APPENDIX 12-1

LANDSCAPE AND VISUAL IMPACT ASSESSMENT METHODOLOGY

1. LVIA METHODOLOGY

1.1 Scope and Definition of Landscape and Visual Impact (LVIA) Study Area

For the purposes of this EIAR, where the 'proposed development site' or 'the site' is referred to, this relates to the primary study area for the proposed development, as delineated by the green EIAR site boundary on the EIAR figures (maps). The proposed development site is discussed in some detail in terms of its landscape character.

However, the landscape and visual baseline mapping and viewpoint selection are based on wider study areas. The study area has been chosen as 20 kilometres for visual effects and effects on landscape designations. This is referred to as the 'study area' or 'LVIA study area' for which the baseline maps are produced and viewpoint locations selected. The geographical parameters for this LVIA study area was determined by desktop study, survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects and best practice policy guidance or standards (Appendix 3, DoEHLG Wind Energy Development Guidelines' 2006 and GLVIA 2013).

As landscape character is primarily reflected by the elements within a certain area rather than those outside it and due to the nature of landscape character areas covering large areas of land within County Donegal, all landscape character areas or parts of falling within 15 kilometres from the proposed wind turbines are included in landscape character assessment (LCA Study Area). This LCA study area was defined based on the professional judgement of the LVIA team. Furthermore, on the basis of desk studies and survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects, 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 the Zone of Theoretical or ZTV mapping; see Section **Error! Reference source not found.** of this chapter for further details) and/or very distant visibility, and are therefore unlikely to be subject to significant effects.
- Effects on designated landscapes beyond a 20km radius from the proposed development, 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 beyond a 15km radius from the proposed development, where it is judged that potential significant effects on landscape character are unlikely to occur.
- Effects on visual receptors beyond a 20km radius from the proposed development, where it is judged that potential significant effects are unlikely to occur.
- Cumulative effects in relation to single turbines (except where otherwise stated).
- Cumulative visual effects beyond a 20km radius from the proposed development.
- Cumulative effects on landscape character beyond a 15km radius from the proposed development, where it is judged that potential significant effects on landscape character are unlikely to occur.
- All potential landscape and visual effects occurring during decommissioning of the proposed development.

1.2 Guidelines

Ireland signed and ratified the European Landscape Convention (ELC) in 2002, which introduces a pan-European concept which centres on the quality of landscape protection, management and planning. The Department of Arts, Heritage and the Gaeltacht has published a National Landscape Strategy for Ireland in 2015. 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, this DoEHLG 2000 guidance remains in draft form.

The landscape and visual impact assessment was primarily based on the *Guidelines for Landscape and Visual Impact Assessment* or GLVIA (The Landscape Institute/Institute of Environmental Management and Assessment, UK, 2013). A range of other guidelines also inform the preparation of this landscape and visual impact assessment, which include:

- Wind Energy Development Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, 2006),
- Draft Revised Wind Energy Development Guidelines (Department of Planning, Housing and Local Government, 2019),
- Visual Assessment of Wind Farms: Best Practice (Scottish Natural Heritage, 2002).
- Visual Representation of Wind Farms: Version 2.2 (Scottish Natural Heritage, 2017).
- Siting and Designing Wind Farms in the Landscape, Version 3a (Scottish Natural Heritage, 2017).
- Assessing the Cumulative Impact of Onshore Wind Energy Developments. (Scottish Natural Heritage, 2012)
- Photography and photomontage in landscape and visual impact assessment (Landscape Institute Advice Note 01/11, 2011)
- Visual representation of development proposals (Landscape Institute Technical Guidance Note 02/17, 2017)
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations (Scottish Natural Heritage, 2015)
- Cumulative Impact of Wind Turbines on Landscape and Visual Amenity (Carmarthenshire County Council, 2013)

1.3 Zone of Theoretical Visibility Mapping

The Zone of Theoretical Visibility (ZTV) represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM), overlaid on a map base. A DTM refers to the way in which a computer represents a piece of topography in three dimensions as a digital model. ZTV maps provide the following information:

- Indicates broad areas where visibility of a wind energy development is most likely to occur;
- How much of the wind energy development is likely to be visible (using different coloured bands for different numbers of turbines);
- The extent and pattern of visibility.

