which will result in some change to landscape features and aesthetics. Could include the addition of some new uncharacteristic features or elements that would lead to the potential for change in landscape character in a localised area or part of a landscape character area. Would include moderate effects on the overall landscape character that do not affect key characteristics. The effects could be long- to medium-term and/or partially reversible.
'Slight'	The loss of or change to landscape features of limited extent, or changes to landscape character in smaller areas. Changes would not affect key characteristics. The addition of any new features or elements to the landscape would only result in low-level changes to the overall aesthetics of the landscapes. Changes to the landscape are more evident at a local level and not over a wide geographical area. The effects could potentially be medium- to short-term and/or reversible.
'Negligible'	A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short-term and/or reversible.

1.6.1.4 Landscape Effects Assessment Matrix

Table 1-5 below shows how the overall 'significance' of landscape effects is determined, arrived at by combining the landscape receptor 'sensitivity' and the 'magnitude of change' classifications. Landscape receptor sensitivity is shown in the first, left-hand column and magnitude of landscape change is shown in the first row at the top. This matrix is used as an indicative tool to assist in determining the significance of landscape effects. In different circumstances, differing levels of mitigating factors may ultimately result in a different determination of the level of significance. The significance of a landscape effect is based on the balance between the sensitivity of the receptor and the magnitude of effect. The significance of the landscape effect is arrived at using a combination of the matrix (Table 1-4) and the EPA (2022) classifications shown in Table 1-5 below.

Table 1-4 Landscape effects significance assessment matrix

	Substantial	Moderate	Slight	Negligible
Very High	Major	Major/Moderate	Moderate	Moderate/Minor
High	Major/Moderate	Moderate	Moderate/Minor	Minor
Medium	Moderate	Moderate/Minor	Minor	Minor/Negligible
Low	Moderate/Minor	Minor	Minor/Negligible	Negligible

The determination of significance uses a seven-point scale, ranging from 'Major' to 'Negligible'. This seven-point scale is translated to the EPA (2022) impact assessment classifications of 'significance', as outlined in Table 1-5 below.

Table 1-5 EPA Impact Assessment Significance Classification for Landscape Effects

Matrix Classification Significance	EPA Significance Classification	EPA (2022) Definition of Significance
Major	Profound	An effect which obliterates sensitive characteristics.
Major/Moderate	Very significant	An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.
Moderate	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate/Minor	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends.
Minor	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Minor/Negligible	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Negligible	Imperceptible	An effect capable of measurement but without significant consequences.

1.6.2 Assessing Visual Effects

Visual effects relate to changes in views and visual amenity of the surroundings of individuals or groups of people. These may result from changes in content and character of views as a result in changes to the landscape. The assessment of visual effects is based on views shown in photomontages and the potential visibility indicated by ZTV mapping as well as actual visibility on the ground.

It should be noted that in assessing visual effects, there are different types of effects:

- **Visual obstruction:** Occurs when there is an impact on a view which blocks the view;
- **Visual intrusion:** Occurs when there is an impact on a view, but which does not block the view.

Due to the nature of the development and the appearance of wind turbines, 'visual intrusion' occurs more frequently than 'obstruction'. The significance of the effect on visual receptors is a combination of the 'sensitivity' of the receptor as well as the 'magnitude of the change'.

1.6.2.1 Visual Receptor Sensitivity

The 'sensitivity' of a visual receptor depends on the occupation or activity of the people involved, as well the extent to which the attention is focused on views and visual amenity, according to the GLVIA3

(LI & IEMA, 2013). Visual receptor sensitivity is assessed as either being 'Very High', 'High', 'Medium', or 'Low', based on the definition of descriptions and examples set out in Table 1-6 below.

Table 1-6 Visual Receptor Sensitivity Assessment Criteria

Sensitivity of Visual Receptor(s)	Description
'Very High'	Included in this category are viewers primarily focused on views from this particular location, such as visitors to popular destinations identified for their outstanding views, and residents in close proximity who have primary views of a scenic quality in the direction of the proposed turbines.
'High'	Includes viewers at designated views or landscapes, such as residents in close proximity to the viewpoint who have primary views in the direction of the proposed turbines that may not necessarily be of a particularly scenic quality, viewers at well-known heritage or popular tourist or recreational areas and viewers along scenic or tourist routes.
'Medium'	Includes viewers who may have some susceptibility to a change in view, such as residents in medium proximity but who do not have views focused in the direction of the proposed turbines or whose views are not of a particularly scenic quality, those from views which are not designated but may have local recreational uses or those travelling along routes or at views which are considered moderately scenic.
'Low'	Includes viewers engaged in activities where the focus is not on the landscape or view. This includes those travelling along a busy route, viewers at work or engaged in sport not related to views or the experience of the landscape.

