

TA 4.10: Lighting Assessment

TECHNICAL APPENDIX 4.10: LIGHTING ASSESSMENT

1 Introduction

- 1.1 ASH design + assessment Ltd (ASH) has undertaken an assessment of the landscape and visual effects of the aviation lighting proposals for the Proposed Varied Development. This assessment is supported by a series of Zone of Theoretical Visibility (ZTV) Figures illustrating the theoretical extent of visible aviation lighting (see TA Figures 4.10.1-4.10.4)and by visualisations from four of the main LVIA viewpoints as agreed with The Highland Council (THC) and Scottish Natural Heritage (SNH) (see TA Figures 4.10.5-4.10.8).
- 1.2 This Technical Appendix is supported by the figures listed in Table 4.10.1 below.

Table 4.10.1: Supporting Figures in Annex 1
Annex 1: Figures
TA Figure 4.10.1a: Hub Height ZTV A3
TA Figure 4.10.1b: Hub Height ZTV A1
TA Figure 4.10.2: Landscape Character Types with Hub ZTV
TA Figure 4.10.3: Designated and Protected Landscapes with Hub ZTV
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TA Figure 4.10.5a: VP3 Loch nan Clach Geala Baseline Photo and Wireline
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TA Figure 4.10.8b: VP7 A836 west of the B871 Wireline
TA Figure 4.10.8c: VP7 A836 west of the B871 Photomontage

Description of Proposed Lighting

- 1.3 This assessment is based on the requirements of the Civil Aviation Authority (CAA) Policy Statement: *Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level*¹ (the CAA policy statement).
- 1.4 In line with the CAA policy statement, the assessment is therefore based on the following assumptions:
 - Each of the 39 turbines would have a 2,000 candela red light fitted to the top of the nacelle (assumed to be at 119 m), visible in all directions;

¹ Safety and Airspace Regulation Group, 2017. *Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level*. Civil Aviation Authority

- Each of the 39 turbines would have a 32 candela red light fitted to the tower at half the height of the nacelle (assumed to be at 59.5 m). This would require three lights arranged around the tower so as to be visible in all directions and therefore could result in two lights being visible from some angles;
- Lights would be switched on at all times when ambient lighting is below 500 lux. This therefore assumes that in addition to the hours of darkness, lights would be on before sunset, as the sky lightens in the morning, or on dark overcasts days; and
- All lights would be steady (i.e. not flashing). However, depending on wind direction, moving turbine blades seen in front of lights may give an impression of flashing lights from some locations.

Proposed Mitigation

- 1.5 Due to the height of Proposed Varied Development (turbines being above 150 m to tip), aviation lighting would be required in line with the CAA Policy Statement¹. Discussions between the Applicant and the CAA on a reduced aviation lighting scheme are currently taking place, however, as an aviation lighting design had not been agreed at the time of finalising the aviation lighting assessment, assumptions have been made with regard to the worst-case scenario on the extent and type of aviation lighting, as noted above.
- 1.6 Further discussion with aviation stakeholders will be carried out to develop an aviation lighting mitigation strategy which could reduce these effects. Discussions would include consideration of:
 - Potential reduction of aviation lighting intensity during good meteorological visibility;
 - Radar activated aviation lighting (should this be approved for use); and
 - Potential for cardinal or strategic aviation lighting on selected turbines.

2 Approach and Methodology

Scope

- 2.1 A 20 km Detailed Study Area was selected, being the area within which it is considered that significant effects from aviation lighting could potentially be experienced. This area is consistent with the Detailed Study Area for the LVIA of the Proposed Varied Development.

Methodology

- 2.2 The aviation lighting assessment has been prepared with reference to Guidelines for Landscape and Visual Assessment (Third Edition) (GLVIA3)² and broadly in line with emerging guidelines provided by SNH³.
- 2.3 GLVIA3 places a strong emphasis on the importance of professional judgement in identifying and defining the significance of landscape and visual effects. As part of this assessment, professional judgement has been used in combination with structured methods and criteria to evaluate value, sensitivity, and magnitude and significance of effect. The assessment has been undertaken and verified by two Chartered Landscape Professionals to provide a robust and consistent approach.
- 2.4 Methods promoted by GLVIA3 require an appreciation of the existing environment and the ability of its key components to accept the change proposed. An understanding of the potential effects which could occur and how these could affect the key components and the potential to mitigate adverse effects. There are four key stages to the assessment which are presented in the following sub-sections.

² Landscape Institute (LI) / Institute of Environmental Management and Assessment (IEMA), (2013), *Guidelines for Landscape and Visual Impact Assessment, Third Edition*. Routledge.

³ Scottish Natural Heritage, (2017), *Visual Representation of Wind Farms (Version 2.2)*.

Establishing the Baseline

- 2.5 The baseline has been determined through a combination of desk study and site survey, taking account of the appearance and intensity of existing visible lights. Desk appraisal has involved review of the ZTV and wirelines. Site survey was undertaken at twilight and in the subsequent hours of darkness on 8th to 11th October 2019 by Chartered Landscape Architects.

Appreciation of the Proposed Varied Development

- 2.6 An appreciation of the proposals has been developed through building an understanding of the proposed aviation lighting requirements and the surveyors experience of existing wind turbine sites with aviation lights of a similar intensity during the hours of darkness.

Analysis of Receptors and Residual Effects

- 2.7 Preparation of the baseline is followed by the systematic identification of likely effects on the receptors. This is a two-fold process, giving consideration to how effects could arise from aspects of the Proposed Varied Development, and how these changes could be accommodated in the existing baseline.

Sensitivity of Landscape Receptors

- 2.8 Landscape sensitivity is reflective of the nature of the landscape and its ability to accommodate development of the type proposed without compromising its key characteristics and components. This involves the consideration of the baseline value of the landscape and its susceptibility to change. When considering value and susceptibility in the context of aviation lighting, the degree to which the character of the area is currently characterised by artificial lighting or a lack of it is particularly important. It should be noted that some characteristics that contribute to the daytime value of a landscape may not be as relevant at night and vice versa.
- 2.9 Landscape sensitivity has been evaluated using a three-point scale as follows:
- High – a highly valued landscape of particularly distinctive character susceptible to relatively small changes of the type proposed;
 - Medium – a reasonably valued landscape with a composition and characteristics tolerant to some degree of change of the type proposed; and
 - Low – a relatively unimportant landscape which is potentially tolerant of a large degree of change of the type proposed.