Production of ZTV maps is usually one of the first steps of Visual Impact Assessment, after the selection of the LVIA Study Area

The preparation of the Zone of Theoretical Visibility of a proposed wind farm development is guided by Chapter 2: Section 46 of the Scottish Natural Heritage's (SNH) 2017 document, *Visual Representation of Wind Farms* states the following:

> *"…a ZTV map illustrates locations within a study area from where a development would potentially be visible. However, just because a development can be seen, it does not automatically follow that this will result in likely significant landscape and visual impacts. This creates a circular process of decision-making. The final distance of a ZTV should extend far enough to include all those areas within which significant visual impacts of a wind farm are likely to occur (LVIA "study area"); yet the significance of these landscape and visual impacts will not be established until the VIA has been completed; and the LVIA process needs to be informed by the ZTV. As part of this cycle of assessment, the distance recommendations given within the table below act as a starting point".*

Table 2-1 below is a reproduction of the table included in Chapter 2: Section 48 of the same SNH (2017) document and presents recommended initial ZTV distances based on the height of the proposed turbines.

Table 1-1 SNH Recommended initial ZTV distance

Height of Turbines including Rotors (m)	Recommended initial ZTV distance from nearest turbine or outer circle of wind farm
Up to 50	15
51-70	20
71-85	25
86-100	30
101-130	35
131-150	40
150+	45

In this instance, the maximum proposed blade-tip height of the proposed turbines is 173 metres (m) and, thus, the recommended initial ZTV distance from the proposed development is 45km. However, as stated in the SNH guidance document, the final distance of the ZTV *"should extend far enough to include all areas where significant visual impacts of a wind farm are likely to occur"*. As the visibility (and potential for significant visual impact) of turbines decreases with distance, as shown in Figure 1-1 below, it was determined, based on the terrain surrounding the site of the proposed development and the professional judgement and wind farm project experience of the LVIA team, that a ZTV distance of 20km was fully sufficient for the purposes of the LVIA assessment (or in the case of landscape character,15 kilometres).

1.3.1 Limitations of ZTV Mapping

The Scottish Natural Heritage guidelines referred to above 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 development 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 farm could potentially be seen given no intervening obstructions and favourable weather conditions.
- 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 will decrease with the 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 The 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 will occur during the assessment of viewpoints.
- In order to handle large areas of terrain, the DTM data is based on information that does not allow detail to be distinguished below a certain height level. There are also differences in the way that the software package 'interpolates' between heights in the calculations made.

1.3.2 ZTV Methodology

The ZTV maps presented in the EIAR show visibility of the proposed wind farm using the half blade height of the wind turbines (based on the minimum proposed bade length of 66m, the maximum proposed hub height of 107m and therefore the maximum proposed tip height of 173m) as points of reference. Half blade height is used as only half of the blade is required to be visible over the topography for the model to determine that the turbine is visible from any particular location. If full blade height were to be used or indeed half blade height assuming the maximum proposed blade length of 70m, the areas of theoretical visibility would be reduced.

The maps also show the visibility of the proposed wind farm in addition to visibility of other existing and permitted wind farms in the area. The area covered by the ZTV maps has a radius of 20 kilometres from the outer-most proposed turbines. As this ZTV area includes a considerable proportion of sea, the ZTV maps show only the visibility on land.

ZTV maps assume a worst-case or 'bare ground' scenario, i.e. no land-cover. They represent 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 will restrict or limit visibility of the wind turbines, due to the screening effects of vegetation, for example forestry and road-side hedgerows and trees, and buildings, particularly within towns and villages.

