Appendix A – LVIA Methodology

Introduction

The current best practice and guidance for Landscape and Visual Impact Assessment (LVIA) for wind farms needs to be adapted to take account of project specific factors. These include the size and scale of the development (i.e. numbers of turbines and their overall heights), the presence of other wind development in the study area (the extent of which depends on the height of turbines proposed), and location of the development (Council areas have guidance specific to their administrative area). For these reasons, it is usual to agree a scope for the landscape and visual assessment with the statutory authorities. This appendix aims to explain the adopted approach and methodology in context of the legislative background and the scope of the LVIA agreed with the statutory authorities, i.e. Argyll and Bute Council.

Scope and Method of Assessment

Given the height of the proposed turbines (86.5m to blade tip), a 30km study area was applied.

Following OS base analysis and assessment of the initial ZTV, a preliminary list of viewpoints was prepared by Locogen Ltd. The viewpoints were chosen to represent a range of receptors in the study area, located at different distances, directions and heights relative to the proposed development. Following a meeting with planning officers regarding the proposed development, a Proposed Viewpoints Location Plan Overlaid onto the ZTV (suggesting 11 viewpoints in total) was emailed to Argyll and Bute Council (dated 2 February 2015) and subsequently agreed, prior to the production of visualisations and the progression of the LVIA.

A review of the existing landscape and visual characteristics of the study area with reference to its key features, perceived value and sensitivity to development of the nature proposed, forms the initial stage of the LVIA. The data gained from this review provides the baseline against which to assess the magnitude and significance of potential impacts arising from the proposed development.

Guidance

The LVIA for the proposed wind energy development has been based on guidelines provided in the following publications:

- Landscape Character Assessment: Guidance for England and Scotland, The Countryside Agency and Scottish Natural Heritage (2002);
- Guidelines for Landscape and Visual Impact Assessment, Landscape Institute and Institute of Environmental Assessment (3rd Edition, 2013);
- Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes, Scottish Natural Heritage (2001);
- Visual Assessment of Wind Farms Best Practice, University of Newcastle, Scottish Natural Heritage Commissioned Report (2002).
- Visual Analysis of Wind Farms Good Practice Guidance, Scottish Natural Heritage (2006);
- Visual Representation of Windfarms: Good Practice Guidance, Scottish Natural Heritage (2006);
- Visual Representation of Wind Farms (May 2014);

- Siting and Designing Wind Farms in the Landscape (Version 1, December 2009);
- Strategic Locational Guidance for Onshore Wind farms in respect of the Natural Heritage, (March 2009);
- Scottish Planning Policy (SPP, 2014);
- Guidance, Assessing the Cumulative Impact of Onshore Wind Energy Developments, Scottish Natural Heritage (March 2012);
- Guidance, Cumulative Effect of Windfarms, Scottish Natural Heritage, (Version 2 revised 13th April 2005);
- Guidance, Assessing the Impact of Small-Scale Wind Energy Proposals on the Natural Heritage, Scottish Natural Heritage (February 2011);
- PAN 45 replacement, Scottish Government Notes: Onshore Wind Turbines (updated August 2012);
- PAN 45 replacement, Scottish Government Notes: Process for Preparing Spatial Frameworks for Wind Farms (updated August 2012); and
- Advice on Assessing the Impacts of Development Upon the Integrity of National Scenic Areas (November 2013).

Evaluation of the Existing Environment – the Baseline

The baseline review is undertaken through desk-based data review followed by a site survey to verify the findings, and then analysis of the data.

Desk Based Data Review

Existing mapping, legislation, policy documents and other written, graphic and digital data relating to the proposal and broader study area was reviewed. This included the following documents:

- Scottish Planning Policy (SPP, 2014);
- Argyll and Bute Local Development Plan (March 2015);
- Inverclyde Local Development Plan (August 2014);
- North Ayrshire Local Development Plan (May 2014);
- Loch Lomond and the Trossachs Local Plan (December 2011);
- Argyll and Bute Landscape Character Assessment;
- Ayrshire Landscape Character Assessment;
- Loch Lomond and the Trossachs National Park Landscape Character Assessment;
- The Inventory of Gardens and Designed Landscapes in Scotland;
- Ordnance Survey maps; and
- Digital sources of mapping and aerial photography.