Sensitivity of Visual Receptors

- 2.10 Sensitivity to change considers the nature and viewing expectation from the receptor and takes into account the perceived value of the existing view and the susceptibility of the visual receptor to change. The importance of the aspect of the view which would be changed contributes to the sensitivity evaluation. The sensitivity evaluation considers the value of views during low light conditions when aviation lights could be on, as well as during full darkness.
- 2.11 The value and susceptibility of receptors can differ at night. Features that are valued during the day may not be visible at night while other features such as the starry night sky may best be appreciated during the hours of darkness. Likewise, individuals seeking out activities that require darkness (i.e. stargazing) will have a higher level of susceptibility than others whose activities take place irrespective of the light levels (i.e. outdoor sporting clubs that gather under flood lights in the evening or commuters focused on the road).
- 2.12 Sensitivity to the change proposed has been evaluated using a three-point scale as follows:
- High: Where the appearance of the Proposed Varied Development would affect or alter an important part of a highly valued, impressive or well composed view obtained with no detracting features;

- Medium: Where the appearance of the Proposed Varied Development would affect or alter a fairly important part of a valued or pleasing view obtained or a notable part of a less well composed view obtained with some detracting features; and
- Low: Where the appearance of the Proposed Varied Development would affect or alter an unimportant part of the overall view obtained or would affect or alter a view obtained which is of limited value or poorly composed, with numerous detracting features.

Magnitude of Change on Landscape Receptors

- 2.13 Magnitude of change concerns the degree to which the Proposed Varied Development would alter the existing characteristics of the landscape. The appraisal of magnitude involves consideration of the nature and scale of the change which would occur in relation to the identified potential effects and also the duration and potential reversibility of the effect. These are used to identify a magnitude rating for the landscape receptor as a whole.
- 2.14 Magnitude is categorised on a four-point scale as follows:
- High – notable change in landscape characteristics over an extensive area ranging to a very intensive change over a more limited area;
 - Medium – perceptible change in landscape characteristics over an extensive area ranging to a notable change in a localised area;
 - Low – virtually imperceptible change in landscape characteristics over an extensive area or a perceptible change in a localised area; and
 - Negligible – no discernible change in any landscape characteristics or components.

Magnitude of Change on Visual Receptors

- 2.15 Magnitude of change concerns the extent to which the existing view obtained would be altered by the Proposed Varied Development. The evaluation of magnitude gives consideration to factors such as the scale or extent of the changes within the view, the extent to which this could alter the composition or focus of the view and the duration and reversibility of these changes.
- 2.16 Magnitude of change has been evaluated using a four-point scale as follows:
- High: Where the Proposed Varied Development would result in a very noticeable change in the existing view obtained by the viewer;
 - Medium: Where the Proposed Varied Development would result in a noticeable change in the existing view obtained by the viewer;
 - Low: Where the Proposed Varied Development would result in a perceptible change in the existing view obtained by the viewer; and
 - Negligible: Where the Proposed Varied Development would result in a barely perceptible change in the existing view obtained by the viewer.

Assessment of Significant Effects

- 2.17 The purpose of this assessment in the context of the EIAR is to identify predicted significant effects on the landscape and visual amenity arising from the proposed aviation lighting strategy for the Proposed Varied Development. For the purposes of the assessment effects identified as being **Moderate** or above may be regarded as significant in term of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the 2017 EIA Regulations)⁴.

⁴ Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: <http://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed February 2020).

Level of Landscape Effects

- 2.18 Evaluation of the predicted significance of effects on landscape receptors has been carried out through analysis of the anticipated magnitude of change in relation to the identified landscape sensitivity and using a degree of professional judgement. The assessment takes into account effects upon existing landscape elements, features and key characteristics and assesses the extent to which these would be lost or modified, in the context of their importance in determining the existing baseline character.
- 2.19 The significance of landscape effects has been evaluated using a four-point scale as follows:
- **Major** – the Proposed Varied Development is at considerable variance with the landform, scale and pattern of the landscape and would be a dominant feature, resulting in considerable reduction in scenic quality and large-scale change to the intrinsic landscape character of the area;
 - **Moderate** – the Proposed Varied Development is out of scale with the landscape, or inconsistent with the local pattern and landform and could be locally dominant and / or result in a noticeable reduction in scenic quality and a degree of change to the intrinsic landscape character of the area;
 - **Minor** – the Proposed Varied Development does not quite fit with the scale, landform or local pattern of the landscape and could be locally intrusive, but would result in an inappreciable reduction in scenic quality or change to the intrinsic landscape character of the area; and
 - **Negligible** – the Proposed Varied Development sits well within the scale, landform and pattern of the landscape and would not result in any discernible reduction in scenic quality or change to the intrinsic landscape character of the area.

Level of Visual Effects

- 2.20 The level of visual effect identified concerns the importance of changes resulting from the introduction of aviation lights on the Proposed Varied Development. Evaluation of the visual effect is based on consideration of the magnitude of change in relation to visual sensitivity, taking into account proposed mitigation measures, and is established using professional judgement. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract from the view or disrupt the scale, structure or focus of the existing view obtained.
- 2.21 The prominence of aviation lights in the view will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the 'worst case' scenario. This is assumed to be in clear conditions in full darkness, unless the value of the view or effect would be greater in different lighting conditions (i.e. sunrise or sunset conditions). However, it is recognised that predicted effects could be reduced in some conditions. For example, in the case of low cloud or haze or in situations of low light, rather than full darkness.
- 2.22 Effect significance has been evaluated using a four-point scale and using the following criteria:
- **Major:** The Proposed Varied Development would become a prominent and very detracting feature and would result in a very noticeable deterioration to an existing highly valued and well composed view obtained by the viewer;
 - **Moderate:** The Proposed Varied Development would introduce some detracting features to an existing highly valued view or would be more prominent within a pleasing or less well composed view, resulting in a noticeable deterioration of the quality of view obtained by the viewer;
 - **Minor:** The Proposed Varied Development would form a perceptible but not detracting feature within a pleasing or valued view or would be a prominent feature within a poorly composed

view of lesser value, resulting in a small deterioration to the existing view obtained by the viewer; and

- **Negligible:** The Proposed Varied Development would form a barely perceptible feature within the existing view and would not result in any discernible deterioration to the view obtained by the viewer.

Limitations of the Assessment

- 2.23 The use and limitations of ZTV diagrams are explained in Technical Appendix 4.1: Technical Methodologies for Visual Representation (EIAR Volume 4). The scope of assessment is defined in paragraph 1.4 where the key assumptions for the turbine lighting assessment are set out.
- 2.24 The appearance and brightness of aviation lights has been estimated by the assessors, based on experience of similar intensity aviation lighting visited and observed during the hours of darkness.