Separate colour bands are used on each ZTV map to indicate the number of turbines which will potentially be visible to half blade i.e. only half a blade might 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.

1.3.3 Route Screening Methodology - Roads

In order to comprehensively demonstrate the varying characteristics of the roads and to record the actual visibility in comparison to the theoretical visibility, a methodology was developed by MKO's Landscape and Visual Assessment Team. This is termed Route Screening Analysis and it was undertaken from all roads within a five-kilometre radius of the proposed turbines.

Route Screening Analysis as its name suggests considers the actual visibility of the proposed wind farm from surrounding roads. Within 5km of the proposed development, the area generally comprises upland forested areas, agricultural land, a network of trees and hedgerows, and settlements. In order to get a clearer understanding of visibility and screening, and to bridge the gap for the assessor between the computer-generated ZTV maps and the actual nature of visibility in the study area, Route Screening Analysis was undertaken.

Within a five-kilometre radius of the proposed development site boundary, each route with theoretical visibility was driven, with notes taken on screening, views, and the direction of the views to the proposed development. The Route Screening Analysis was undertaken in August 2019.

In preparation for the route screening assessment, the ZTV maps were overlaid with aerial imagery and printed at a large scale. Each route was driven once in each direction as a minimum. The route was driven slowly along the route and mapping and notes of each section of roadway on a high-resolution aerial image was carried out. Screening between the wind farm site and the relevant side of the road was marked. In cases where the road travels directly in the direction of the proposed wind farm, screening on both sides of the road was included and the most representative of the two roadsides were mapped.

In addition, photographs were taken at regular intervals of approximately 500 metres along the routes to allow later confirmation of mapping, and to methodically record the views along the route. A photograph of the view along the road was taken in each direction, as well as the view to either side of the road. Following the site visit, a map was created of each route. The screening along the route was mapped as one of three categories:

The categories were as follows:

- Little/no screening – mainly open and with some very light vegetation
- Intermittent/Partial Screening – light deciduous roadside vegetation and vegetation with short gaps which would allow intermittent or partial views
- Dense Screening – vegetation which is dense enough to block views (e.g. coniferous forestry)

1.4 Viewpoint Photomontages

1.4.1 Viewpoint Identification

The viewpoints or photo locations were selected following guidance contained in the DoEHLG 'Wind Energy Development Guidelines for Planning Authorities' (2006), the 'Guidelines for Landscape and Visual Impact Assessment' (2013) and in the 'Visual Representation of Wind Farms' (Scottish Natural Heritage, 2017). The selection of photo locations is designed to give a representative range of views of the proposed development.

Viewpoints, the photo locations from which the photomontages are produced, were chosen after compiling the Visual Baseline. The main purpose of establishing the visual baseline is to identify the key visual receptors that should be considered for viewpoint selection. To this end the following key receptors have been identified in order of priority in the LVIA (20km) study area:

- Designated Scenic Routes
- Settlements
- Recreational and Tourist Destinations
- Viewing Areas (e.g. marked on OSi Maps)
- Transport Routes
- Recreational Routes
  - Waymarked Walking Routes
  - Cycle Routes
  - Scenic Drives
  - Tourist Routes (e.g. Wild Atlantic Way)

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 are identified, a Visual Receptor Preliminary Assessment is carried out to eliminate the visual receptors for the following reasons:

- No or very limited theoretical visibility indicated on the ZTV map for the visual receptor
- Designated views and scenic routes as well as OSi Viewing Points that are not directed towards the proposed development
- Visual receptors visited on site where views towards the turbines were either entirely screened or substantially screened and distance from the proposed development site would mitigate any visual effects

Establishing visibility from potential visual receptor locations, on the ground, was assisted by the TrueViewVisuals software, which is an iPad-based tool to help visualisation of a project live on the ground before it is built. This tool was used during the screening of visual receptors.

All other key visual receptors were selected as viewpoint locations. In addition, viewpoints were selected in close proximity to the proposed turbines, where turbines are likely to be most visible and hence visual effects may be greatest.