Photomontage viewpoints are selected as specific locations representative of key visual receptors. The viewpoint assessment tables in Appendix 14-3: *Photomontage Assessment Tables* consider all receptors represented in the determination of the visual receptor sensitivity rating for each viewpoint. This determination takes a balanced approach considering the types, sensitivities, and quantities of visual receptors represented. The sensitivity rating given to each photomontage viewpoint in Appendix 14-3 considers both the susceptibility of the visual receptors represented as well as the value attached to the available views at that particular location.

1.6.2.2 Magnitude of Visual Change

The magnitude of the visual change resulting at each viewpoint is a combination of scale of the change, the extent of the area to be affected and the duration and reversibility of the effect, determined by reviewing the photomontage and wireframe images for each viewpoint. The magnitude of change is determined in accordance with the definitions and descriptions included in Table 1-7 below.

Table 1-7 Magnitude of Visual Change Assessment Criteria

Magnitude of Change	Description
'Substantial'	Substantial change, where the proposal would result in large-scale, prominent or very prominent change, leading to substantial obstruction of an existing view or complete change in character and composition of the baseline through removal of key elements or the addition of uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed turbines are fully or almost fully visible over a wide extent, at close proximity to the viewer. This change could be long-term or of a long duration.
'Moderate'	The change in the view may involve partial obstruction of existing view or partial change in character and composition of the baseline through the introduction of new elements or removal of existing elements. Likely to occur at locations where the proposed turbines are partially visible over a moderate or medium extent, and which are not in close proximity to the proposed development. Change may be readily noticeable but not substantially different in scale and/or character from the surroundings and wider setting.
'Slight'	The proposal would be partially visible or visible at sufficient distance to be perceptible and result in a low level of change in the view and its composition and a low degree of contrast. The character of the view may be altered but will remain similar to the baseline existing situation. This change could be short-term or of a short duration.
'Negligible'	Any change would only be barely distinguishable from the status quo 'do-nothing scenario' in the surroundings. The composition and character of the view would be substantially unaltered, approximating to little or no change.

1.6.2.3 Visual Effects Assessment Matrix

Table 1-8 below shows how the overall 'significance' of visual effects is determined, arrived at by combining the visual receptor 'sensitivity' and the 'magnitude of change' classifications. Visual receptor sensitivity is shown in the first, left-hand column and magnitude of visual change is shown in the first row at the top of the table. This table is used as an indicative tool to assist in determining the significance of visual effects. In different circumstances differing levels of mitigating factors may ultimately result in a different determination of the level of significance (see below). The significance of a visual effect is based on a balance between the sensitivity of the receptor and the magnitude of effect. The significance of the visual effect is arrived at using a combination of the matrix and the EPA (2022) 'Visual Effect Significance Graph' shown in Figure 1-2 below, in the next section.

Table 1-8 Visual Effects Significance Assessment Matrix

	Substantial	Moderate	Slight	Negligible
Very High	Major	Major/Moderate	Moderate	Moderate/Minor
High	Major/Moderate	Moderate	Moderate/Minor	Minor
Medium	Moderate	Moderate/Minor	Minor	Minor/Negligible
Low	Moderate/Minor	Minor	Minor/Negligible	Negligible

The determination of significance uses a seven-point scale, ranging from 'Major' to 'Negligible'. This seven-point scale is translated to the EPA (2022) impact assessment classifications of significance, as outlined in Table 1-9 below.

Table 1-9 EPA Impact Assessment Significance Classification for Visual Effects

Matrix Classification Significance	EPA Significance Classification	EPA (2022) Definition of Significance
Major	**Profound**	An effect which obliterates sensitive characteristics.
Major/Moderate	**Very significant**	An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.
Moderate	**Significant**	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate/Minor	**Moderate**	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends.
Minor	**Slight**	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Minor/Negligible	**Not Significant**	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Negligible	**Imperceptible**	An effect capable of measurement but without significant consequences.

1.6.2.4 Residual Visual Effect

After determining the significance of the visual effect using the above visual effects assessment matrix, the significance graph below (Figure 1-2) is also utilized. Finally, mitigating factors are taken into consideration to arrive at the final 'residual effect'. In some cases, the mitigating factors merit a reduction in the overall significance classification.