3 Assessment of Effects

Existing Lighting Baseline

- 3.1 The site survey indicated that there were very low levels of artificial light within the 20 km Detailed Study Area. A few small settlements including Strathy, Bettyhill, Melvich and Tongue are the most notable contributors of artificial light. There are also scattered lights at individual crofts and farms. Car headlights and break lights as well as reflections of these on other road markers result in randomised bright illuminations in the landscape, however the overall sense of the Wider Study Area is of a dark landscape.
- 3.2 At the boundary of the 20 km Detailed Study Area, floodlighting at the Dounreay Power Station is a notable source of artificial light, as is Thurso (approximately 35 km to the northeast).

Potential Effects

- 3.3 Potential effects relate to the appearance of proposed 2,000 candela nacelle lights and 32 candela tower lights on each turbine. The effect of lighting on the viewer could be influenced by both the number and the intensity of the lights potentially visible and the extent to which baseline lighting is present. The following issues have been considered in the assessment of predicted effects:
- Aviation lights are typically focussed on a horizontal plane with intensity of light reducing below a certain viewing angle. Therefore, a lesser effect may be experienced by a viewer situated at increased angles below the horizontal. However, potential viewing angles differ between lighting manufacturers and therefore this assessment is based on a worst-case scenario which assumes that, where turbine hubs are visible, nacelle lights would also be perceived;
 - Intensity of lights would diminish with distance. However, in some instances, combinations of greater numbers of lights seen from further away could counter this effect to some extent.
 - Nacelle lights also lead to illumination of turbine blades as they pass through the horizontal plane of the beam and therefore in some situations the viewer would be able to perceive the movement of the turbines during darkness;
 - In certain weather conditions such as mist or low cloud, the nacelle lights could also lead to some illumination of the cloud giving a halo effect; and
 - In certain wind directions and viewing angles, moving turbine blades in front of the light would cause a flashing effect. Where a number of different turbines were aligned, this effect could be increased to a flickering impression.

Zone of Theoretical Visibility

- 3.4
- A hub height ZTV (119 m above existing ground level), was generated to illustrate areas where views of the aviation lights would theoretically be obtained using ArcGIS software. This is presented in TA Figure 4.10.1a. Detailed technical information on the methods for production of ZTVs is included in the Technical Appendix 4.1: Technical Methodologies for Visual Representation (EIAR Volume 4).
- 3.5
- Residual Lighting Effects on Landscape Receptors The landscape receptors within the Detailed Study Area are illustrated on TA Figure 4.10.2 and TA Figure 4.10.3 (EIAR Volume 4, Technical Appendix 4.10, Annex 1). The landscape receptors most likely to experience significant effects as a result of the introduction of aviation lighting are those directly affected by the development’s location within them and those in close proximity where the aviation lighting would represent a notable change to the surrounding landscape.
- 3.6
- The following landscape receptors within the Detailed Study Area were identified as having the potential to experience effects as a result of aviation lighting:
 - Kyle of Tongue NSA;
 - Bens Griam and Loch nan Clàr SLA;
 - Farr Bay, Strathly and Portskerra SLA;
 - WLA 36: Causeymire – Knockfin Flows;
 - WLA 38: East Halladale Flows;
 - Lone Mountains LCT (138);
 - Rocky Hills and Moorland LCT (136);
 - Rounded Hills – Caithness and Sutherland LCT (135);
 - Strath – Caithness and Sutherland LCT (142); and
 - Sweeping Moorland and Flows LCT (134).
- 3.7
- Visibility from other landscape receptors within the Detailed Study Area is either very limited and / or located at a distance at which significant effects on landscape character would be unlikely and as such these are scoped out.

Effects Likely to be Significant

SWEEPING MOORLAND AND FLOWS LCT (134)

- 3.8
- The character of this LCT during hours of darkness is not specifically discussed within the SNH landscape character assessment, however the LCT is generally a dark landscape with little artificial light beyond scattered crofts and farmsteads and passing vehicles. This lack of light contributes to the perception of the landscape as having a “strong sense of naturalness and remoteness, particularly at its core away from the more settled and modified outer fringes.”⁵ However, it should be noted that as this LCT covers extensive parts of Caithness and Sutherland, sources of artificial light in neighbouring LCTs are visible from some parts of the landscape. As a result, this LCT is considered to have a **Medium** sensitivity to the proposed turbine lights.
- 3.9
- The introduction of 39 lit turbines into this LCT would result in a **Medium** magnitude of change within a localised part of the wider LCT. It was assessed that this would result in a localised **Moderate** and therefore significant effect to the LCT. This would largely be due to the potential for the proposed aviation lighting to influence the perception of remoteness locally within the LCT at night.

⁵ Scottish Natural Heritage (2019) *Scottish Landscape Character Types Map and Descriptions – Sweeping Moorland and Flows Landscape Character Type 134 Description*. Available at: <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions> [accessed March 2020]

LONE MOUNTAINS LCT (138)

- 3.10
- The Lone Mountains LCT is characterised by isolated mountains that are the dominant focus within open lower-lying moorland surroundings. Their distinctive profiles are visible from many parts of Caithness and Sutherland. The Bens Griam unit is located closest to the Proposed Varied Development turbines, at just over 7 km to the south. While the proposed aviation lights would not have a direct effect on the LCT they could indirectly affect the perception of the profiles / ridges in some views by appearing in the foreground. This would be most prominent in views towards the western units of the LCT where the ridgelines would be lit up as the sun sets. However, once it is completely dark the profiles of the Lone Mountains and their relationship to the aviation lights would be much less apparent.
- 3.11
- As a result, this LCT is considered to have a **Medium** sensitivity to the proposed turbine lights. The introduction of 39 lit turbines in the adjacent LCT to the north would result in a notable change within a localised part of the LCT and therefore a **Medium** magnitude of change. At times of reduced visibility when the aviation lights could be on during the day, the profiles of these mountains would be less prominent. It was therefore assessed that the proposed aviation lighting could result in a localised alteration to the sense of isolation of the Lone Mountains at dusk and dawn. There would therefore be a **Moderate** and thus significant effect to the LCT.

ROUNDED - HILLS - CAITHNESS AND SUTHERLAND LCT (135)

- 3.12
- This LCT occurs extensively across Caithness and Sutherland. The rolling hills form broad rounded summits that often form the site slopes containing straths. Closer to the coast, the slopes are often steeper than in the more inland areas. These hills are incised by narrow burns and small lochans on the plateau summits. Wind farms are present within the LCT and therefore the turbines of the Proposed Varied Development, whilst not within this LCT, would not represent a new feature within the daytime context of the LCT. The key characteristics of the LCT as described in the character assessment do not describe the landscape during hours of darkness. However, where it occurs within the Detailed Study Area, this LCT can be characterised as a dark landscape with little influence of artificial light. This landscape was considered to have a **Low-Medium** sensitivity to the type of development proposed.
- 3.13
- Within the Detailed Study Area aviation lighting would result in a noticeable change within a localised part of the landscape character and therefore a **Medium** magnitude of change. However, it is unlikely that the proposed aviation lights would affect the intrinsic landscape character of the area. They would be locally influential due to their close proximity and as a result it was assessed that the aviation lighting would have a **Moderate** and therefore significant effect on the units of this LCT that occur within the Detailed Study Area.

