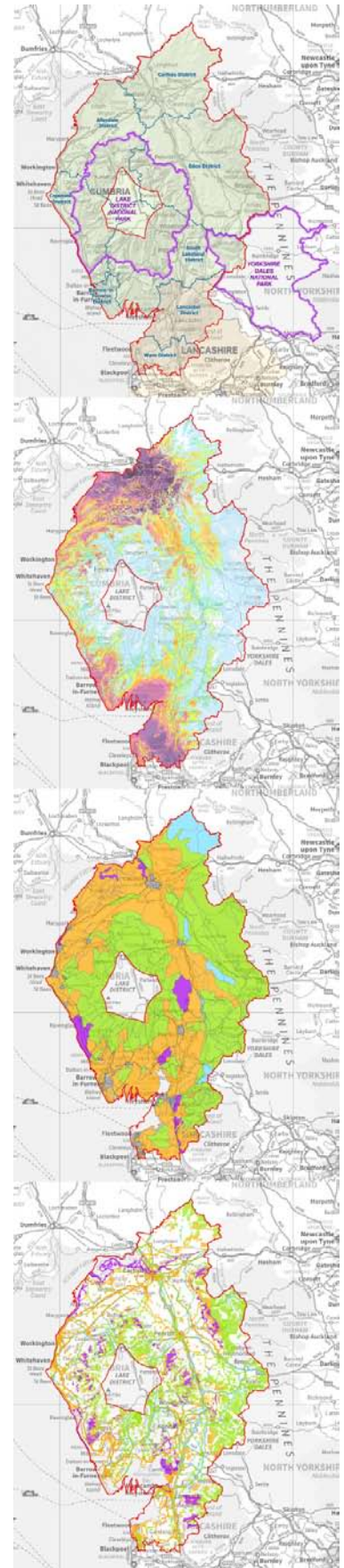


Cumbria County Council Cumulative Impacts of Vertical Infrastructure: Appendix 1: GIS Technical Report

WYG/A072895-1/October 2014





Document Control

Document:	Draft GIS Technical Report	
Project:	Cumulative Impacts of Vertical Infrastructure	
Client:	Cumbria County Council	
Job Number:	A072895-1	
File Origin:	w:\A072000-A072999\A072895-1 - Cumbria CC Landscape\A072895-1 CIVI\A072895-1 CIVI Reports\A072895-1 CIVI Technical Report FINAL with TC 2014_10_23.docx	
Revisions		
Revision:	V3, Final	
Date:	30 October 2014	
Prepared by	Checked by	Approved By
Tim Phillips MSc	Tim Phillips MSc	Mary O'Connor CMLI
Description of Revision	General revision, response to comments on Draft Final, illustrations inserted	

Cumulative Impacts of Vertical Infrastructure

Appendix 1: GIS Technical Report

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- Appendix A: List of data providers
- Appendix B: List of datasets used
- Appendix C: Settlements assessed in the Study

1. Overview and Summary of the Assessment of the Cumulative Effects of Vertical Infrastructure (CIVI)

1.1 Introduction and Background

- 1.1.1 Cumbria and North Lancashire is an area of diverse and, frequently, high quality landscape. The conservation of this landscape is key for its environmental and amenity value, and for the economic benefits it brings.
- 1.1.1 This area is subject to increasing pressure to accommodate energy and communications related infrastructure – most notably wind turbines and the National Grid North West Coast Connections (NWCC) project. This development can by its nature result in significant impacts upon landscape character and visual amenity, both individually and cumulatively.
- 1.1.2 The National Planning Policy Framework, and associated National Planning Policy Guidance, is generally supportive of sustainable development. The need to conserve and enhance the landscape and to address potential issues of cumulative impact, in order that appropriate sites for development can be identified, is also emphasised in the guidance. That requires a robust local evidence base and policies, which will allow for appropriate weight to be given to issues of landscape character and visual amenity and ensure the appropriate siting of such developments.

1.2 What is the purpose of the CIVI Study?

- 1.2.1 In 2013, WYG were commissioned by Cumbria County Council, with their partners Lancashire County Council, the Lake District National Park Authority, Carlisle City Council and Allerdale Borough Council, to undertake a piece of work which would build upon existing local landscape character guidance, following industry standard best practice approaches, specifically to consider the cumulative impact of vertical infrastructure upon the landscape character and visual amenity in Cumbria and North Lancashire.
- 1.2.2 The Cumbria Wind Energy Supplementary Planning Document¹ (CWESPD) helps to inform decisions on the ability of the Cumbria landscapes to accommodate wind energy development, based upon consideration of landscape character, sensitivity and value. This study addresses the cumulative effect of “vertical infrastructure” on the landscape character and visual amenity of Cumbria and adjacent areas of Lancashire arising from the growth in such structures to date and anticipated further growth into the future. The vertical infrastructure considered in this study is

¹ Cumbria County Council (2007) (addendum January and October 2008) Cumbria Wind Energy Supplementary Planning Document

development characterised by vertical elements, such as wind turbines, communications masts, or pylons carrying power lines.

- 1.2.3 The study considers the sensitivity of the landscape within the study area and the sensitivity of the people who use that landscape to changes arising from vertical infrastructure developments, and how the existing and approved schemes affect the character of the landscape and the views experienced by people who use it.

1.3 The outputs from the CIVI Study

- 1.3.1 A suite of reports, maps and associated tabulated information was produced in the course of the Study, presented in the following documents:

Part 1 Key Findings & Guidance

Summarises how the assessment was carried out and the findings of the assessment and; provides general guidance to users of the assessment and a step-wise process for appraising proposals for other developments involving vertical infrastructure elements and their cumulative effects.

Part 2 The Assessment

Provides the background to the study, the details of the assessment methodology and how it was derived and carried out, and sets out the details of the findings of the assessed.

Appendix 1 GIS Technical Report

Provides information about the GIS at the heart of the Study and which was fundamental to the assessment; details the data collected, the analyses and techniques employed to inform the assessment, and guidance for using the CIVI datasets

Appendix 2 Book of Maps

A set of 145 maps, generated from each stage of the Study, from mapping the study area extents and the vertical infrastructure whose cumulative effects were assessed, through mapping the outputs of each of the assessment stages, to maps of the findings of the overall significance of cumulative landscape and visual effects.

Appendix 3 Ground Truthing

The details of the ground truthing exercise, with tabulated information for each of the 52 selected viewpoints accompanied by photographs and location maps.

Appendix 4 Landscape Character Assessment Tables

Landscape character information was collated from the assessments carried out by each of the authorities within the study area summarised in a consistent tabulated format under headings for each landscape area of: Overview, Key characteristics, Sensitivities in relation to vertical structures, and Guidance in relation to vertical structures.

2. The use of GIS within the Study

2.1 What is GIS

2.1.1 A Geographic Information System (GIS) is defined as a system that “integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information”².

2.1.2 GIS is:

- Used to map, view, query, interpret, and visualise data in many ways that reveal relationships, patterns, and trends
- Used to build models of real-world scenarios
- Especially suited to working with large amounts of data and over wide geographic areas.

2.2 GIS and the CIVI Study

2.2.1 GIS is fundamental to the Study underpinning the collection, capture and storage of vertical infrastructure and contextual data; calculating the Zones of Theoretical Visibility and automating the combination of ZTVs into Cumulative ZTVs; bringing together the landscape character assessments into a consistent set of landscape areas; classifying the landscape of the study area into 4 categories; assessing the spatial interaction of landscape category and susceptibility to define the sensitivity of receptors; calculating the magnitude of landscape and visual change; and combining receptor sensitivity and magnitude of change to provide an assessment of significance of effects.