The desk study also establishes the main users of the area, key viewpoints and key features, thus defining the visual baseline which requires to be verified on site. The potential visual receptors are identified and classified according to their associated use (settlements, footpaths, roads etc). The aim of the baseline review of visual resources is to ensure that an

appropriate range of viewpoints is included in the visual assessment. The potential extent of visibility of the proposed development as identified in the preliminary Zone of Theoretical Visibility (ZTV) provides the basis upon which the potential visual receptors are initially identified.

Site Survey

Field survey work is carried out to verify the landscape character types and landscape character units identified within the study area and to gain a full appreciation of the relationship between the proposed development and the landscape.

The baseline visual resource is verified during the survey work and at this time, the validity of the list of representative viewpoints used in the LVIA. Since the ZTV is based on a 1:50,000 digital terrain model, it does not capture local landform. There are times when a viewpoint selected from analysis of the ZTV does not actually have any views to the proposed development. In some instances, this can be remedied by slight adjustments of the grid references, although the location must remain relevant to the particular receptor(s) for which the viewpoint was selected.

Viewpoint Analysis

The viewpoint analysis is illustrated by a range of tools including photographs, wireframes and photomontages. The photographs used to construct the photomontages have been taken using a 50mm lens on a digital SLR camera, which is endorsed by the Landscape Institute (Guideline for Landscape and Visual Impact Assessment, 3rd Edition 2013) and SNH guidance (Visual Representation of Wind Farms: Good Practice Guidance, SNH; and, the adopted version in 2014) for photomontage production. The wireframes have been generated on the same OS digital data used to generate the ZTVs, and therefore illustrate a scenario of maximum theoretical visibility, because they do not take account of the screening effect of small scale variations in landform or vegetation.

The photomontages have been prepared by combining a wireframe of the view with the photograph of the existing view and rendering the image using a model of the proposed wind turbines, also generated electronically.

It should be noted that photography is a tool to assist in the visualisation process, and cannot be expected to replicate the actual view or predicted view that will be attained on the ground.

Whilst a worse-case view for each representative viewpoint was sought on site, and indeed, a few viewpoint locations were revised to try and obtain a view, and although the ZTV illustrated theoretical visibility for all of the viewpoint locations, in reality, a number of factors including subtleties in the local landform and tree cover, resulted in the turbines not actually being visible.

Evaluation Criteria

Identification of Landscape and Visual Effects

The impact assessment aims to identify all the potential landscape, visual and cumulative effects of the development taking account of any proposed mitigation measures.

The assessment aims to describe the changes in the character and the landscape resources that are expected to result from the proposed development. It covers both landscape effects (changes in the fabric, character and key defining characteristics of the landscape), and the visual effects (changes in available views of the landscape and the significance of those changes on people).

The table below identifies potential landscape and visual effects. Potential effects are those that could result from the construction and operation of a wind farm, according to the project,

site and receptor characteristics and their interactions. The inclusion of a potential effect in the table below does not imply that this will occur, or be significant. The assessment is based upon an assessment of the potential effects, in order to identify predicted effects.

Activity	Specific Element	Potential Effects	Potential Sensitive Receptors
Construction	Construction plant, temporary construction compound, vehicle movements	Temporary impacts on landscape fabric Temporary impacts on visual amenity	Landscapes character types Designated landscapes Gardens and designed landscapes Visual receptors: Residents, visitors, tourists, road users, walkers, cyclists
Operation	Presence of tracks, turbines, permanent site compound and substation	Long term but reversible impacts on landscape fabric Long term but reversible impacts on visual amenity Cumulative impacts with other wind farms	Landscapes character types Designated landscapes Gardens and designed landscapes Visual receptors: Residents, visitors, tourists, road users, walkers, cyclists
Decommission	Construction plant, temporary compound, vehicle movements	Temporary impacts on landscape fabric Temporary impacts on visual amenity	Landscapes character types Designated landscapes Gardens and designed landscapes Visual receptors: Residents, visitors, tourists, road users, walkers, cyclists

Potential Landscape and Visual Effects

Zone of Theoretical Visibility

In accordance with SNH guidance relating to turbine size a 30km radius study area has been identified. Zone of Theoretical Visibility (ZTV) mapping was produced to identify the potential visibility pattern of the proposed development within the study area. The ZTV was modelled using a computer based visibility analysis package, compiled using Ordnance Survey digital height data, and a three dimensional digital model of the proposal.