Viewpoints were chosen having regard to the SNH Guidance (2017) which advises that a range of views should be shown at a range of distances and aspects, as well as at varying elevations and showing both where the development will be completely visible as well as partially visible.

1.4.2 Photomontages

Photomontages are visualisations that superimpose an image of a proposed development upon a photograph or series of photographs. 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 has been prepared as part of this assessment and are presented in a separate Volume 2 Photomontage Booklet submitted with this EIAR.

1.4.2.1 Photomontage Limitations

Photographs, and therefore photomontages, are subject to a range of limitations, as stated in *'Visual Assessment of Wind Farms'* (Scottish Natural Heritage, 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 judgments. The guidance also notes that interpretation of visualisations also needs to take into account additional information including variable lighting, movement of turbine blades, seasonal differences and the movement of the viewer through the landscape. However, accepting these limitations, the SNH guidelines state that photomontages are useful tools in the Visual Impact Assessment of wind turbines.

Furthermore, with regard to the representation of cumulative visual effects, existing and permitted turbines are also shown in the photomontages. The representation of existing turbines relies on photographs taken on site, while permitted and proposed turbines are images of turbines superimposed into the image. As such there can be a discrepancy in the lighting and sharpness between these two different representations.

Photomontages are 2D representations of 3D views and thus cannot convey the perspective and depth pf view of seeing the actual objects with the naked eye. One of the areas that this limitation affects is cumulative visual effects where proposed turbines located in front or behind existing or permitted turbines. In the field this physical separation may be obvious, while on the photomontage the turbines may appear as one wind farm.

1.4.2.2 Photomontage Presentations

The viewpoints presented in the accompanying 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 varies scales show the viewpoint location. A 120 -degree existing view image without any proposed and permitted turbine. Existing turbines visible in the landscape may appear within the image and the horizontal extent of the 90-degree and 53.5-degree image to be presented in subsequent images is also framed.*
2. ***Visual Baseline** - 90-degree existing view image without any proposed or permitted turbines and a matching wireframe image of the same view which includes any existing turbines visible in the landscape. If turbines are already existing in the landscape, these are visible on the photograph and are not rendered in the wireframe.*
3. ***Do Nothing Scenario** - 90-degree view image without any proposed, but including existing and permitted turbines. A matching wireframe image shows the turbines of all permitted and existing wind farms coloured by category and labelled for ease of identification.*
4. ***Proposed View (90 degrees)** – Showing a 90-degree photomontage image with the proposed wind farm and all other existing and permitted wind farms within the viewpoint. A matching wireframe image shows the turbines of all proposed, permitted and existing wind farms coloured by category and labelled for ease of identification.*
5. ***Proposed View (53.5 degrees)** – Showing a photomontage image of the proposed turbines and any existing and permitted turbines in a 53.5-degree horizontal field of view.*
6. ***Proposed Wireframe (53.5 degrees)** - Showing a wireframe image of the proposed turbines and any existing and permitted turbines in a 53.5-degree horizontal field of view. The proposed turbines and any other existing wind farms are coloured by category and labelled for ease of identification.*

The viewpoint images contained in the booklet are devised to be viewed at arms-length.

1.4.2.3 Assessment of Other Turbine Configurations

Given that this application proposes a limited range comprising maximum and minimum turbine tip heights, hub heights and blade lengths. Various turbine dimension configurations, within this range, have been considered in relation to the likely landscape and visual effects resulting from the proposed development. The dimensions presented below are the maximum and minimum turbine parameters assessed:

- Turbine Tip Height - Maximum height 173 metres, Minimum height 162 metres
- Hub Height - Maximum height 107 metres, Minimum height 96 metres
- Blade Length - Maximum length 70 metres, Minimum length 66 metres.