2.3 GIS and other software used

2.3.1 ESRI ArcGIS 10 software has been used throughout for all mapping, data collation and spatial analysis. The 3d Analyst extension to ArcGIS has been employed to create the map of landscape category, calculate the Zone of Theoretical Visibility (ZTV) maps and to combine ZTVs into Cumulative ZTV maps.

2.3.2 Geoprocessing models have been setup using ModelBuilder in ArcGIS to automate tasks wherever possible, including:

- Creating feature classes and assigning field definitions
- Generation of ZTVs and CZTVs
- Landscape categorisation

² Environmental Systems Research Institute (ESRI)

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- Determining magnitude of change for landscape and visual receptors

- 2.3.3 AutoCAD Map3D has been used for data conversion and the digitising of some features. Microsoft Excel has been employed extensively for formatting data received in tabular format, the preparation of the Landscape Character Tables, the creation of lookup tables to facilitate analyses and for various calculations.
- 2.3.4 All maps have been exported to PDF from ArcGIS and optimized for viewing and printing using Adobe Acrobat Professional.

3. Data collection

3.1 Acknowledgements

3.1.1 We wish to thank the following key data providers for their help with the study:

- Cumbria County Council
- Lancashire County Council
- Lake District National Park Authority
- Yorkshire Dales National Park Authority
- Allerdale District Council
- Carlisle District Council
- Copeland District Council
- Eden District Council
- Lancaster District Council
- Wyre District Council

3.1.2 A complete list of data providers is included as Appendix A.

3.2 Data Sources

3.2.1 The study uses base mapping and GIS data, publicly available and from Cumbria County Council (CCC) and other local authorities in the study area and buffer zones, and OS MasterMap data to identify vertical infrastructure features shown on maps. This is supplemented by data from National Grid, OFCOM, developers, and others as listed in Appendix A. The district and county local authorities have provided data relating to existing infrastructure and proposed developments currently within the planning system.

Landscape Character Assessments

3.2.2 The baseline for the assessment used existing landscape character assessments as detailed below:

- Natural England, National Landscape Character Areas (<http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/northwest.aspx>)³;
- Cumbria County Council (2007) Cumbria Wind Energy Supplementary Planning Document: Part 1 (including addendum January and October 2008) (<http://www.cumbria.gov.uk/planning-environment/renewable-energy/windEnergy.asp>);

³ Links to assessments valid at 29/08/14

- Coates Associates (2007) Cumbria Wind Energy Supplementary Planning Document: Part 2 Landscape and Visual Considerations
(<http://www.cumbria.gov.uk/planning-environment/renewable-energy/windEnergy.asp>);
- Cumbria County Council (2003) Technical Paper 5: Landscape Character, Cumbria and Lake District Joint Structure Plan 2001-2016
(<http://www.planningcumbria.org/eLibrary/Content/Internet/538/755/1599/2318/2323/38520131637.pdf>);
- Cumbria County Council and AXIS (2003) Technical Paper 6: Planning for Renewable Energy Development in Cumbria, Cumbria and Lake District Joint Structure Plan 2001-2016
(<http://www.planningcumbria.org/eLibrary/Content/Internet/538/755/1599/2318/2323/38520131750.pdf>);
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 1 Landscape Character Guidance
(<http://www.cumbria.gov.uk/planning-environment/countryside/countryside-landscape/land/landcharacter.asp>);
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 2 Landscape Character Toolkit
(<http://www.cumbria.gov.uk/planning-environment/countryside/countryside-landscape/land/landcharacter.asp>);
- Chris Blandford Associates (2008) Lake District National Park: Landscape Character Assessment and Guidelines (part of the Lake District National Park Landscape Character Supplementary Planning Document, adopted 19th October 2011)
(<http://www.lakedistrict.gov.uk/caringfor/policies/lca>);
- Yorkshire Dales National Park Authority (2001) Yorkshire Dales National Park Landscape Character Assessment
(<http://www.yorkshiredales.org.uk/specialplace/specialquality-landscape/characteroflandscape>);
- Land Use Consultants (2010) The Solway Coast Area of Outstanding Natural Beauty Landscape and Seascape Character Assessment
(http://www.allerdale.gov.uk/downloads/Solway_Coast_AONB_-_Landscape_Character_Assessment.pdf);
- Lovejoy (2005) Landscape Sensitivity to Wind Energy Developments in Lancashire
(<http://new.lancashire.gov.uk/media/152752/Wind-Energy-Development.pdf>);
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Character Assessment
(<http://new.lancashire.gov.uk/media/152746/characterassessment.pdf>);
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Strategy
(<http://new.lancashire.gov.uk/media/152743/strategy.pdf>);
- Chris Blandford Associates (2009) Forest of Bowland Area of Outstanding Natural Beauty: Landscape Character Assessment
(<http://new.lancashire.gov.uk/media/152746/characterassessment.pdf>)

3.2.3 Landscape Character Assessments are in preparation for the Arnside and Silverdale AONB and the North Pennines AONB. These were not available at the time of carrying out the Study.

- 3.2.4 National and Regional and, where relevant, local landscape designations have been considered within the study. These have been collated from information supplied by the Local Authorities, Natural England, English Heritage, Sustrans and others as detailed in Appendix A.

3.3 Datasets used in the study

- 3.3.1 Datasets were collected relevant to the following themes:

- Ordnance Survey Base mapping
- Landscape Character
- Landscape Designations and Policies
- Cultural Landscape Designations
- Biodiversity Designations
- Access and Recreation
- Visual Receptors
- Vertical Infrastructure

- 3.3.2 A schedule of all datasets received was maintained in Microsoft Excel and updated upon receipt of any data to include details of the supplier, version date and other appropriate information. A compact version of the schedule of datasets used is included as Appendix B.

4. Data standards

4.1 Data format and conversion

4.1.1 Data for the study has been provided and collected in a number of formats including:

- ESRI Geodatabase
- ESRI Shapefile
- MapInfo TAB
- MapInfo MID/MIF
- AutoCAD DWG
- Geographic Markup Language – GML, GZ
- Raster datasets – ESRI GRID and Raster Catalogs
- Raster imagery – TIFF, JPEG
- Web Feature Service
- Google Earth - KML, KMZ
- Microsoft Access - MDB
- Microsoft Excel – XLS, XLSX
- Text formats including ASCII and CSV

4.1.2 Each of the datasets provided was subject to a brief check for issues relating to georeferencing, missing attribute data, and incomplete coverage across the study area. A series of thematic ArcGIS map documents (mxd files) was created in order to map and review the many datasets received.

4.1.3 In order to use the data in the study it has been necessary to convert and process the collected datasets as follows:

- All vector datasets were converted to Geodatabase Feature Classes
- Feature Datasets (a collection of Feature Classes) were created for related data, e.g. onshore wind developments, telecommunication masts and transmitters
- Tabular data was formatted to ArcGIS conventions (field names without spaces or special characters, cell formats as numeric or string) and saved as tables within a Geodatabase
- Raster image tiles were checked for correct georeferencing
- Spatial and attribute indices were added to large datasets to facilitate use

4.1.4 All raster outputs from the analyses have been stored in ESRI GRID format with a 50m grid resolution.

4.2 Coordinate system

4.2.1 All spatial datasets used or created during the course of the study have been stored in a Transverse Mercator projection in Ordnance Survey 1936 British National Grid coordinates .Data

received in WGS 1984 projection has been re-projected to British National Grid coordinates using the 7 parameter “OSGB_1936_To_WGS_1984_NGA_7PAR” transformation.

4.3 Spatial resolution

4.3.1 The Study uses numerous datasets which have been captured at a range of scales; from 6 figure grid references for turbine locations and telecommunication masts locations identified from OS MasterMap, to 50 metre gridded DTM data and designations and policy data captured against 1:50,000 base maps.