WLA 39: EAST HALLADALE FLOWS

- 3.14
- This WLA is located to the east of the site. The Proposed Varied Development would appear larger and closer than Strathly North wind farm during the hours of daylight and would affect a new part of the context where little perceived contemporary land use or development is present. In areas towards the western and northern boundaries, and further to the east within the south-eastern section, the daytime effects would be less. These areas, particularly the western and northern boundary areas, have a lower sensitivity due to increased influence of existing features and contemporary land use. The western landscape is also less influential on these areas: in the west and north the Proposed Varied Development would be seen as more a part of the surrounding context and less associated with the WLA and therefore the effect would be seen as more indirect; to the east, intervening landform starts to interrupt the view towards this area and therefore it does not appear to increase the extent of the WLA in the same way. However, in these areas the Proposed Varied Development would introduce a new man-made focus and could still lead to a distraction within some views.

- 3.15
- The Key Qualities of the WLA do not specifically describe the landscape during hours of darkness. However, due to its remote nature, particularly within the central parts, the WLA can be characterised as a dark landscape with little influence of artificial light. The WLA is therefore considered to have a **Low-Medium** sensitivity to the type of development proposed.
- 3.16
- The introduction of aviation lights on 39 turbines into the adjacent landscape would result in localised areas experiencing a **Medium** magnitude of change. As visibility of the aviation lighting across the majority of the WLA would be limited to the western edge it was assessed that this would result in a **Minor** (not significant) overall effect with localised **Moderate** (significant) effect to the LCT. This would largely be due to the potential for the proposed aviation lighting to influence the *Wide Skies* and *Open and Extensive Visibility* Key Qualities at dusk and in low light in views westward towards Ben Hope and Ben Loyal.
- Effects Likely to be Not Significant
- MINOR TO MODERATE LANDSCAPE EFFECTS
- 3.17
- A **Minor - Moderate** (not significant) landscape effect was identified for Bens Griam and Loch nan Clàr SLA and Strath – Caithness and Sutherland LCT (142) and localise parts of the Kyle of Tongue NSA, Farr Bay, Strathly and Portskerra SLA, WLA 36: Causeymire – Knockfin Flows. Aviation lighting on the Proposed Varied Development, would affect the wider landscape context outwith these landscape receptors.
- 3.18
- The Bens Griam and Loch Clàr SLA has a strong sense of remoteness, wildness and space particularly in its interior. Although the characteristics of the SLA during the hours of darkness are not specifically discussed in the citation, the areas sense of isolation and remoteness are undoubtedly enhanced by the dark nature of the surrounding landscape at night. While the SLA itself would be highly sensitive to the introduction of artificial lighting within its boundaries, aviation lighting on the Proposed Varied Development would be located approximately 7 km to the north at their closest visible point. Additionally, as shown on TA Figure 4.10.3 visibility of the aviation lights would be limited to the north facing slopes of Ben Griam Beg, Ben Griam Mòr and Beinn a’ Mhadaidh. More distant sources of artificial lighting can already be seen from within the SLA and as such while located in closer proximity, the proposed aviation lighting would not introduce a wholly new feature into the surrounding landscape context of the SLA. As a result, the SLA has been assessed has having a **Medium** level of sensitivity to the proposed aviation lighting. Due to the predicted notable changes in very localised parts of the SLA a **Low-Medium** magnitude of change was identified.
- 3.19
- Given the above it was assessed that aviation lighting on the Proposed Varied development would result in an inappreciable alteration to the intrinsic special qualities of the SLA. As shown by the ZTV on TA Figure 4.10.3 extensive areas of the SLA would remain unaffected by aviation lighting on the Proposed Varied Development, allowing individuals seeking Accessible Solitude (particularly in the interior of the SLA) to find it. Likewise, the Flow Country Views would only be affected within a small part of the SLA. A **Minor – Moderate** (not significant) effect was therefore identified for the SLA.
- 3.20
- The Strath – Caithness and Sutherland LCT includes all of the major straths in Caithness and Sutherland. Within the Detailed Study Area this includes Strathly Halladale and Strathnaver. These straths create linear spaces, with open floors containing rivers. Water is a key characteristic across all of the straths with a central river meandering across the floodplain, often traced by clumps of birch and alder. The side slopes channel views obtained from the narrow roads running along the edge of the floodplain. While the straths are relatively well-settled, they remain dark landscapes at night with a distinctly rural sense of place emphasised by the pastures and fields located within the floodplain. The main sources of artificial light come from the scattered dwellings and passing vehicles.

- 3.21
- The ZTV indicates that the visibility of aviation lighting on the Proposed Varied Development within this LCT would largely be limited to the upper slopes but that all 39 lit turbines could be visible from some very localised areas. Given the presence of existing artificial lights within the LCT the sensitivity to the proposals was assessed to be **Medium**. The introduction of aviation lighting approximately 5 km to the east at the closest visible point and its limited potential visibility across the two units of the LCT within the Detailed Study Area was judged to represent a **Low-Medium** magnitude of change. It was therefore judged that aviation lighting on the Proposed Varied Development would result in a **Minor-Moderate** and therefore not significant effect to the LCT.
- 3.22
- Negligible** overall effects with areas of Localised **Minor – Moderate** and therefore not significant effects were identified for the Kyle of Tongue NSA, Farr Bay, Strathly and Portskerra SLA and WLA 36: Causeymire – Knockfin Flows. As with most of the Detailed Study Area these landscapes are generally considered to be characterised by darkness outside of the settlements that dot the coastline at night. While the Proposed Varied Development could increase the prominence of wind turbines in the surrounding context during the hours of daylight, given the scattered settlements and associated artificial lighting along the coast it would not introduce a new feature within surrounding context of the NSA or the SLA. While the parts of the WLA that fall within the Detailed Study Area are less influenced by artificial lights associated with the coastal settlement, they are located over 15 km southeast from the Proposed Varied Development turbines. Given the small areas affected within these receptors and distance to the Proposed Varied Development, the introduction of aviation lighting on the Proposed Varied Development would be very unlikely to lead to any noticeable reduction to the scenic quality or change to the intrinsic landscape characteristics or special qualities of these landscapes.
- MINOR LANDSCAPE EFFECTS
- 3.23
- Minor** (not significant) effects would be anticipated for the Rocky Hills and Moorland LCT (136). Located approximately 4 km northwest of the Proposed Varied Development turbines at its closest point, the LCT is considered to have a **Low-Medium** sensitivity to aviation lighting on the Proposed Varied Development largely due to its proximity to other sources of artificial light (i.e. passing vehicles and dwellings) and the scattered pattern of theoretical visibility. While aviation lighting on the Proposed Varied Development would not directly affect the distinctive dips, straths and glens and knolls of the LCT, it could result in perceptible changes to the sense of seclusion within localised areas and therefore a **Low-Medium** magnitude of change. It was considered that while the aviation lighting may be locally influential, it would not result in an appreciable alteration to the intrinsic landscape character of the area. There would therefore be a **Minor** and thus not significant effect to the LCT.
- 3.24
- Residual Lighting Effects on Landscape Receptors Summary Anticipated effects on designated and protected landscapes and LCTs are summarised in Table 4.10.2 below. For the purposes of this assessment, effects with a **Moderate** rating or greater are considered to be significant.