A blade length of 66m and a hub height of 107m was considered throughout this assessment as a representative visual illustration of the proposed development on the basis of the professional judgement of MKO's LVIA team and on consideration of the range of turbines which could be installed. This combination of blade length and hub height (providing a 173m tip height) has been identified as a worst-case scenario for likely visual effects and is most representative for assessment, on the basis that the greatest extent of the entire turbine structure (blades and tower) would potentially be visible from the viewpoints assessed in the EIAR. This turbine configuration of the reasonably limited range is termed as the 'Highest Hub and Shortest Blade' and is presented for all 13 No. photomontage viewpoints. The photomontage booklet accompanying the EIAR (Volume 2) presents visualisations of the limited range of alternative turbine configurations at key viewpoint locations. These configurations (hub height, blade length and tip height) are reported below, as well as their relative position within the photomontage booklet.

- **Highest Hub and Shortest Blade -** Upper Bound Configuration of the proposed range – All 17 No. Photomontage Viewpoints.
  - Maximum Tip Height – 173 metres
  - Maximum Hub Height – 107 metres
  - Minimum Blade Length – 66 metres

Irrespective of which combination of hub height and blade length, within the proposed range outlined in this application, is installed on site, the significance of residual visual effects will not be altered (Refer to Viewpoint (VP) Assessment in Appendix 12-3 of the EIAR). However, for the avoidance of doubt, two alternative turbine configurations, listed below, are presented for five selected viewpoints included in the photomontage booklet. These configurations were deemed appropriate alternative visual representations of the proposed development within the proposed range. The viewpoints selected are representative of short-range views (VP 01, VP 03, VP 09 and VP12 <3.5 km from the nearest proposed turbine) and a longer-range view (VP 08, 7.5km from the nearest proposed turbine). The following configurations were also considered

- **Lowest Hub and Shortest Blade - Lower Bound** Configuration of the 'Limited Range' – 4 No. Photomontage Viewpoints (VP 01 Gortnaskea; VP 03 Carrowmore or Glentogher; VP 08 Tullyarvan; VP 09 Illies; VP 12 Tullydish Upper)
  - Minimum Tip Height – 162 metres
  - Minimum Hub Height – 96 metres
  - Minimum Blade Length – 66 metres

- **Lowest Hub and Longest Blade - Median** Configuration of the 'Limited Range' – 4 No. Photomontage Viewpoints (VP 01 Gortnaskea; VP 13 Carrowmore or Glentogher; VP 19 Tullyarvan; VP 20 Illies; VP 23 Tullydish Upper)
  - Tip Height – 166 metres
  - Minimum Hub Height – 96 metres
  - Blade Length – 70 metres

These configurations are presented as photomontages within both 90 degree and 53.5 degree fields of view with accompanying wireframes.. **Irrespective of which turbine model** (within the ranges for which planning permission is being sought) **is procured for the proposed development, the significance of residual landscape and visual effects will not be altered.**

1.5 Landscape and Visual Impact Assessment Methodology

1.5.1 Identification of Landscape Receptors

The landscape receptors were selected following guidance contained the *'Guidelines for Landscape and Visual Impact Assessment'* (2013) and in the *'Visual Representation of Wind Farms'* (Scottish Natural Heritage, 2017).

The following landscape receptors are identified in the landscape baseline:

- Landscape designations based on:
  - County Donegal Development Plan 2018-2024 (CDP)
  - Derry Area Plan 2011
  - Northern Area Plan 2016
- Landscape character of the proposed development site and its immediate environment based on:
  - Landscape Type identified using DoEHLG Guidelines 2006
  - Site Visit carried out during October 2019
- Landscape character of the study area based on:
  - Landscape Character Assessment of County Donegal 2016
  - Northern Ireland Landscape Character Assessment 2000

After all landscape receptors are identified, a Landscape Receptor Preliminary Assessment is carried out to eliminate the landscape receptors, where no or very limited theoretical visibility has been indicated on the ZTV map.

All other landscape receptors were selected for further assessment of landscape effects.