4.3.2 Data capture specifically undertaken for the Study includes:

- Digitising Long Distance Footpaths from OS 1:50,000 raster maps
- Digitising a limited number of point locations for vertical infrastructure from aerial photography
- Digitising point locations for tourist attractions from OS MasterMap and raster maps

4.3.3 The spatial resolution of the study is defined as 50m (equivalent to the resolution of the DTM) and it is recommended that the Study outputs are not analysed at a scale greater than 1:50,000.

4.4 Metadata

4.4.1 Datasets provided with the report are complete with metadata to the latest UK Gemini 2.2 standard, to facilitate the future use of the datasets and satisfy the requirements of the 2007 INSPIRE⁴ directive.

⁴ Infrastructure for Spatial Information in Europe (INSPIRE) Directive

5. Defining the Study Area

5.1.1 The extent of the Study Area is defined by the combined area of:

- Cumbria County Council including the Districts of Allerdale, Barrow-in-Furness, Carlisle, Copeland, Eden, and South Lakeland.
- The area of the Lake District National Park Authority within a 12km buffer from its boundary
- The area of the Yorkshire Dales National Park Authority within Cumbria County
- The Lancashire districts of Lancaster and Wyre

OS Boundary-Line and Natural England's National Parks datasets were combined to create the GIS polygon representing the Study Area as shown on Map SA.01.

5.1.2 Buffer zones from the study area were generated at 15km, 25km and 35km intervals (Map SA.02). These represented the area of search for vertical infrastructure according to the height criteria included in Table 6.1.

5.1.3 A further 29 LPAs are located within or partly within the buffer zones and for which vertical infrastructure data was collected:

- | | |
|--------------------------------|----------------------------|
| ■ Dumfries and Galloway | ■ Rossendale District |
| ■ Scottish Borders | ■ Hyndburn District |
| ■ Northumberland | ■ Blackburn with Darwen |
| ■ Northumberland National Park | ■ Bury District |
| ■ Gateshead District | ■ Preston District |
| ■ County Durham | ■ South Ribble District |
| ■ Darlington | ■ Chorley District |
| ■ Richmondshire District | ■ Bolton District |
| ■ Harrogate District | ■ Wigan District |
| ■ Craven District | ■ St. Helens District |
| ■ Bradford District | ■ West Lancashire District |
| ■ Ribble Valley District | ■ Sefton District |
| ■ Pendle District | ■ Fylde District |
| ■ Calderdale District | ■ Blackpool |
| ■ Burnley District | |

6. Mapping Vertical Infrastructure

6.1 Developments considered

- 6.1.1 Developments considered within the study include both existing and proposed developments. Proposed developments included in the detailed analyses and assessment were limited to those that had already received planning permission (consented) at the time of writing the study.
- 6.1.2 Data has been collected for the following types of vertical infrastructure and shown on Maps VI.01 to VI.15:
- Onshore wind turbines;
 - Offshore wind turbines;
 - Electricity transmission towers (pylons); and
 - Mobile phone, radio and television transmitters, or other communications masts.
- 6.1.3 The study defines three scales of vertical infrastructure based upon height; large-scale, medium-scale, and small-scale. Small-scale structures are considered as from 15m up to 50m in height; medium-scale structures as 51m-100m; and large-scale structures as over 100m.
- 6.1.4 The minimum height structure to be included within the study was 15m, in order to eliminate elements in the urban and urban fringe areas e.g. highway and street lighting columns or telecommunication poles. Low voltage electricity transmission lines (11kV and 33kV) on wooden poles have been excluded from the study as these structures are generally below the 15m height threshold.
- 6.1.5 Stacks and chimneys associated with power generation and distribution were originally considered to be included within the assessment. However, due to lack of available data these elements have had to be excluded from this study. These types of structures are not identified consistently on OS Mastermap and height data is not readily available.
- 6.1.6 Developments in the planning system but not yet consented are not included in the main analyses and assessment; however, they are discussed and analysed to some extent in the Main Report and include the following:
- Onshore wind turbine developments - submitted applications in the study area and buffer zones;
 - Walney Extension offshore wind farm;
 - the Moorside Nuclear Power Station; and
 - The North West Coast Connections reinforcement works and route corridors.
- 6.1.7 Developments which are at the scoping or screening stage of the planning process have also been excluded, due to the limited level of information available with regards the proposed layout and structure heights.

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6.2 Vertical infrastructure database

- 6.2.1 Data for the developments (proposed and existing) was collated as point feature classes in a vertical infrastructure geodatabase in GIS, including 6-figure OS grid references for the location of each structure and the height of the structure in metres above ground level.
- 6.2.2 For onshore and offshore wind developments the following information was also collated as attribute data in the database:
- Development name or address
 - Current status: Operational, Under-Construction, Consented or Submitted Planning Application
 - Relevant Local Planning Authority
 - Planning application reference
 - Year of application
 - Year of planning consent
 - Year the development commenced operating
 - Hub and blade-tip height, and rotor diameter of wind turbines

NAME	STATUS	L A NAME	X	Y	Hub	Rotor	Blade_Tip	Application_Ref
Westlakes Research Institute	Operational	Copeland	299700.5969	514938.9736	<Null>	<Null>	15.25	4/09/2318/0
Wath Brow	Operational	Copeland	302854.9164	514485.7367	<Null>	<Null>	15	4/09/2341/0
PENNINGTON C OF E SCHOOL	Consented	South Lakeland	326634.4187	477098.5763	15	5.5	17.5	5/2009/9003
LAMBRIGG PARK, LAMBRIGG,	Operational	South Lakeland	359947.5396	494566.2763	<Null>	<Null>	15	SL/2009/0313
WORMPOTTS FARM	Operational	Eden	363262	519958	15	5.5	17.75	09/0409
INTAKE	Operational	Eden	370057.9849	506219.6568	12	6	15	09/0514
Stepping Stones Farm	Consented	Allerdale	316284	548583	15	<Null>	17.7	2/2009/0355
Rosewain Farm	Consented	Allerdale	328932.5781	549487.83	18.3	<Null>	24.8	2/2009/0520
CTY Sturtevant School, Sturtevant, Carlisle, CA5 TAT	Operational	Carlisle	340246.835	550003.835	15	5.4	17.700001	06/9033
Greenlands, Wreay, Carlisle, CA4 ORR	Consented	Carlisle	342300.911	548156.195	18.3	13.4	25	09/0769
Tarnwater	Consented	Lancaster	351294	474297	18	13	24.5	09/01105/FUL
Dewlay Cheese	Operational	Wyre	348416.9251	443892.8178	80	<Null>	126	08/00676
Riverside Industrial Park	Consented	Wyre	349288.3774	443011.9508	15	<Null>	23.9	09/00729
Pruders Farm	Consented	Wyre	337550.8025	449143.1615	<Null>	<Null>	23.9	09/00709/FUL

5-1 Extract from database of onshore wind developments

- 6.2.3 For electrical transmission towers the pylon model and voltage of the associated powerline was also collated as attributes.
- 6.2.4 Once the database had been assembled, a preliminary sift was carried out to exclude structures that did not meet the height/distance thresholds as set out in Table 5.1.

Table 5.1 Scale and Distance Criteria for Vertical Elements

Height of vertical element (m)	Scale of infrastructure	Maximum distance (km) from study area boundary
15 to 50	Small-scale	15

Height of vertical element (m)	Scale of infrastructure	Maximum distance (km) from study area boundary
51-100	Medium-scale	25
Over 100	Large-scale	35

Structures which did not satisfy the inclusion criteria were identified by overlaying the study area and buffer zone polygons on the vertical infrastructure point datasets and running a combination of location and SQL (Structured Query Language) queries to filter out structures which were too small or too distant.

- 6.2.5 With regards the data collated for telecommunications masts, it was evident that there were several incidences of structures that were geographically coincident, i.e. a number of telecommunications transmitters which are located at different heights on a larger telecommunications mast and share the same OS 6 figure grid reference. In these instances, only the largest structure height (i.e. the main mast) was used in the calculation of the ZTVs.