Table 4.10.2: Residual Lighting Effects on Landscape Receptors Summary							
	Not Significant				Significant		
	Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Lone Mountains LCT (138)					x		
Rocky Hills and Moorland LCT (136)			x				
Rounded Hills – Caithness and Sutherland LCT (135)					x		
Strath – Caithness and Sutherland LCT (142)				x			
Sweeping Moorland and Flows LCT (134)					x		
Kyle of Tongue NSA	x			(L)			
Farr Bay, Strathly and Portskerra SLA	x			(L)			
Bens Griam and Loch nan Clar SLA				x			
WLA 36: Causeymire – Knockfin Flows	x			(L)			
WLA 39: East Halladale Flows WLA			x		(L)		
(L) – Denotes that the effect would be localised to only part of the landscape receptor within the Detailed Study Area.							

- 3.25 Residual Lighting Effects on Visual Amenity The visual receptors within the Detailed Study Area are illustrated on TA Figure 4.10.4. Areas with theoretical visibility are illustrated through the use of a hub height ZTV. The receptors most likely to experience significant effects as a result of the introduction of aviation lighting are those in close proximity where the lighting would represent a notable change to the view. This section discusses the findings of the aviation lighting assessment undertaken for the Proposed Varied Development.
- 3.26 The following receptors within the Detailed Study Area were identified as having the potential to experience effects as a result of the turbine lighting.

Viewpoints

- 3.27 Ten of the viewpoints included in the LVIA fell within the study area for the aviation lighting assessment. These are detailed in Table 4.10.3 below. These VPs were considered to be representative of the range of views likely to be obtained during low light or dark conditions. While all of the viewpoints were all visited during both hours of daylight, due to health and safety concerns only roadside viewpoints were visited during the hours of darkness. In consultation with SNH and THC, four of these viewpoints were selected as the locations for visualisations of the aviation lighting (see Table 4.10.3 below).

Table 4.10.3: Turbine Lighting Assessment Viewpoints			
LVIA Viewpoint Number	Location	Grid Reference**	Receptor Type
VP1	Ben Griam Beg	283185, 941167	SLA / Viewpoint
VP2	Cnoc Riabhach	292003, 937695	WLA 36
VP3*	Loch nan Clach Geala	295343, 957116	WLA 39
VP4*	View from east of Melvich	291980, 964461	Route
VP5*	View from Strathly	284166, 965031	Settlement
VP6	View from Bettyhill viewpoint	274862, 961925	Route
VP7*	View from A836 west of the B871 (nr Borgie)	269489, 957272	Route
VP8	Sgor Chaonasaid	257961, 949822	NSA / WLA 38
VP10	Beinn Ratha	294954, 960923	WLA 39
VP11	Forsinard	288982, 942360	Settlement / Route
* Photomontage provided: Photographs taken at twilight as per current good practice, Visual Representation of Wind Farms Guidance (Version 2.2) ³ . The photomontage for VP3 is based on a manipulation of the daytime photograph to match the conditions of the other baseline twilight photographs. **Turbine lighting assessment viewpoints have been located as close as possible to those for the main LVIA. However, some have been slightly relocated for safety reasons.			

Routes

- 3.28 Based on the hub height ZTV diagram, the following receptors within the Detailed Study Area were identified as having the potential to experience effects as a result of the aviation lighting (see TA Figure 4.10.4):
- A836 (Tongue – eastern edge of Detailed Study Area) (NC500/ Cycle Route 1);
 - A836 Tongue to detailed study area;
 - A897;
 - B871 (North);
 - B871 (South);
 - B873;
 - Far North Railway;
 - Scottish Hill Track 344: Strath Halladale (Trantlebeg) to Strathly;
 - Scottish Hill Track 342 – Crask Inn to Badanloch Lodge;
 - Scottish Hill Track 343 Halkirk to Forsinain or Braemore;
 - Core Path SU04.02 – Torrisdale – Invernaver, Coast Route;
 - Core Path SU04.04 – Clachan Burn (Bettyhill to Bettyhill Community Turbines Loop);
 - Core Path SU04.05 – Kirtomy – Cnoc Mor circuit; and
 - Core Path SU24.05 – Ben Tongue Circuit.

Settlements

- 3.29 There are four larger settlements within the Detailed Study Area, Bettyhill, Strathly, Melvich and Tongue.
- 3.30 The ZTV shows that there is very limited or no potential visibility of the proposed aviation lighting from Bettyhill, Melvich or Tongue. Artificial lighting is already present in each of these

communities in the form of streetlights, domestic lights and other lights such as at the local hotels. While these are not overly bright landscapes it is unlikely that the introduction of the proposed aviation lighting would be noticeable even on the outskirts. As such, these communities are scoped out of further assessment.

- 3.31
- Of the 11 settlement receptors identified for inclusion in the LVIA, eight were identified as having the potential to experience effects as a result of the aviation lighting based on the ZTV diagram (see TA Figure 4.10.4). The following receptors within the Detailed Study Area were identified as having the potential to experience effects as a result of the aviation lighting on the Proposed Varied Developments:
- Strathy (North of the A836 and east of the River Strathy);

Strathy (South of the A836 and East of the River Strathy);

Strathy (West of the River Strathy);

Strathy Point;

Lednagullin;

Crask / Farr;

Skelpick; and

Forsinard.