The ZTV of the proposal is illustrated in Drawing 176-010 and includes up to a 30km radius ZTV based on the visibility to the hubs and blade tips of the rotor blades on the turbines.

The ZTV is a digital model and it assumes a 'worst case visibility scenario' in that it assumes a bare land surface and takes no account of vegetation, local variations in topography or the presence of walls, buildings, hedgerows and other such objects which can substantially reduce visibility from that predicted by the ZTV. The ZTV does not account for atmospheric conditions such as haze, fog, rain, and duration of sunlight hours, which may substantially reduce visibility for extended periods. The assessment has been based on the blade tip ZTV, which means that it indicates all parts of the study area where some part of one or more turbines may be visible. Where the ZTV indicates that there is no visibility of turbines, this may be considered accurate.

The viewpoint assessment was informed using a computer generated visibility analysis carried out using Ordnance Survey Digital Terrain Model (DTM) data and a 3D model of the turbines,

based on a 86.5m blade tip height machines, located at the turbine positions shown in the site layout plan.

The Effects of Distance on Perception of Wind Farm Developments

The distance from which a wind farm is viewed will affect the viewer's perception of the wind farm. VLM Landscape Design Ltd has conducted an analysis of available guidance and other published information upon the effect of distance however, the guidance generally applies to wind turbines over 100m tall. The following documents have been reviewed:

- The former Planning Advice Note 45, Renewable Energy Technologies, Scottish Executive (revised 2002);
- Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes, Scottish Natural Heritage (2001);
- Visual Assessment of Wind Farms Best Practice, Scottish Natural Heritage Commissioned Report, University of Newcastle (2002); and
- Cumbria Wind Energy Supplementary Planning Document, Cumbria County Council Planning Guidance, Coates Associates (2007).

PAN 45 and Annex 1 & 2 has been replaced by web based renewable advice. However, new advice does not provide guidance on distance. As such, the table below which is taken from PAN 45: Renewable Energy Technologies (2002) is still relevant. It is not stated what tower height the table relates to, earlier in the document turbines of tower height >70m and rotor diameter >80m are discussed. In this regard, and given the proposed turbine height of 86.5m (to blade tip), the following table is used only as a general guide.

Distance	Perception of wind turbines
Up to 2km	Likely to be a prominent feature
2 – 5km	Relatively prominent feature
5 – 15km	Only prominent in clear visibility – seen as part of wider landscape
15 – 30km	Only seen in very clear visibility – a minor element in the landscape

General Perception of a Wind Farm in an Open Landscape

This table defines general trends, and the perception of each development will be affected by a number of factors including:

- Landform;
- Features of the landscape and built environment;
- Weather conditions;
- Season;
- Time of day;
- Direction of view; and
- Size, scale and breadth of the development.

The distances stated are guidelines only, and as such should not be used prescriptively, as perception will be affected by the range of factors listed above and the size of the proposed turbines.

Landscape Sensitivity and Magnitude of Change

The aim of the Supporting Environmental Document is to identify and evaluate potential effects arising from a proposed development. Wherever possible identified effects are quantified, however the nature of LVIA requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, criteria for the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been defined.

The sensitivity of the landscape resource is variable according to the existing landscape, its relationship to the proposed development, the nature of the development being assessed and the type of change being considered. The determination of the landscape's sensitivity to changes associated with the proposal is defined as high, medium, low or negligible. This is based on the professional interpretation of the key landscape characteristics, the scale of the landscape and the nature of views, and the perceived landscape value as reflected by landscape designations.