6.3 Limitations and Assumptions

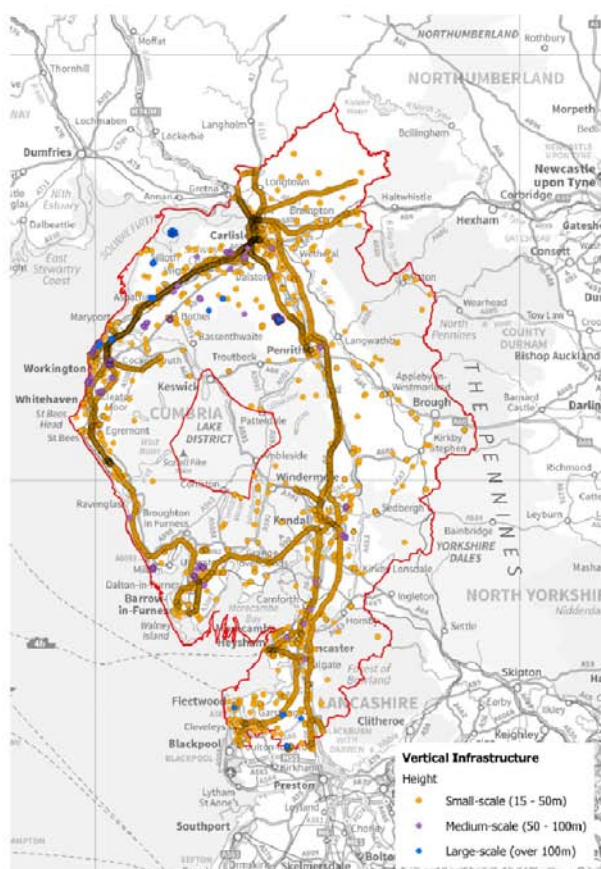
- 6.3.1 For developments where location coordinates for the proposed structures are not stated explicitly in the planning application, grid references have been derived from development layout plans and, in a small number of cases (mostly domestic scale wind turbines), the structure location has been assumed to be at the centroid of the development boundary. In those instances where location coordinates for developments have been provided by a LPA, it has been assumed that these are correct.
- 6.3.2 Given the extent of the study area and the number of vertical structures considered, it has not been possible to validate the location of all features or the attribute data associated with the features. Where possible, checks have been made against OS base mapping and recent aerial photography but it is possible that errors are present. Additionally, discrepancies for the location of structures were found between datasets received from different sources. Further, the micro-siting of onshore wind turbines (generally within 50m of the permitted location) introduces a potential error of $\pm 50\text{m}$ for the location of turbines. Consequently, data validation is recommended as an important element in the ongoing maintenance of the vertical infrastructure database.
- 6.3.3 For some of the smaller domestic wind turbines, the planning application does not explicitly state the dimensions of the proposed turbine. In these instances the dimensions have been assumed based on the generating capacity stated in the application.
- 6.3.4 For all National Grid pylons, the model of the pylon (but not the height of the structure) is stated in the National Grid dataset. The study assumes the pylon height is the nominal standard height for the model and does not take into account the use of height extensions or reductions for particular pylons. With regards pylons on the local distributor network, the pylon height has been assumed as a standard height for the operating voltage (mostly 132kV) of the associated line.

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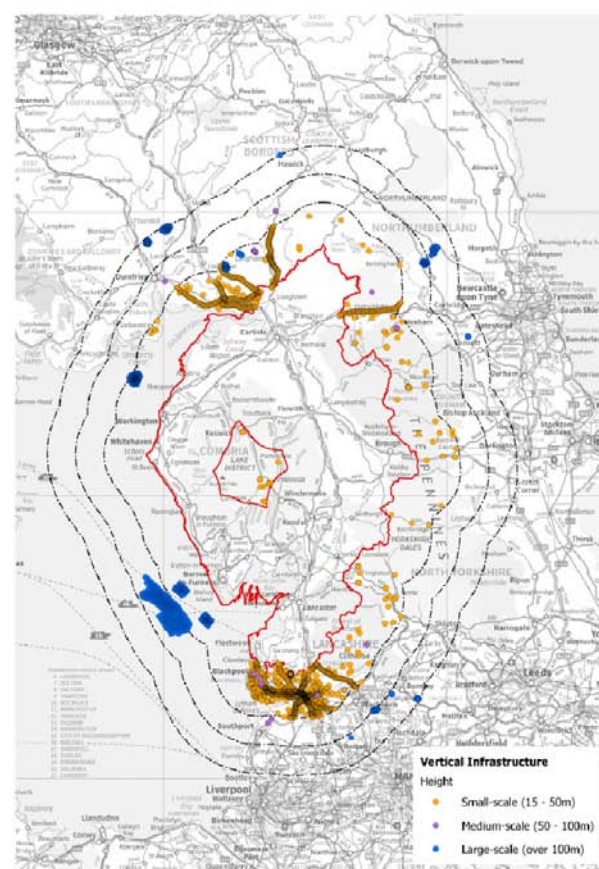
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- 6.3.5 Vertical infrastructure data for the Study was collected during the period September 2013 to February 2014. Updates to the data collected at the start of the study were undertaken where possible in February 2014. However, there is a potential that some development proposals submitted in late 2013 and early 2014 have been omitted from the database.
- 6.3.6 The recording of proposals for vertical infrastructure was found to be inconsistent across LPAs. The majority of LPAs maintained schedules of existing and proposed wind energy development proposals but not all could readily identify proposals for telecommunication masts. Consequently, it is likely that some existing and proposed masts have been omitted from the database.

Vertical Infrastructure in the Study Area



Vertical Infrastructure in the Buffer Zones



5-2 Vertical infrastructure recorded in the CIVI database

7. Mapping Landscape Areas

7.1.1 The Landscape Character Assessments and corresponding datasets were collated for the following areas:

- Cumbria;
- Lancashire;
- Lake District National Park (LDNP);
- Yorkshire Dales National Park (YDNP);
- Solway Coast AONB; and
- Forest of Bowland AONB.

Maps LCA.01 to LCA.07 illustrate the extent of these assessments within the study area and the classifications used.

7.1.2 Some assessments classified areas of landscape according to the landscape type represented, some of which were sub-divided (as in Cumbria) into sub-types. Other assessments identified landscape character areas as geographically unique areas, while the landscape types or sub-types could occur in several different geographic locations. Further, the following character assessments overlap; Cumbria and Lake District National Park, Cumbria and Solway Coast AONB, Lancashire and Forest of Bowland AONB. The following table outlines the classifications used by the assessments:

Table 6.1 Landscape Character Assessment Classifications

Landscape Character Assessment	Classification Units
Cumbria	Landscape Types; Landscape Sub-Types
Lancashire	Landscape Types; Landscape Character Areas
Lake District National Park	Landscape Types; Landscape Sub-Types; Areas of Distinctive Character
Yorkshire Dales National Park	Landscape Character Areas
Solway Coast AONB	Landscape Character Types; Landscape Character Areas
Forest of Bowland AONB	Landscape Character Types; Landscape Character Areas

7.1.3 After trialling various approaches, the assessment proceeded on the basis of the unique landscape character areas identified in all the assessments except Cumbria's and the sub-type

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areas of the Cumbria assessment. In order to create a continuous non-overlapping polygon dataset the Cumbria sub-type areas were clipped to exclude the area covered by the Solway AONB Landscape Character Areas and Lake District National Park Areas of Distinctive Character, and the Lancashire Landscape Character Areas were clipped to exclude the area covered by the Forest of Bowland AONB Landscape Character Areas.