1.5.2 Assessing Landscape Effects

The methodology uses qualitative methods in order to arrive at an assessment, which is based on the Landscape and Landscape Assessment (2000) Guidelines as well as the GLVIA (2013).

Landscape effects can be described as changes which affect the landscape as a resource. This includes how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects and its landscape character. Landscape effects also relate to changes in the structure of the landscape. Under the GLVIA (2013), the assessment of likely significant effects on landscape receptors includes a judgement on both the sensitivity of the receptor as well as magnitude of the change.

1.5.2.1 Assessing Landscape Sensitivity

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

Susceptibility to change can be 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 development without undue consequences for the maintenance of the baseline (existing) landscape and/or the aims of landscape planning policies and strategies. Landscape value is a combination of values which are assessed in the landscape baseline, combining any formal landscape designations.

No landscape sensitivity was stated for landscape character areas for either County Donegal or Derry. Hence for this LVIA, Map 8.2.1 - *Wind Energy Map* (although not currently included in the Donegal CDP, due to a High Court decision) was used for County Donegal and, for county Derry, the 2010 *Wind Energy Development in Northern Ireland's Landscapes* was consulted to arrive at following the landscape sensitivity to wind farm:

- High
- Medium
- Low
- Negligible

1.5.2.2 Assessing Magnitude of Change in the Landscape

The magnitude of change in each landscape character area is a combination of the visual presence - size and scale - of the change and the extent of the area to be affected. As this methodology is tailored to wind energy development, the duration of the effect is assumed to be the same in all cases – long-term (the proposed overational life of the wind farm is 35 years). The magnitude of change for each landscape character area was assessed using the definitions outlined in Table 1-2 below.

Table 1-2 Magnitude of Landscape Change Assessment Criteria[1]

Magnitude of Change	Description
High	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.

[1] *Derived from the content within GLVIA*

Magnitude of Change	Description
Medium	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.
Low	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.
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 landscape receptor sensitivity and magnitude of change are then used to look up the significance of the effect in the EPA chart in Figure 1-2 below.

1.5.3 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 the ZTV maps as well as actual visibility on the ground.

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

- **Visual obstruction:** This occurs when there is an impact on a view which blocks the view
- **Visual intrusion:** This 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 likely significant effects of the proposed development in terms of visual effects are informed by the ZTV and photomontages. 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 because of changes to the landscape. 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.

1.5.3.1 Visual Receptor Sensitivity

Visual Receptor Sensitivity depends on the occupation or activity of the people, as well the extent to which the attention is focused on views and visual amenity, according to the GLVIA Guidelines (2013). Visual receptor sensitivity is assessed as either being High, Medium or Low, based on the definition of descriptions and examples set out in Table 1-3 below.

Table 1-3 Visual Receptor Sensitivity Assessment Criteria[2]

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

1.5.3.2 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 1-4 below.

Table 1-4 Magnitude of Visual Change Assessment Criteria

Magnitude of Change	Description
High	Substantial change, where the proposals would result in large-scale, prominent or very prominent change, leading to substantial obstruction of existing view or complete change in character and composition of the baseline though removal of key elements or addition of uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed development is 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.
Medium	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 development is partially visible over a moderate or medium extent, and which are not in close proximity to the development. Change may be readily noticeable but not substantially different in scale and character from the surroundings and wider setting.
Low	The proposals 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.

[2] *Derived from the content within GLVIA*

Magnitude of Change	Description
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.

1.5.4 Landscape and Visual Effects Significance

The below chart was taken from the EPA 2017 *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports*, which in turn was adapted from the SNH 2013 *A handbook on environmental impact assessment*. This chart will be used to arrive at the significance of the effects after the receptor sensitivity and magnitude of change for both the landscape and visual receptors have been determined.