1.6.3 Determination of Residual Landscape and Visual Effects

The matrices and tables above are excellent tools to aid professional judgement in the determination of the significance of an effect. They are useful in that they provide a transparent, objective structure to the process of balancing sensitivity and magnitude of change. In the context of the determination of visual effects, the formulaic process created by the use of the matrix above provides an indicative initial assessment, which can be seen clearly in the photomontage assessment tables in Appendix 14-3.

However, over-reliance on the formulaic process, which is heavily influenced by the definitions of sensitivity and magnitude of change contained in Table 1-6 and Table 1-7 above, can lead to a failure to properly account for the full range of circumstances and factors at play in the determination of the significance of a visual effect (see Sub-Section 3.35 in '*Step 3: Judging the Overall Significance of the*

Effects' of the GLVIA3, LI & IEMA, 2013, p.41). A wide range of factors, mitigating or otherwise, can factor into such a determination, and it is not possible to capture the complexity involved in balancing all considerations within the necessarily limited definitions contained in these tables. This then naturally results in circumstances whereby the process of the determination of significance using the formulaic method involved with the matrix shown above in

Table 1-8 can result in misrepresentations of the overall significance of visual effects. It is only with professional judgement, and narrative descriptions of effect, that such complexity can be integrated into the determination of significance. Therefore, the formulaic methods based upon the matrix presented above are combined with professional judgement in the determination of significance. This is illustrated below in Figure 1-2, where the professional judgement of the competent expert is used to properly determine the significance of an effect taking all considerations into account.

A focus is placed upon the narrative description of effects (see Sub-Section 3.36 of the GLVIA3, LI & IEMA, 2013, p.41) given the naturally subjective nature of the significance determination process, particularly in relation to visual effects, ensuring that the rationale for the overall judgement is clear (see Sub-Sections 3.28 and 3.29 in '*Step 2: Combining the Judgments*', GLVIA3, 2013, p.40). The comprehensive assessment of photomontages included in Appendix 14-3 aims to provide a transparent and robust determination of residual visual effects utilising the graph in Figure 1-2 below in combination with a clear and logical narrative.