Criteria	High	Medium	Low
Landscape designated for its national landscape value	Landscape designated for its national landscape value High landscape value, with very strong sense of place	Landscape designated for regional or local landscape value Medium landscape value	No designations present Low landscape value (i.e. industrial landscapes), with elements that detract from sense of place
Scale of Landscape	Small scale landscape	Medium scale landscape	Large scale landscape
Views	Enclosed, medium and short distance views	Open, medium distance views	Panoramic, open and long distance views
Cultural heritage interests that contribute to landscape character	Contains features or sites of national importance	Contains sites of regional importance	Few or no features of interest

Sensitivity of Landscape Receptors

As every proposed development and its interaction with the landscape is unique, there will be situations where predefined criteria will not accurately reflect the potential residual effects. In such cases, professional judgement takes precedence and is explained in the text.

The criteria used for understanding the magnitude of landscape change are summarised below.

Level of Magnitude	Definition of Magnitude
High	Total loss or major alteration to key elements, features or characteristics of the baseline landscape so that the post development character and composition of the baseline landscape resource will be fundamentally changed.
Medium	Partial loss or alteration to one or more key elements, features or characteristics of the baseline landscape so that the post development character and composition of the baseline landscape resource will be partially, but noticeably changed.

Low	Minor loss of or to one or more key elements, features or characteristics of the baseline landscape so that the post development character and composition of the baseline landscape resource will be noticeably changed but the underlying character of the baseline landscape will be similar to the pre-development character.
Negligible	Very minor loss or alteration to one or more key elements, features or characteristics of the baseline landscape. Change to the landscape character will be barely distinguishable. No discernible effect upon the view.

Definitions of Landscape Magnitude of Change

Assessing Impacts on National Scenic Areas

In addition to the criteria above for assessing the sensitivity and magnitude of change on landscape resource, SNH has published specific advice relating to "Assessing the Impacts of Development upon the Integrity of National Scenic Areas" (November 2013). This document advises that a more detailed approach to the assessment of NSAs should be adhered to given that they will have many *"special qualities"* that underpin the reason for NSA designation. SNH define 'special qualities' as *"the characteristics that, individually or combined, give rise to an area's outstanding scenery".*

As prescribed within the document, a systematic approach to the assessment of each of the special qualities of the NSA within the study area (as identified within "The Special Qualities of the National Scenic Areas", SNH Commissioned Report No. 374, August 2010) will in turn inform professional judgement of the effect on the overall integrity of the whole designated area.

Visual Receptor Sensitivity and Magnitude of Change

The sensitivity of visual receptors depends upon:

- The location of the viewpoint;
- The context of the view;
- The activity of the receptor, such as relaxing at home, taking part in leisure, recreational and sporting activities, travelling or working;
- Whether receptors are likely to be stationary or moving and how long they will be exposed to the change at any one time;
- The extent of the area or route from which the changes would be visible;
- The frequency of the view (whether receptors will be exposed to the change daily, frequently, occasionally or rarely) and the duration of the view; and
- Orientation of receptors in relation to the development (whether views are oblique or direct).

Visual receptor sensitivity is defined as High, Medium, Low or Negligible as described in the following table.

High
Users of outdoor recreational facilities including strategic recreational footpaths, cycle routes or rights of way, whose attention may be focused on the landscape; important landscape features with physical, cultural or historic attributes; views from principal settlements; visitors to beauty spots and picnic areas.
Medium
Other footpaths, people travelling through or past the landscape on roads, train lines or other transport routes, views from passenger ferries and cruisers, views from minor settlements.
Low
People engaged in outdoor sports or recreation (other than appreciation of the landscape), and those whose attention may be focused on their work or activity rather than the wider landscape.
Negligible
Views from heavily industrialised areas or where direct views of the development are severely restricted and/or distant.

Definition of Visual Receptor Sensitivity

In practice, a location may have different levels of sensitivity, according to the different receptors at that location. The sensitivity of any one group of receptors may also be different at different locations. The specific combinations of factors that have influenced the judgement of sensitivity are described in the viewpoint baseline text.

Sensitivity of Residential Settlements

The sensitivity of any settlement to the proposed development is dependent on the orientation of the main living areas of individual dwellings. Where several dwellings are orientated in the same way, these are grouped together and considered as one receptor. For the purposes of this assessment, the general orientation of the settlements has been ascertained as far as possible by site survey and desk top study. The criteria for sensitivity of the settlements are outlined in the table below.