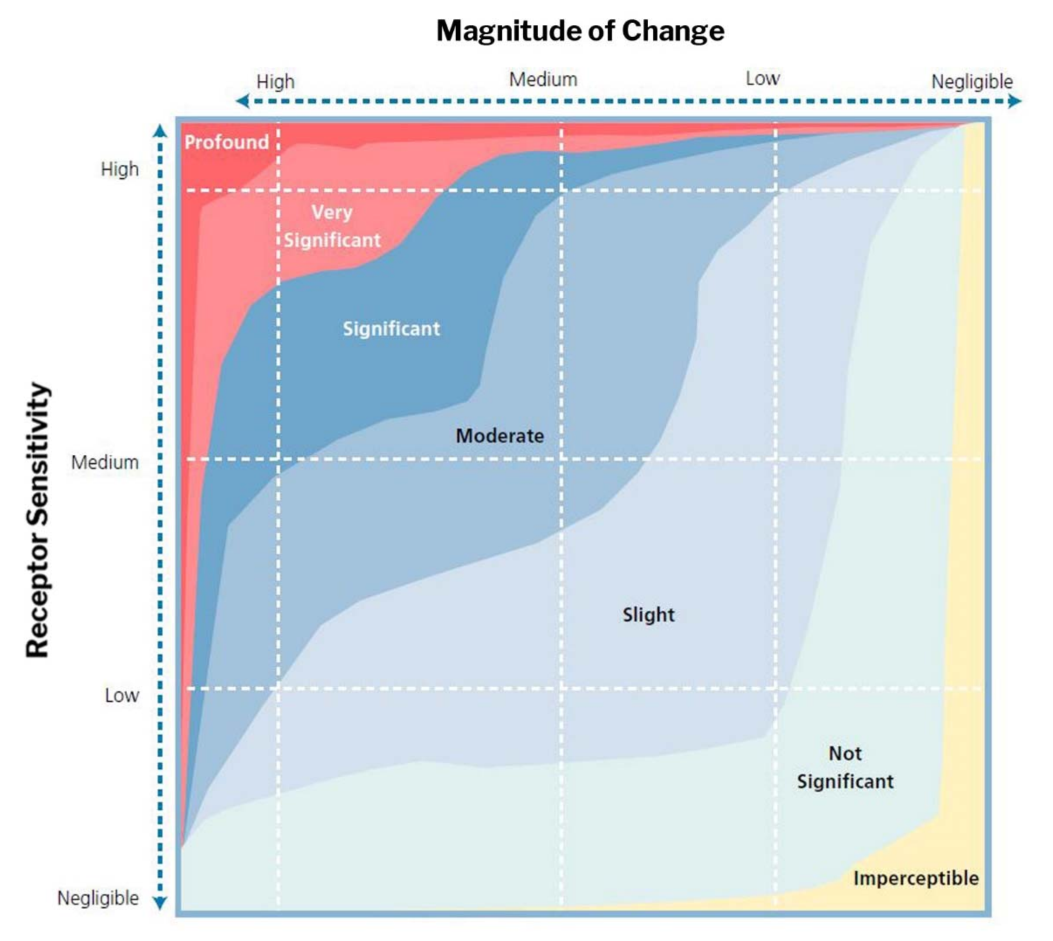

Figure 1-2 EPA chart to determine significance of landscape and visual effects

The definitions, also taken from the EPA 2017 *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports,* corresponding to the seven degrees of significance are outlined in Table 1-5 below.

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

EPA Significance Classification	EPA (2017) Definition of Significance
Profound	An effect which obliterates sensitive characteristics
Very significant	An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Imperceptible	An effect capable of measurement but without significant consequences

1.5.4.1 Residual Visual Effect

After determining the significance of the visual effect using the above visual effects assessment matrix, mitigating factors are taken into consideration to arrive at the final residual effect.

1.5.5 Assessing Cumulative Landscape and Visual Effects

1.5.5.1 Cumulative Landscape Effects

The SNH 2017 publication *Assessing the Cumulative 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. To this effect the guidelines 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 proposed development site and the LCAs in which the site is located. Therefore, these landscape receptors will be assessed for cumulative landscape effects on the physical fabric of the landscape arising from the proposed development.