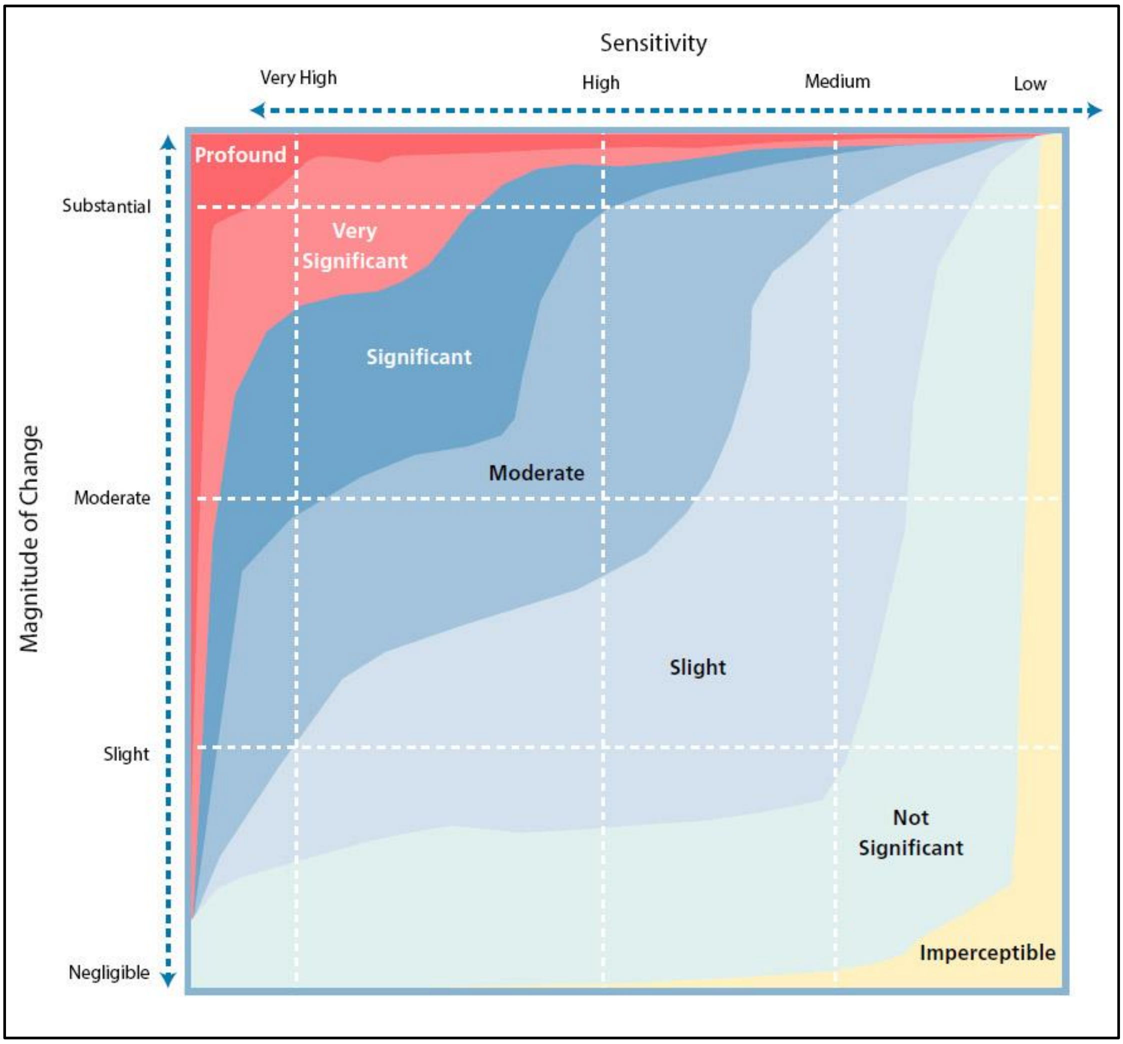

Figure 1-2 Visual Effect Significance Graph (adapted from EPA, 2022)

1.6.4 Assessing Cumulative Landscape and Visual Effects

1.6.4.1 Cumulative Landscape Effects

The Nature Scot 2021 publication 'Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments' identifies two principal areas of cumulative landscape effects, on the physical fabric of the landscape and on the landscape character, which state:

- *'Cumulative effects on the **physical fabric** of the landscape arise when two or more developments affect landscape components such as woodland, dykes, rural roads or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant; for example, where the last remnants of former shelterbelts are completely removed by two or more developments;*
- *Cumulative effects on **landscape character** arise when two or more developments introduce new features into the landscape. In this way, they can change the landscape character to such an extent that they create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character'.*

Potential changes to the physical fabric outlined above are predominantly restricted to the Wind Farm Site and the LCAs in which the Site is located. Therefore, the landscape receptors are to be assessed for cumulative landscape effects on the physical fabric of the landscape arising from the proposed turbines.

Cumulative effects on the landscape character were assessed in the identified LCAs with theoretical visibility of the proposed turbines, with particular emphasis on the LCA in which the proposed turbines will be located.

Cumulative landscape effects are included in Appendix 14-2: *LCA Assessment Tables* and summarised in Section 14.7 '*Likely Significant Landscape and Visual Effects*' of Chapter 14 of the EIAR.

1.6.4.2 Cumulative Visual Effects

For this assessment, the Nature Scot (2021) definition of cumulative effects as 'additional changes caused by a proposed development in conjunction with other similar developments', is used; however, this assessment also considers other types of developments. The definition in the WEDGs (DoEHLG, 2006) defines cumulative impacts in terms of wind farms, as the perceived effect on the landscape of two or more wind energy developments visible from any one place.

The GLVIA3 (LI & IEMA, 2013) and Nature Scot (2021) guidance also note that cumulative visual effects can be experienced **in combination**, where two or more developments are visible from one viewpoint, either **simultaneously** or **in succession**, and these are considered in the assessment of visual effects from photomontage viewpoints in Appendix 14-3.

Another type of cumulative visual effect includes where two or more developments are seen **sequentially**, where a viewer moves to another viewpoint or along a transport or recreational route and sees the same or different developments. The photomontage viewpoints illustrate the combined visibility and analysis of the photomontages, route screening, site visits and field work undertaken, thereby allowing sequential visibility to be assessed.