Effects Likely to Be Significant

SCOTTISH HILL TRACK 344: STRATH HALLADALE (TRANTLEBEG) TO STRATHY

- 3.32
- This recreational route passes through a changeable landscape. Large parts of the surrounding coniferous planting have been felled, opening up views during the day to the surrounding ‘Flow Country’ moorland and bog as part of nature conservation efforts. The Bens Griam dominate views from the southern portion of the route. Strathy North wind farm is prominent in views obtained along much of the route, particularly the northern section that passes very close to it. Beside Strathy North wind farm there are very few potential sources of artificial light along this route, until it begins to approach Strathy. Visual sensitivity of the route is therefore considered to be **Medium-High**. The introduction of lit turbines would represent a noticeable change to views obtained from this route, particularly along the middle stretch where it passes through the site. This would lead to a **Medium-High** magnitude of change leading to a **Moderate-Major** (significant) visual effect. This is largely due to the potential for the aviation lighting to influence the perception of remoteness along this otherwise dark route at night.

VIEWPOINT 4 – VIEW FROM EAST OF MELVICH

- 3.33
- This viewpoint is located on the A836 to the northeast of the site. It is representative of middle to longer distance views that users including commuters travelling westward along this road could experience as they pass from Caithness into Sutherland. During daylight hours, this viewpoint offers views from A-road over the surrounding area with a number of power lines crossing the views with Strathy North wind farm visible over the horizon line. The baseline dusk view is one with limited artificial light. The lights at Dounreay Power station can be made out in the distance to the east as a regularly spaced grouping.
- 3.34
- Similar to the daytime baseline, views obtained during the hours of darkness are channelled along the road eastward and westward, with the ridgeline of the distant rolling hills prominent against the dusk sky. Views to the north and south of the road are somewhat restricted due to the road’s position within the rolling moorland landscape.
- 3.35
- The photomontage for this viewpoint (TA Figure 4.10.6c) indicates that aviation lighting would be seen against the sky over the ridge to the southwest in the middle distance. It also shows that the turbine tower lights would be hidden behind the ridgeline and not visible from this viewpoint.

- 3.36
- The introduction of aviation lighting on the Proposed Varied Development into the baseline view would result in a **Medium** magnitude of change to a viewpoint with **Medium** visual sensitivity. It was assessed that the introduction of the aviation lighting would result in a **Moderate** and therefore significant effect to the viewpoint largely due to the absence of other artificial lighting in the view obtained by the viewer.

VIEWPOINT 5 – VIEW FROM STRATHY

- 3.37
- This viewpoint is located on the A836 within Strathy near Cnoc Tuthcaid and is representative of worst-case scenario views obtained from the settlement and nearby areas. It is also representative of the views drivers could get as they pass through the settlement. Daytime views are focused along the A836 towards the east and west with distant views restricted by the rolling hills. There are open views to the south over low lying grassland before the ground slopes up towards the hills. Strathy North wind farm is visible over the ridgeline. Residential properties form a linear feature along the single track road to the south defining the edge of the foreground field system.
- 3.38
- Dusk views obtained by the viewer would be similar to their daytime counterparts however, as the light faded, they would become more focused on the road and ridgelines against the sky. The scattered farmsteads and dwellings provide some baseline artificial light in addition to the cars passing through. TA Figure 4.10.7c illustrates that aviation lighting would be seen to the south over the ridgeline against the sky in a relatively dark part of the surrounding landscape. In dusk light the Strathy North wind farm would be visible in the foreground, but it would fade from view as the sky grew darker.
- 3.39
- The introduction of aviation lighting on the Proposed Varied Development would result in a **Medium** magnitude of change to a viewpoint with **Medium** visual sensitivity. It was assessed that this introduction would result in a **Moderate** and therefore significant effect to the viewpoint, largely due to the sensitivity of the settlement set within an otherwise largely dark landscape.

VIEWPOINT 7 – VIEW FROM A936 WEST OF THE B871 (NR BORGIE)

- 3.40
- This viewpoint is found on the A836 to the northwest of the proposal. It is representative of middle distance views drivers would get from this stretch of the A-road and potential worst case scenario views on the descent into Strathnaver from the west.
- 3.41
- The main views obtained from this viewpoint regardless of the time of day are along the A836 towards the east and west. Views to the north and south are restricted by the simple rolling moorland covered in low level vegetation. Longer distance views are largely restricted by the intervening topography with some rolling hills seen in the distance to the south and east.
- 3.42
- The aviation lighting on the Proposed Varied Development would be visible in the distance to the southeast over the ridgeline against the sky (see TA Figure 4.10.8c). As the only other baseline artificial lighting at this viewpoint is from passing cars, this would represent a new feature within the otherwise dark landscape.
- 3.43
- The introduction of aviation lighting on the Proposed Varied Development to this **Medium** sensitivity viewpoint would result in a **High** magnitude of change. It was assessed that the resulting effect would be **Moderate** and therefore significant. While the change would be very noticeable as it would be within the main view of those travelling eastward, it would represent a distant change to only one part of the much larger dark surroundings.

VIEWPOINT 11 - FORSINARD

- 3.44
- This viewpoint is located near Forsinard Flows NNR at the junction of the A897 and Far North Line on the edge of the Bens Griam and Loch nan Clar SLA. It is representative of the views which could be obtained by road/rail users and visitors to the RSPB Forsinard Flows Visitor Centre to the southeast of the site.