High
Direct views of the development from the main living room are available/may be possible.
Medium
Oblique views of the development from the main living room are available/may be possible.
Low
Very oblique views of the development are available/may be possible from main living room.
Negligible
Oblique/very oblique views of the development may be possible from the main living room, which are further limited by filtering and/or screening provided by intervening objects (e.g. trees/man-made structures etc).

Definition of Sensitivity of Residential Settlements

The magnitude of visual change arising from the development is described as High, Medium, Low or Negligible based on the overall extent of visibility. For individual viewpoints it will depend upon the combination of a range of factors:

- The distance of the viewpoint from the development and duration of effect;
- Extent of the development visible from the viewpoint (number and parts of turbines visible);
- The angle of view in relation to main receptor activity;
- The proportion of the field of view occupied by the development;
- The background to the development; and
- The extent of other built development visible, particularly vertical, elements.

Level of Magnitude	Description of Change	Definition of Magnitude
High	Dominant	Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape. The introduction of incongruous development. A high proportion of the view is affected.
Medium	Conspicuous	Noticeable, partial change to a proportion of the landscape, affecting some key characteristics and the experience of the landscape. The introduction of some uncharacteristic elements. Some of the view is affected.
Low	Apparent	Minor change, affecting some characteristics and the experience of the landscape to an extent. The introduction of elements which are not uncharacteristic. Little of the view is affected.
Negligible	Inconspicuous	Little perceptible change. No discernible effect upon the view.

Definition of Visual Magnitude of Change

Other factors may also influence the visual effect. These relate to both human perception and to the physical environment itself. Factors which tend to reduce the apparent magnitude include:

- Sky-lining of front-lit turbines (where turbines are seen against the sky and the sun is behind the viewer, thus turbines reflect light and blend more easily into the brightness of the sky);
- Landform backdrop to back-lit turbines (where turbines are back-clothed by landform and the viewer sees them silhouetted with the light behind them. In this scenario the turbines are more likely to blend into the landscape);
- An absence of visual clues;
- Turbines do not form the focal point of the view;
- A complex and varied scene; and
- High relative elevation of view.

Factors which tend to increase the apparent magnitude include the following:

- Back-grounding of turbines (where turbines are seen against a backcloth of land);
- Visual clues;
- Turbines form the focal point of the view;
- A simple scene; and

- Low relative elevation of view.

The significance of any identified landscape or visual effect has been assessed as Major, Moderate, Minor or Negligible / None effect. These categories have been determined by consideration of viewpoint or landscape sensitivity and predicted magnitude of change as described above, with the following table used as a guide to correlating sensitivity and magnitude. It should be noted that this is a guide only, and there will be times when the combination of sensitivity and magnitude yield a slightly different result from that predicted by the table. Where this discrepancy leads to prediction of significant effect, it is explained in the text.

	Landscape and Visual Sensitivity			
Magnitude of Change	High	Medium	Low	Negligible
High	**Major**	**Major/moderate**	Moderate	Moderate/Minor
Medium	**Major/moderate**	Moderate	Moderate/minor	Minor
Low	Moderate	Moderate /minor	Minor	Minor/None
Negligible	Moderate/minor	Minor	Minor/none	None

Correlation of Sensitivity and Magnitude to Determine the Significance of Effects

When the overall effect is predicted to be Major/Moderate or higher (bold), this is considered to be a Significant effect, as referred to in Schedule 3 of the EIA Regulations. Significant effects may in some circumstances not be unacceptable or necessarily negative and may be reversible. The combination of sensitivity and magnitude of change may sometimes result in a Major/Moderate to Moderate effect, which correspondingly may or may not be Significant. The effect may be Significant if experienced over an area of extensive proportion. It may also be Significant from an individual static viewpoint, within an area which does not experience a Significant effect.

This matrix is not used as a prescriptive tool, and the methodology and analysis of potential effects at any particular location must take account of professional judgement, therefore in some situations the analysis may not reflect the effects predicted by the grid.