The guidance on cumulative effects given in the WEDGs (DoEHLG, 2006) relating to the Wind Farm Site is as follows:

- *'Similarity in the siting and design approach is preferred where a number of wind energy developments are located in the same landscape character area, particularly within the same viewshed. However, an alternative approach where a particular aesthetic effect is sought may be acceptable;*
- *Different wind energy developments can appear as a single collective unit if located near each other;*
- *It is preferable to avoid locating turbines where they can be seen one behind another, when viewed from highly sensitive key viewpoints (for example, viewing points along walking or scenic routes, or from designated views or prospects), as this results in visual stacking and, thus, confusion. This may not be critical, however, where the wind energy development to the rear is in the distant background;*
- *Wind energy developments within relatively close proximity to one another, while in different landscape character contexts, may be so close as to be within the same visual unit and, therefore, should involve the same siting and design approach'.*

The SNH Guidance v.3a (2017) states that *'introducing turbines that are not similar in form, design, colour and scale may increase visual complexity and clutter'*. Therefore, the cumulative assessment concentrates on the following issues:

- Whether the proposed turbines increase the spatial extent of turbines in the view;
- Whether the different wind energy developments can appear as a single collective unit or there is separation;
- Whether 'visual stacking' occurs; and
- Whether the contrast of different size and design between different wind developments creates visual clutter.

As cumulative visual effects depend on the aspect from which the turbines will be seen, various viewpoints were selected to give a thorough overview of the how the proposed turbines will appear in conjunction to turbines already existing, permitted or proposed.

1.6.4.3 Reporting of Cumulative Effects in the LVIA: Chapter 14 and Impact Assessment Appendices

Discussion and assessment of cumulative landscape and visual effects are reported in the following locations of Chapter 14 in this EIAR:

- Section 14.6 of Chapter 14 – *Cumulative Context*:
  - This section of Chapter 14 provides an overview of the other developments likely to contribute to cumulative effects in combination with the Proposed Development in the LVIA Study Area and the various cumulative scenarios which are likely to occur in existing and future receiving environments.
  - This Section provides an overview of the assessment methodology and cumulative ZTV mapping;
- Appendix 14-2: *LCA Assessment Tables:*
  - This Appendices assesses the likely significant effects of the Proposed Development on designated LCAs, with a specific assessment table for each designated LCA scoped in for assessment.
  - One row in each table is dedicated to the likely cumulative landscape effects arising in each LCA in combination with the Proposed Development and is factored into the overall rating of significance of impacts on each LCA.
- Appendix 14-3: *Photomontage Assessment Tables:*
  - This Appendices assesses the likely significant visual effects of the Proposed Development from photomontage viewpoints, with a specific assessment table for each viewpoint.

  - Two rows in each assessment table ('Cumulative Context', and 'Cumulative Effects') are dedicated to the discussion and assessment of likely cumulative visual effects as seen in the photomontages from each viewpoint.
  - Potential for cumulative visual effects are factored into the 'Magnitude of Change' determination for each viewpoint which has the potential to alter the outcome of the visual impact assessment and the determination of likely significant effects for each viewpoint (See methodology criteria previously in Section 1.6.2 and 1.6.3).
- Section 14.7.3.2 of Chapter 14 – Cumulative Landscape Effects:
  - This section includes discussion of interactions of the Proposed Development with other wind energy developments within the landscape including an overview of relevant of the cumulative assessments on LCAs reported in Appendix 14-2.
- Section 14.7.3.4 of Chapter 14 – Cumulative Visual Effects
  - This section includes discussion of visual interactions of the Proposed Development with other wind energy developments including an overview of relevant of the cumulative assessments as shown in the photomontages reported in Appendix 14-3

The effects reported both in Chapter 14 and within the assessment appendices (Appendix 14-2: LCA Assessment Tables; Appendix 14-3: Photomontage Assessment Tables) uses appropriate and logical narrative to discuss cumulative interactions between the Proposed Development and all other wind energy developments irrespective of which category (Existing; Permitted; Proposed) they occur in. Discussion of cumulative interactions on specific landscape and visual receptors is relative to the effects on that receptor and proportionate to the likelihood of significant landscape and visual effects occurring. Discussion and the impact assessments also considers the probability of such cumulative effects arising in mind of the category of the other developments with which the Proposed Development interacts, meaning 'Existing', 'Permitted' or 'Proposed'.

Assessment of cumulative landscape and visual effects need to be proportional. The focus is always on the extent to which the Proposed Development will contribute towards the cumulative effects on the particular receptors under assessment, these contributions are clearly explained in narrative in the cumulative impact assessments included in the Chapter (Sections 14.7.3.2 and 14.7.3.4), as well as the impact assessment Appendices (Appendix 14-2 and Appendix 14-3).