Cumulative effects between the proposed development and all other existing and permitted wind farms (within the LCA (15km) Study Area) on the landscape character will be assessed for the Landscape Character Areas (LCAs) that have theoretical visibility of the proposed development with particular emphasis on the LCA in which the proposed turbines will be located.

Table 1-6 below taken from *Cumulative Impact of Wind Turbines on Landscape and Visual Amenity* (Carmarthenshire County Council, 2013) will be used to assign a current status of the LCAs and whether the addition of the proposed turbines will change the status of any of the LCAs.

Table 1-6 Landscape types with regard to wind turbine development descriptions (Source Guidance on cumulative impact of wind turbines on landscape and visual amenity

	Landscape Status	Description
1	Landscape character area with no wind turbines	No turbines within an area and not visible except at a distance where they are very small or inconspicuous.
2	Landscape character area with occasional wind turbines in it and/or intervisible in another landscape character area/s	Turbines are visible but are not at a scale, number, spacing or extent that makes them a defining/key characteristic. Turbines might be seen occasionally at close quarters but more often within background views.
3	Landscape character area with wind turbines	Turbines are located and visible and are at a scale and/or a spacing that makes them one of the defining/key characteristics. Turbines might be seen in the foreground, mid-ground or background. However, there would be other key characteristics which would be strong and there would be sufficient separation between turbines for views without turbines and other characteristics remaining dominant in these parts of the area.
4	Wind turbine landscape	Turbines are frequent and may include extensive wind farms and are the dominant, defining characteristic but there is separation between groups of turbines. However, within these areas wind turbines are likely to be visible.
5	Windfarm	Landscape fully developed as a wind farm with no clear separation between groups of turbines.

Cumulative landscape effects are included in LCA Assessment Tables in Appendix 12-2 and summarised in the Chapter 12 (Landscape and Visual) of the EIAR.

1.5.5.2 Cumulative Visual Effects

For this assessment, the SNH (2012) definition of cumulative effects as additional changes caused by a proposed development in conjunction with other similar developments is used.. The definition in the DoEHLG Guidelines (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 GLVIA (2013) and SNH (2012) guidance also note cumulative visual effects can be experienced in combination, where two or more developments are visible from one viewpoint, as well as sequentially, where a viewer moves to another viewpoint and sees the same or different developments. The photomontage viewpoints illustrate combined visibility and analysis of the photomontages and route screening allows sequential visibility to be assessed.

The SNH 2017 publication *Siting and Designing Wind Farms in the Landscape* gives additional guidance on assessing combined visual effects in that it states:

Therefore, the cumulative assessment will concentrate on these three issues:

- Whether the proposed turbines increase the spatial extent of turbines in the view
- Whether there is visual contrast in different size and design between different wind developments
- If there is visual contrast then, whether there is visual separation between the proposed turbines and other wind developments in the landscape

The latter two are due to the SNH 2017 publication *Siting and Designing Wind Farms in the Landscape* stating that '*a key factor determining the cumulative impact of wind farms is the distinct identity of each group. This relates to their degree of separation and similarity of design. This applies whether they are part of a single development, a wind farm extension, or a separate wind farm in a wider group. A wind farm, if located close to another of similar design, may appear as an extension; however, if it appears at least slightly separate and of different design, it may conflict with the other development. In these cases, if a landscape is unable to accommodate the scale of a combined development, wind farm groups should appear clearly separate.*'

In other words, cumulative visual effects are reduced if two or more wind farms either read as one continuous development due to similarity in design and scale or if this is not the case visual separation should ensure that they appear as two separate entities.

Additionally, undesirable effects such as 'visual stacking' (overlapping of turbine rotors) were also taken into consideration.

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 how the proposed turbines will appear in conjunction to turbines already present.

The assessment of cumulative effects is included in the viewpoint assessment tables in Appendix 12-3 and summarised in the Chapter 12 (Landscape and Visual) of the of the EIAR.