- 3.45 The main view is to the south along the A897 across a low lying landscape to the hills in the distance. Ben Griam Beg, Ben Griam Mòr and Meall a’ Bhùirich are prominent against the skyline to the southwest. Towards the west the RSPB Flows Lookout is visible standing within the peatland pools of the blanket bog landscape. Views to the north are restricted by the trees that make up the shelterbelt around the Forsinard Railway Station and surrounding buildings, while commercial forestry restricts views to the southeast. This results in a dark landscape when the sun sets, with the only artificial lights coming from the small collection of buildings surrounding the station and from passing vehicles.
- 3.46 The LVIA wirelines (see Figure 4.18b (EIAR Volume 3b)) indicate that four turbine hubs and therefore aviation lights would be visible from this viewpoint to the northwest over the ridge against the skyline. As this viewpoint is likely to be visited by birdwatchers at dusk and dawn with the expectation that it will be a dark landscape, it is identified as being **Highly** sensitivity to the introduction of artificial light. The introduction of four aviation lights against the skyline would be noticeable and would represent a **Medium** magnitude of change. The proposals would introduce some detracting features to an existing highly valued view and would have a **Moderate** (significant) effect largely focused around the predicted effects at dusk.
- STRATHY – ALL PARTS (NORTH OF THE A836 AND EAST OF THE RIVER STRATHY, SOUTH OF THE A836 AND EAST OF THE RIVER STRATHY AND WEST OF THE RIVER STRATHY)*
- 3.47 Strathy is a dispersed settlement. Existing artificial lights are largely limited to domestic lights and community amenities, such as the hall. The ZTV shows that due to variations in topography visibility of aviation lighting on the Proposed Varied Development would be scattered and intermittent. As a result, Strathy is considered to have localised **Medium** sensitivity to the aviation lighting on the Proposed Varied Development, while the wider settlement is considered to have a **Low** sensitivity. The introduction of turbine lighting into the skies to the south would be a notable change seen at a distance of approximately 12-14 km. This would result in a localised **Medium** magnitude of change and localised **Moderate** and therefore locally significant effect where aviation lighting was visible. There would be a **Negligible** (not significant) and therefore not significant effect in the wider parts of the community where aviation lighting was not visible.
- A836 (TONGUE – EASTERN EDGE OF DETAILED STUDY AREA) (NC500/ CYCLE ROUTE 1), A897 AND B871 (NORTH)*
- 3.48 The three main roads within the Detailed Study Area that fall within the ZTV are the A836, the A897 and the B871. With the exception of the A836 when it passes through the settlements discussed above, these three roads are generally dark with no street lighting and limited artificial light from other sources. The roads are narrow and winding and in the case of the A897 and B871 single-track. Driving these roads during hours of darkness or even low light, requires the full attention of the driver on the road ahead. These routes are therefore considered to be of **Medium** sensitivity. Whilst aviation lighting on the Proposed Varied Development would be theoretically visible from some sections of these roads, users’ attention would generally be focused on the immediate area in front of the car illuminated by the headlights. As a result, the lighting would be perceived as part of the wider background. Aviation lights could be more prominent in sections where they appeared in the direction of travel, however, the undulating nature of the surrounding landscape would mean that they were only visible for short stretches at a time as drivers travelled through the area. As a result, it was considered that they would result in localised **Medium** magnitude of change for each of the three routes. Due to the intermittent and limited nature of visibility along the three routes, predicted effects were assessed to be **Minor** (not significant) overall with some localised areas of **Moderate** (significant) effect.

Effects Likely to be Not Significant

MINOR – MODERATE EFFECTS

- 3.49 From the summit of Ben Griam Beg, to the south of the site, has 360° panoramic views can be obtained across the landscape during the daytime. Much of the detail of this surrounding landscape would become lost during the hours of full darkness. However, during dusk and other low light conditions, Ben Graim Mòr and Meall a’ Bhuirich to the south and the distinctive western mountain ranges would likely still be influential on perceptions of the surrounding landscape. Existing artificial light is limited to the settlement clusters along the coast, small scattered farmsteads along the straths and the lights of the odd passing car. Sensitivity is considered to be **Medium** as aviation lighting on the Proposed Varied Development would not introduce a wholly new feature into the surrounding landscape. The changes to views northward would represent a notable change to one part of the wider view and therefore a **Low-Medium** magnitude of change was identified. Given that the wider surrounding landscape would remain largely dark and that artificial lighting is already present, a **Minor-Moderate** (not-significant) predicted effect was identified.
- MINOR EFFECTS*
- 3.50 A **Minor** (not significant) effect was identified for one of the VPs, four of the routes, four of the settlements and residential groupings, and localised parts of one other route included in the assessment (see Table 4.10.4 below for details). From these receptors, visibility would often be intermittent and / or distant. Aviation lighting on the Proposed Varied Development would comprise either a new and perceptible feature within a small part of the wider context or a small additional feature where existing artificial lighting is more prominent. This would lead to a minimal reduction in the quality of the view experienced from the receptors and therefore the effect would be not significant.
- 3.51 Daytime views obtained from VP2: Cnoc Riabhach are extensive towards the west and south-west, if somewhat more constrained by undulating moorland in other directions. The simple landscape has few existing sources of artificial light to interrupt the otherwise dark expanse at night. As such, it was identified to have a **Medium** sensitivity to the introduction of turbine lighting in the distance. Given the distance and direction of the proposed aviation lighting, it was considered that this would result in a **Low-Medium** magnitude of change. This would represent a small deterioration to a part the wider existing view and therefore a **Minor** (not significant) effect.
- 3.52 Lednagullin is located to the west of Strathy off the A836 overlooking Armadale Bay. The ZTV indicates that there would be theoretical visibility of aviation lighting from the dwellings closest to the A836. The surrounding landform slopes towards Armadale Bay provides viewers with wide open views to the northwest and restricted views to the south. Where visible, the aviation lighting would appear in the sky over the horizon to the south. As this a less important part of the overall view, but one that would still be experienced on a regular basis by residents as the made their way towards the A836, Lednagullin was identified to have a **Low-Medium** sensitivity to the introduction of aviation lighting. Given the distance and direction of the proposed aviation lighting, it was considered that they would result in a **Low-Medium** magnitude of change. This would represent a small deterioration to a part the wider existing view and therefore a **Minor** (not significant) effect.
- 3.53 Crask is located to the east of Bettyhill off of the A836 to the northwest of the site. It is made up of a number of scattered properties, the majority of which are off a single track road travelling east-west. Farr Bay draws viewers’ attention towards the water and Ben Hope and Ben Loyal are visible in the distance to the west. As the sun sets, these views draw the eye to the northwest. The settlement was considered to have a **Medium** sensitivity to the Proposed Varied Development as it would not alter the main view. The ZTV indicates that aviation lighting would be theoretically visible from parts of the settlement. This would likely result in a perceptible-noticeable and therefore **Low-Medium** change to the existing views to the southeast. Given the distance to

proposal, the introduction of the aviation lighting would likely result in a small deterioration to a small part of the much wider landscape and therefore a **Minor** (not significant) effect.