7.1.4 Each distinct polygon or “landscape area” was assigned a unique identifier code which takes the form of a geographical abbreviation plus a reference which links back to the source assessment. The following abbreviations for the geographical areas were used:

- Cumbria – CCC
- Lancashire – LCC
- Lake District National Park – LDNP
- Yorkshire Dales National Park – YDNP
- Solway Coast AONB – SC
- Forest of Bowland AONB – FOB

For example, the assessment for the Solway Coast AONB identifies landscape character area G1 Allonby; the corresponding polygon in the GIS layer of landscape areas has been assigned the unique identifier SC-G1. The Cumbria sub-type 1a Intertidal Flats occurs in 4 geographically separate locations and is represented by polygons CCC-1a-1, CCC-1a-2, CCC-1a-3 and CCC-1a-4 respectively in the landscape areas layer. The landscape areas are shown on Map LCA.08.

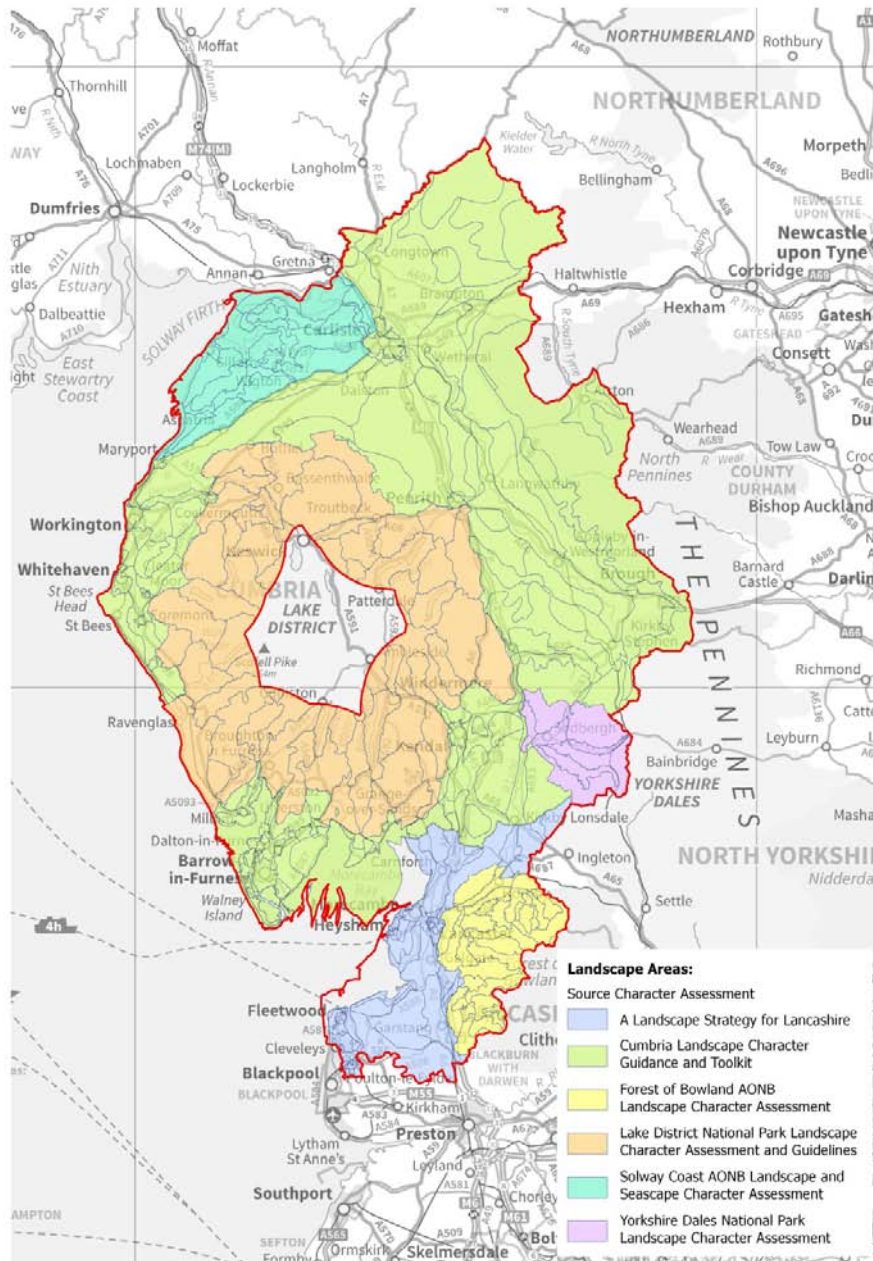
7.1.5 The areas identified as urban in the landscape character assessments (and in general are not afforded the same detailed assessment as the non-urban landscape character areas) are included in the landscape areas dataset for completeness but are not assigned a unique identifier. These areas are considered in detail under the settlements grouping of visual receptors.

7.1.6 Combining the various landscape character assessment polygons into a single GIS layer resulted in the creation of a number of “sliver” polygons (small, narrow polygons along the borders of larger polygons), occurring at the join between two assessments. The larger of these slivers have been included in the full assessment and given an appropriate unique identifier. The smaller slivers are excluded from the assessment but included in the landscape areas dataset for completeness; these smaller areas have not been assigned a unique identifier.

7.1.7 The elements of the landscape character type/sub type/area descriptions relevant to the CIVI study are summarised in the set of Landscape Character Assessment Tables. Information was collated from the assessments in a consistent format under the following headings for each landscape area where available and relevant:

- Overview;
- Key characteristics;
- Sensitivities in relation to vertical structures; and
- Guidance in relation to vertical structures.

A concise version of these tables was compiled in Excel and linked to the GIS polygons by the unique identifier codes using a table join.



6-1 Landscape Areas and source Character Assessments

8. Mapping Visual Receptors

8.1.1 The following groups of visual receptors are considered in the study and are shown on Maps VR.01 to VR.07:

- People in settlements
- Users of CROW access land
- Users of long distance footpaths
- Users of cycle routes
- Travellers along roads;
- Railway travellers; and
- Visitors to tourist attractions

Settlements

8.1.2 Settlements have been mapped from settlement boundary datasets provided by the LPAs, supplemented with urban areas as identified on the OS Meridian dataset “Developed Land Use Area”. In total, 694 settlements have been identified within the study area boundary; these are shown on Map VR.01 and listed in Appendix C.

CROW Access Land

8.1.3 Land designated under the Countryside and Rights of Way Act 2000 has been mapped from the Natural England All Areas Access Layer GIS dataset. The dataset includes Open Country, Registered Common Land and all CROW s16 dedicated land with areas of Section 28 restrictions, military byelaw, race courses and aerodromes removed. The study area includes over 2100km² of designated CROW Access Land as shown on Map VR.02.

Long distance footpaths

8.1.4 Long distance footpaths and promoted walking routes within the study area are shown on Map VR.03 and include the following:

- National Trails, mapped from the Natural England dataset:
 - Hadrian's Wall Path
 - Pennine Bridleway
 - Pennine Way
- Other long distance footpaths, digitised from Ordnance Survey 50k raster tiles (using local rights of way network datasets where coincident):
 - Cumbria Way
 - Dales Way
 - Lancashire Coastal Way
 - Wyre Way
- Promoted walking routes, as identified on tourism websites and digitised from route maps:
 - A Dales High way
 - Allerdale Ramble
 - Cistercian Way

Coast to Coast Walk
Cumbria Coastal Way
Isaac's Tea Trail
Lancaster Canal Walk
Pennine Journey
St Bega's Way

Cycle routes

8.1.5 Cycle routes considered in the Study are shown on Map VR.04 and include:

- National Cycle Network, Regional Routes and links from Sustrans dataset
- National Byway and Local Cycle Routes from data provided by LPAs

Roads

8.1.6 The study considers travellers on the following classes of road:

- Motorways;
- Primary routes (trunk roads);
- A roads; and
- B roads.