Cumulative Methodology

Although a Guide to Assessing the Cumulative Effects of Wind Energy Development has been produced (DTI Final Consultation Draft December, 1999), there are as yet no formalised guidelines in Great Britain defining an approved methodology for the assessment of cumulative effects on landscape and visual amenity that have been approved and endorsed by the Landscape Institute. The approach used is therefore based on guidance notes on cumulative landscape and visual impact assessment of wind farm developments produced by SNH (March 2012) and the Guidelines for Landscape and Visual Impact Assessment (GLVIA) LI-IEMA 2013.

Scope of Cumulative Assessment

The Cumulative Landscape and Visual Impact Assessment (CLVIA) takes account of all wind developments which have potentially significant overlapping study areas, and that are in 'the public domain' i.e.:

- Any constructed wind farm;
- Any consented wind farm proposal; and

- Any wind farm proposal that has been lodged as a planning application to Argyll and Bute Council or the Scottish Executive (at the time of writing this report).

Broadly in line with current SNH guidance (Assessing the Cumulative Impact of Onshore Wind Energy Developments, March 2012), all wind energy developments within the study area (30km radius of the proposed development) have been mapped onto a location plan (Drawing 176-022) and listed in the table below.

Name of Wind Development	Status	Approximate Distance from Site
Ardacharanmore Farm (1, 45.9m)	Approved	2.6 km
Cruach Mhor Wind Farm (35, 71m)	Operational	2.8 km
Achanelid Community Wind Farm (5, 110m)	Scoping	5.5 km
A'Cruach Phase 2 (2, 135m)	Pending	14.8 km
A'Cruach Wind Farm (21, 126.5m)	Approved	15.0 km
Bachan Burn Wind Farm (20, 110m)	Scoping	15.5 km
Auchintirrie Farm (2, 47m)	Pending	20.3 km
Cruach A'Phubuill (3, 120m)	Approved	20.6 km
Stronachullin Farm (12, 77m)	Operational	20.7 km
An Suidhe (24, 84m)	Operational	22.0 km
Garrow Hill (1, 40m)	Approved	22.3 km
Finnock Bog Farm (2, 40m)	Approved	23.3 km
Kelly Mains Farm (1, 42m)	Approved	23.3 km
Sheilhill Farm (1, 34m)	Approved	25.7 km

List of Other Wind Energy Developments within a 30km radius Study Area

Types of Cumulative Effect

Cumulative effects are those that occur, or may occur, as a result of more than one wind farm project being constructed. Extended combined visibility of wind turbines at particular locations in the landscape may be simultaneous or successive in nature. Extended visibility of wind turbines over parts of the study area from where there are currently no wind turbines visible may give rise to an extended sequential visibility of wind turbines across the landscape.

Simultaneous, Successive and Sequential Visibility of Wind Turbines

- Simultaneous visibility: cumulative effects occur where more than one wind farm is visible in the same direction from a particular place (i.e. without turning one's head);
- Successive visibility: cumulative effects occur where wind farms are visible in more than one direction from that place (i.e. where one has to turn around to see other wind developments, but remains at the same location); and

- Sequential visibility: cumulative effects occur where the observer has to move to another viewpoint to see the other wind farm(s), so they appear in sequence, depending on speed of travel and distance between the viewpoints.

The assessment of potential cumulative landscape and visual effects is carried out in the same generic way as that of non-cumulative effects and are assessed as High, Medium, Low or Negligible/None. Professional judgements are made in relation to the magnitude of change caused by the wind farm to the existing landscape and visual baseline. As in the case of non-cumulative effects, the matrix shown in the table above is used to bring together receptor sensitivity and magnitude of change.

Assessment of Construction, Operational and Decommissioning Effects

The landscape and visual effect of construction, operational and decommissioning effects will be noted in the Landscape and Visual Assessment (Chapter 5). They will be assessed using the methodology that has been outlined in this appendix. The assessment will note the effect arising from the different activities associated with the construction, operation and decommission, including:

- The construction and use of access tracks;
- Temporary increase in traffic and plant during the construction phase; and
- Temporary increase in traffic and plant during the decommissioning phase.