- 3.54 Skelpick is located to the northwest of the site within Strathnaver. The properties along the single track road are generally well spaced with views over and along the Strath. The surrounding landform focuses views to the north and south. The ZTV indicates that aviation lighting would be theoretically visible from parts of the community. Given the dark nature of this rural landscape it is likely that most activities undertaken by residents after sunset will take place indoors or with the aid of artificial outdoor lighting. As a result, Skelpick is identified as having a **Low-Medium** level of sensitivity to the proposed aviation lighting. As shown by the ZTV the topography of the surrounding area will limit the extent to which the aviation lighting would be theoretically visible. Local obstructions including trees and outbuildings would further limit these views. It was therefore judged that the proposals would result in a perceptible change and therefore **Low** magnitude of change and a **Minor** (not significant) effect.
- 3.55 Strathy Point is a linear settlement overlooking Strathy Bay. Existing artificial lights are largely limited to domestic lights within the community. The ZTV shows that due to variations in topography, visibility of the proposed lighting would be scattered and intermittent. As a result, this receptor is considered to have a **Low** sensitivity to the proposed aviation lighting, with localised areas of **Medium** sensitivity. The introduction of aviation lighting into the skies to the south could result in a perceptible change, however given the distance and intermittent visibility, this would be a localised **Low-Medium** magnitude of change. This would represent a small deterioration to a part the wider existing view and therefore a **Minor** (not significant) effect.
- 3.56 The three core paths leading off of the A836 to the northwest of the site (Core Path SU04.04 – Clachan Burn (Bettyhill to Bettyhill Community Turbines Loop), Core Path SU04.05 – Kirtomy – Cnoc Mor circuit and Core Path SU24.05 – Ben Tongue Circuit) all experience similar existing levels of artificial lighting. These include lighting from the nearby settlements, scattered farmsteads and passing vehicles on the A836. As such, they are considered to have a **Low-Medium** sensitivity to the introduction of turbine lighting. The addition of aviation lighting on the Proposed Varied Development to the south-east would represent a perceptible **Low-Medium** change in views obtained from the route which are otherwise largely dark. This addition would represent a small deterioration to a part the wider existing view and therefore a **Minor** (not significant) effect.
- 3.57 Scottish Hill Track 343 Halkirk to Forsinain or Braemore is a remote recreational route through a largely dark landscape. It is likely that mature forestry would screen much of the theoretical visibility of the aviation lighting, however where visible it would represent a perceptible change within the surrounding landscape. The route is considered to a **Low-Medium** sensitivity to the introduction of turbine lighting. Where visible, the addition of aviation lighting would represent a **Low-Medium** change and a small deterioration to a part of the view obtained and therefore a **Minor** (not significant) effect.
- 3.58 The A836 from Tongue to the edge of the Detailed Study Area travel generally north / south across open, dark and remote moorland. Artificial lighting is largely limited to passing vehicles using the route. As such the sensitivity of this transportation route to the introduction of artificial light is considered to be **Medium**. Visibility of the aviation lighting on the Proposed Varied Development would be limited to distant views against the skyline to the east, obtained from a small part of the northern section of the route. From the southern part of the route, a very small number of aviation lights would be visible across Loch Loyal. This would result in a localised perceptible change and therefore **Negligible** (Localised **Low**) magnitude of change. Given the limited visibility, visual effects would be considered to be **Negligible** (not significant) for the overall route with some localised areas experiencing **Minor** (not significant) effects.

NEGLIGIBLE – MINOR EFFECTS

- 3.59 Effects on the Forsinard residential grouping would be considered to be **Negligible – Minor** (not significant) largely due to the screening provided by the mature woodlands that surround it. It was considered that while a small number of the aviation lights could be perceptible from the approach to the settlement from the south they would not lead to any discernible change within the settlement.
- 3.60 Effects on Core Path SU04.02 – Torrisdale – Invernaver, Coast Route, would be considered to be **Negligible – Minor** (not significant) largely due to the distance, limited visibility and influence of artificial lighting at Bettyhill.
- 3.61 Given the constrained views and influence of internal train lighting limiting travellers’ views outward onto the dark landscape obtained from the Far North Railway, effects on this route would be considered to be **Negligible – Minor** (not significant).
- 3.62 Residual Lighting Effects on Visual Amenity Summary Predicted effects on visual receptors are summarised in Table 4.10.4 below. For the purposes of this assessment, effects with a **Moderate** rating or greater are considered to be significant.

Table 4.10.4: Residual Lighting Effects on Visual Amenity Summary							
Receptor	Not Significant				Significant		
	Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Viewpoints							
VP1: Ben Griam Beg				x			
VP2: Cnoc Riabhach			x				
VP3: Loch nan Clach Geala					x		
VP4: East of Melvich					x		
VP5: Strathy					x		
VP6: Bettyhill Viewpoint							
VP7: A836 west of the B871					x		
VP8: Sgor Chaonasaid				x			
VP10: Beinn Ratha					x		
VP11: Forsinard					x		
Routes							
A836 (Tongue – eastern edge of Detailed Study Area) (NC500/ Cycle Route 1)			x		(L)		
A836 Tongue to Detailed Study Area	x		(L)				
A897			x		(L)		
B871 (North)			x		(L)		
Far North Railway		x					
Scottish Hill Track 344: Strath Halladale (Trantlebeg) to Strathy						x	

Table 4.10.4: Residual Lighting Effects on Visual Amenity Summary							
Receptor	Not Significant				Significant		
	Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Scottish Hill Track 343 Halkirk to Forsinain or Braemore			x				
Core Path SU04.02 – Torrisdale – Invernaver, Coast Route		x					
Core Path SU04.04 – Clachan Burn (Bettyhill to Bettyhill Community Turbines Loop)			x				
Core Path SU04.05 – Kirtomy – Cnoc Mor circuit			x				
Core Path SU24.05 – Ben Tongue Circuit			x				
Settlements							
Strathy (North of the A836 and east of the River Strathy)			x		(L)		
Strathy (South of the A836 and East of the River Strathy)			x		(L)		
Strathy (West of the River Strathy)	x						
Strathy Point			x				
Lednagullin			x				
Crask / Farr			x				
Skelpick			x				
Forsinard		x					
(L) – Denotes that the effect would be localised to only part of the visual receptor within the Detailed Study Area.							

4 Conclusion





4.1 As summarised in Tables 4.10.2 and 4.10.4 above, three landscape receptors, localised parts of one landscape receptor, seven visual receptors and localised parts of five additional visible receptors were assessed as having potential to experience significant adverse effects (i.e. Moderate or above) as a result of aviation lighting on the Proposed Varied Development (as described in paragraph 1.4). This would largely be due to the absence of artificial light within the Detailed Study Area and the fact that receptors would therefore generally be more sensitive to this type of change. The large number of bright red aviation lights that would be seen, and in many cases appearing to flash or flicker due to either overlapping and / or intervening blades, would result in significant adverse effects.

4.2 Discussions with aviation stakeholders is currently underway and, and a draft aviation lighting strategy for the Proposed Varied Development has been submitted to the CAA for discussion. The outcome of which could result in reduced landscape visual effects through measures such as:





- Reduction of aviation lighting intensity during good visibility (greater than 5 km) as permitted by the CAA;
- Use of radar activated aviation lighting should this be approved and be an economically viable option; and
- Use of cardinal or strategic aviation lighting of selected turbines to limit the spread of theoretical visibility.

ANNEX 1: TECHNICAL APPENDIX 4.10 FIGURES

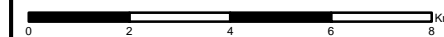
Key

-  Site Boundary
-  Turbine
-  20 km Detailed Study Area
-  5 km Distance Radii

Hub Height Zone of Theoretical Visibility (ZTV): Number of Turbine Hubs Theoretically Visible

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 39

Scale 1:150,000@ A3



TA Figure 4.10.1.a
Hub Height ZTV

Strathy South Wind Farm
EIAR 2020