The road network included in the study is extracted from OS VectorMap District data and route numbers are shown on Map VR.05.

Railways

8.1.7 Railway lines included are those within the National Rail Network, the Blackpool to Fleetwood Tramway and the following heritage (tourist) railways (as shown on Map VR.06):

- Eden Valley Railway
- Lakeside and Haverthwaite Railway
- Ravenglass and Eskdale Railway
- South Tynedale Railway
- Railway at Threkeld Quarry and Mining Museum

Route data is extracted from OS VectorMap District data.

Tourist Attractions

8.1.8 The tourist attractions considered (as shown on Map VR.07) are those identified in the following lists and are located within the study area:

- Cumbria Top 20 Visitor Attractions 2013 by visitor numbers⁵

⁵ Source: Cumbria Tourism - Visitor Attractions Monitor 2013

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- Visits to tourist attractions in Lancashire 2012/13⁶

Heritage railways which are included on these lists are considered under the railways grouping. The list of attractions considered includes:

- Brockhole, Lake District National Park Centre
- Carlisle Castle
- Carlisle Cathedral
- Grizedale Forest Park
- Hill Top (the home of Beatrix Potter)
- Holker Hall
- Leighton Moss RSPB Reserve
- Rheged Centre, Redhills
- Sizergh Castle
- The Beacon, Whitehaven
- The World of Beatrix Potter
- Ullswater Steamers
- Whinlatter Forest Park & Visitor Centre
- Windermere Lake Cruises
- Wray Castle

- 8.1.9 The locations of tourist attractions have been mapped in GIS with reference to OS Street View raster maps, OS VectorMap District data, the Country Parks dataset supplied by Natural England, and the RSPB dataset of its reserves. In the case of lake cruises on Windermere and Ullswater, the entire lake has been mapped as the location of the receptors.

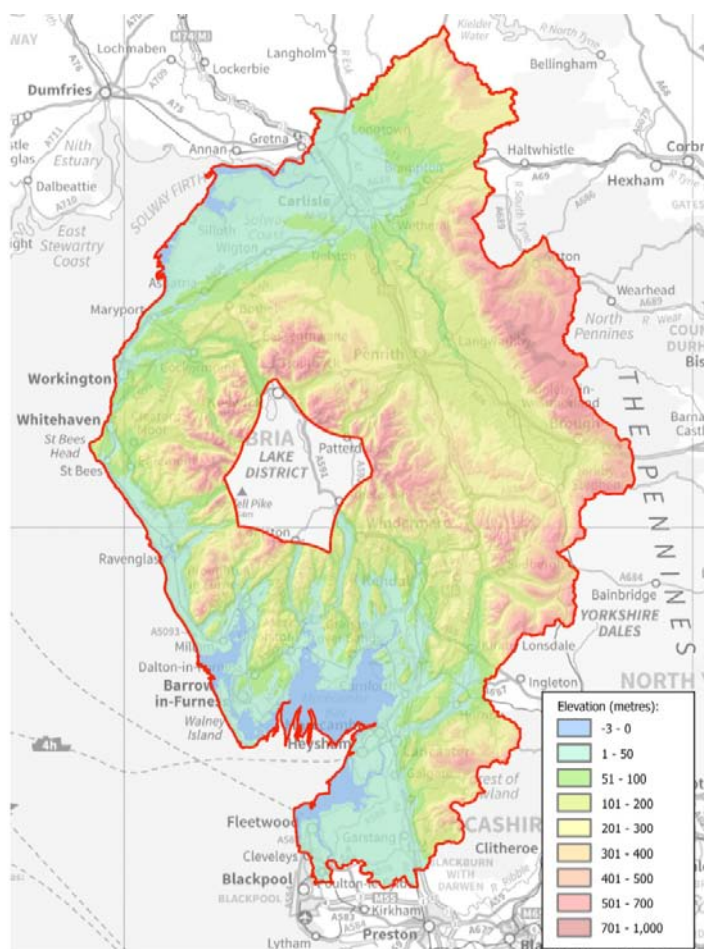
⁶

Source: Regional Attractions Survey; Visit Britain – Survey of Visits to Visitor Attractions

9. Zone of Theoretical Visibility Calculation

9.1 Digital Terrain Model

- 9.1.1 A Digital Terrain Model (DTM) was compiled from Ordnance Survey OS TerrainTM 50 data in ASCII grid format for the full extent of the study area and the buffer zones. With regards accuracy of the DTM, the Root Mean Square Error (RMSE) for OS Terrain 50 is 4m based on a comparison of the data against GPS readings.⁷ The DTM for the extent of the study area is shown below:



8-1 Topography of the Study Area

⁷ OS Terrain 50 User guide and technical specification <http://www.ordnancesurvey.co.uk/docs/user-guides/os-terrain-50-user-guide.pdf>

9.2 ZTV parameters and calculation

- 9.2.1 A Zone of Theoretical Visibility (ZTV) was generated using the Viewshed tool in ArcGIS 3D Analyst for each wind turbine, pylon, telecommunication mast or other vertical element. The distance for each ZTV produced was defined, dependent on the height of the vertical structure being considered. The following table illustrate the distance over which the ZTV was produced for the various height thresholds of infrastructure considered:^{8,9}

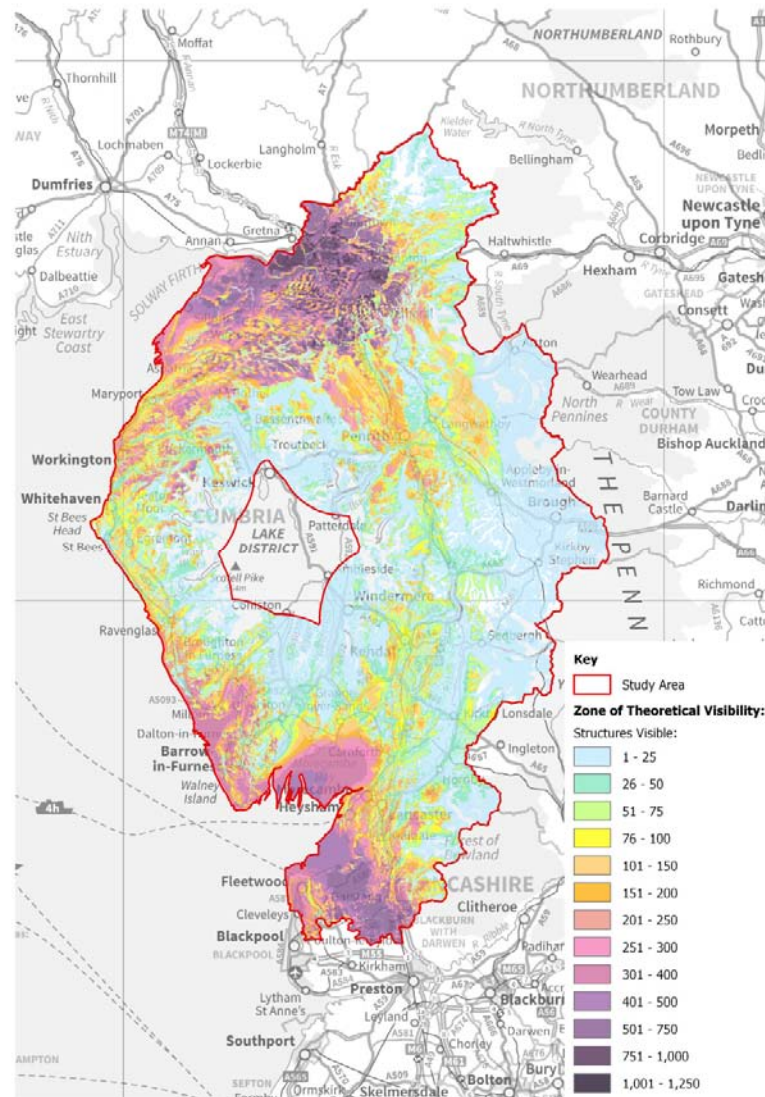
Table 8.1 ZTV Distances for Various Heights of Vertical Elements

Height of vertical element (m)	Scale of infrastructure	ZTV distance (km)
up to 50	Small-scale	15
51-100	Medium-scale	25
Over 100	Large-scale	35

- 9.2.2 In general, the offshore wind turbines all fall into the large-scale group; the transmission infrastructure falls into the small-scale group; and the remaining vertical infrastructure falls into all 3 groups. However, although the transmission infrastructure falls into the small-scale group based upon the height range of pylons, for the purpose of assessing magnitude of landscape change they have been defined as medium-scale infrastructure, but with the ZTV extent of small-scale infrastructure. This is to balance the size of the components – the pylons- with the length of the corridors they occupy.
- 9.2.3 For all ZTVs the viewer height was set at 1.5m above the ground level of the DTM and correction for the curvature of the earth was applied with a refractivity coefficient of 0.13.
- 9.2.4 Each ZTV was output in ESRI GRID format with a 50m grid cell resolution equivalent to that of the underlying DTM data and with the value of each grid cell equal to the number of structures theoretically visible within the extent of the grid cell.
- 9.2.5 Cumulative ZTVs were created using a combination of the Viewshed, Reclassify and Raster Math tools in 3d Analyst. For presentation on Maps ZTV.01 to ZTV.08, the ZTVs have been clipped to the study area boundary. Values contained in the cumulative ZTV rasters represent the number of structures visible from a grid cell rather than the number of developments visible.

⁸ Adapted from Table 2 of Horner+MacLennan & Envision, Visual Representation of Windfarms Good Practice Guidance, Scottish Natural Heritage, 2006

⁹ Paragraph 53 of the latest SNH guidance (Visual Representation of Windfarms Version 2, Scottish Natural Heritage, July 2014), published after the analysis for this study had been undertaken, includes a revised table of recommended ZTV extents with a ZTV distance of 30km recommended for turbines 86-100m high, 35km recommended for turbines 101-130m high and 45km recommended for turbines over 150m



8-2 Cumulative ZTV of all vertical infrastructure (excluding developments at the planning stage)

9.3 ZTV limitations

- 9.3.1 Because the computer generated ZTV is based on the existing landform only it illustrates the theoretical visibility of the vertical infrastructure within the surrounding area based on the existing landform, without taking into account screening provided by other elements such as vegetation, woodland cover and built development. The ZTVs therefore represent a worst case scenario of visibility.

10. Category, Susceptibility and Sensitivity

10.1 Landscape Category

10.1.1 The value attached to the landscape is usually based on a consideration of the following elements:

- The importance of the landscape, or the perceived value of the landscape to users or consultees, as indicated by, for example, international, national or local designations;
- Cultural associations in the arts or in guides to the area, or popular use of the area for recreation, where experience of the landscape is important;
- Conservation interests: The presence of features of wildlife, earth science or archaeological or historical and cultural interest can add to the value of the landscape as well as having value in their own right.

10.1.2 The categorisation of the landscape was based on the evidence of designations, policies protective of particular landscape areas, promotion of areas or routes because of their landscape or visual qualities, and identified or designated cultural heritage, biodiversity or recreation interests. Each indicator of landscape category was attributed a weighting of 1 to 5 according to its relative importance; a weighting of 5 represents the most important.

Table 9.1 Indicators of Landscape Category and weightings

Category	Indicator	Weighting
Landscape designation	National Park	5
	National Park Variation	4
	AONB	4
	Heritage Coast	3
Landscape policy area	Limestone Pavement	1
	Other local policies	1
Cultural landscape designation	World Heritage Site	3
	Historic Park & Garden	3
	Registered Battlefield	3
	Conservation Area	3
	Scheduled Monument	1
	Listed Building	1
Biodiversity designation	International designation (SAC, RAMSAR, or SPA)	2
	National designation (SSSI)	1
Recreation interest	CROW Land	1
	National Trail	3
	Long distance Footpath	2

Category	Indicator	Weighting
	Promoted Walking Route	1
	National Cycle Route	3
	Regional Cycle Route	2
	Local Cycle route	1
	Country Park	1
	Canal	1

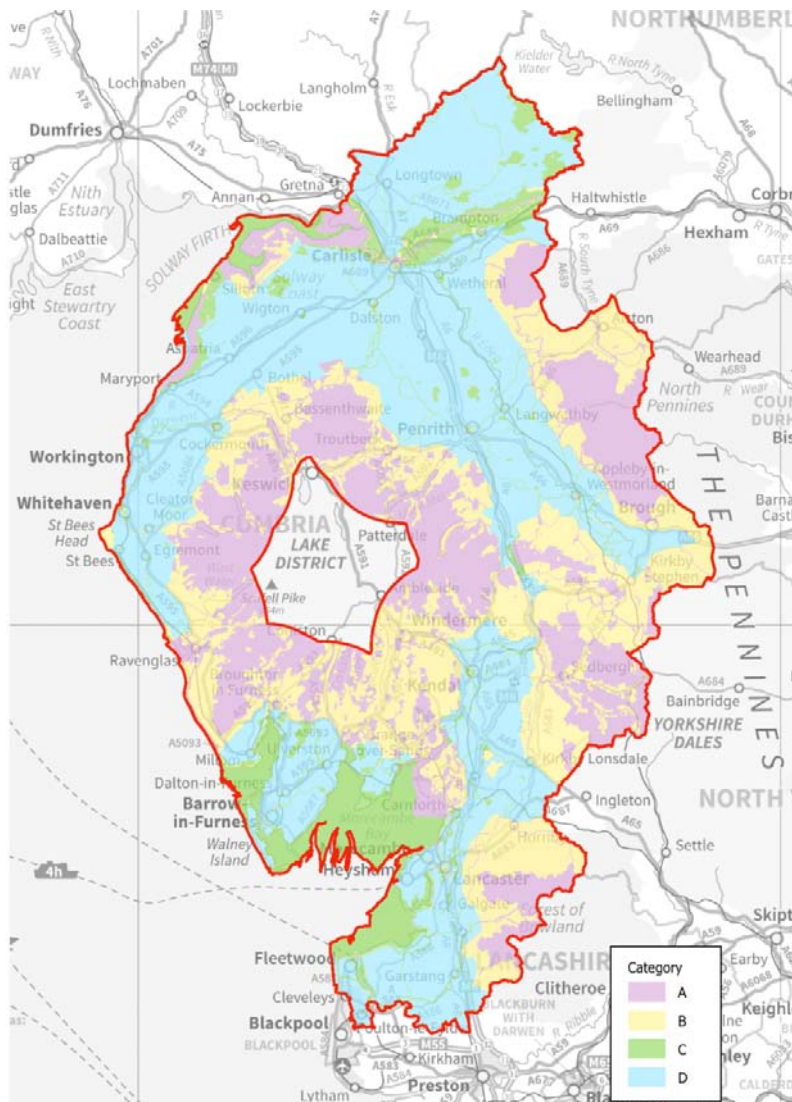
- 10.1.3 Listed buildings have been included only where there is a concentration of 10 or more listed buildings in a 1km x 1km grid square. With regards biodiversity, nationally designated sites have been included only where they lie outside internationally designated sites; i.e. a site covered by several biodiversity designations (e.g. SPA, SAC and SSSI) is counted once and for the highest level of designation present (international or national).
- 10.1.4 Each indicator was mapped as a raster layer in GIS and added together with weightings applied to produce a landscape category raster with 50m grid resolution. Scores in the resulting raster range from 0 (no indicators present) to 20 (several indicators present). Four landscape categories were defined (A – D), with corresponding scores as follows:

Table 9.2 Indicators of Landscape Category and weightings

Score Range	Landscape Category
6 or more	A
4 or 5	B
2 or 3	C
0 or 1	D

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9-1 Landscape Category of the Study Area

- 10.1.5 A vector version of the landscape category raster was created in order to allow overlay analysis with the landscape areas and visual receptor feature classes.
- 10.1.6 For the landscape areas, an average landscape category score for each landscape area was calculated by:
- Intersecting the landscape area polygons with the landscape category polygons;
 - For each resultant polygon, multiplying the area in m^2 of the polygon by the category score of the polygon
 - Summing these values for each landscape area
 - Divide this total by the area in m^2 of the landscape area polygon to give an average landscape category score
 - Round the score to the nearest whole number
 - Assign the landscape category A-D as per this value

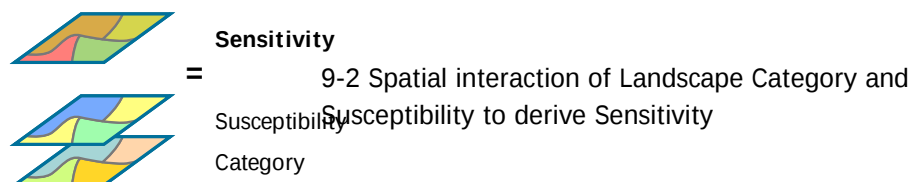
- 10.1.7 The landscape category for the visual receptors was assigned by intersecting the visual receptor feature class with the landscape category feature class. For the settlements the same procedure was used to calculate an average score for landscape category as for the landscape areas. For the remaining visual receptors, the landscape category is determined directly from the intersected polygons.

10.2 Susceptibility

- 10.2.1 The susceptibility of each landscape area to each of the three-scales of vertical infrastructure was determined with reference to the relevant landscape character assessment and graded High, Moderate or Slight. This information was included as three fields in the landscape area tables which were linked to the landscape area polygons.
- 10.2.2 The susceptibility of the visual receptors to changes in views and visual amenity is related to the occupation or activity of people experiencing the view and the extent to which their attention or interest is focused on the view. A Susceptibility field was created in the attribute table for each type of receptor and the following grades assigned:
- People in settlements – High susceptibility;
 - Users of CROW access land – High susceptibility;
 - Users of long distance footpaths – High susceptibility;
 - Users of cycle routes – High susceptibility;
 - Travellers along roads generally – Slight susceptibility;
 - Travellers along roads – scenic routes – Moderate susceptibility;
 - Railway travellers – commuter routes- Slight susceptibility;
 - Railway travellers – commuter routes partly used as scenic routes – Medium susceptibility;
 - Railways travellers – promoted scenic routes – High susceptibility; and
 - Visitors to tourist attractions - High susceptibility.

10.3 Sensitivity

- 10.3.1 **GLVIA3**¹⁰ advises that the sensitivity of landscape receptors combines judgments of their susceptibility to the type of change arising from the development proposal and the value attached to the landscape. This study uses GIS to assess the sensitivity of both landscape and visual receptors based on the spatial interaction of susceptibility and category.



¹⁰ Guidelines for Landscape and Visual Impact Assessment 3rd Edition published by The Landscape Institute and the Institute of Environmental Management & Assessment in April 2013

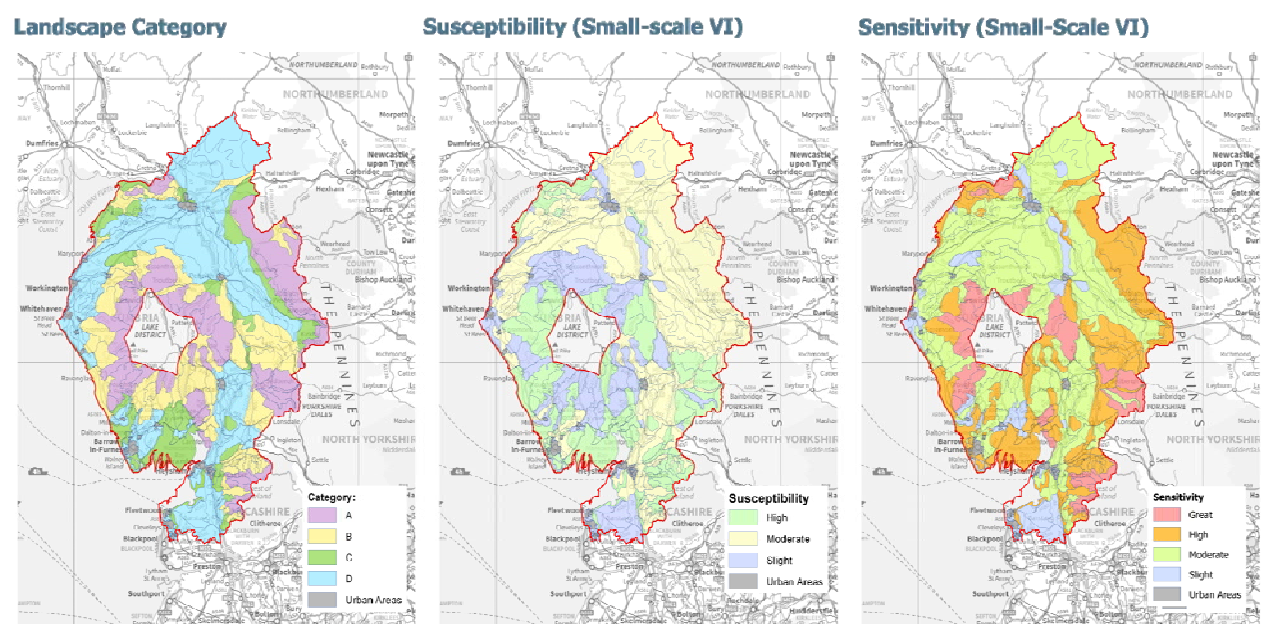
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10.3.2 The following matrix was used to determine the sensitivity from the combination of category and susceptibility:

Table 9.3 Matrix for assessing Landscape and Visual Sensitivity

	Landscape category			
Susceptibility	A	B	C	D
High	Great	High	High	High
Moderate	High	High	Moderate	Moderate
Slight	Moderate	Moderate	Slight	Slight

10.3.3 A table join was used with a lookup matrix to automatically fill in the sensitivity fields for the landscape areas and visual receptors. There are three sensitivity fields for each landscape area, one per scale of vertical infrastructure, and one sensitivity field for each visual receptor.



9-3 Landscape Category, with Susceptibility and Sensitivity maps (for small-scale vertical infrastructure)

11. Assessing magnitude of change

11.1 Landscape areas

Magnitude of direct landscape change

- 11.1.1 Direct magnitude of change was defined as the magnitude of change resulting from the presence of vertical infrastructure within a landscape area. The GIS calculation for direct change is derived from:
1. the scale of the vertical infrastructure present, defined from the cumulative height of the infrastructure within the landscape area, and
 2. the geographic extent from the density of the infrastructure present in the landscape area.
- 11.1.2 For each of the three scales of vertical infrastructure, the point locations of all structures of that scale were overlaid on the landscape area polygons. A Spatial Join was used to count the number of structures present within each landscape area and to calculate the total height of those structures.
- 11.1.3 For each landscape area, density was calculated for each of the three scales of vertical infrastructure by dividing the count of structures within the landscape area by the area in km² of the landscape area.
- 11.1.4 These two measures were then combined by multiplying the cumulative height by the density, and classifying the resultant scores as follows:

Table 10.1 Magnitude of direct landscape change: small-scale vertical infrastructure

Cumulative Height x Density	Direct Magnitude
>500	Large
>50 and ≤500	Medium
>0 and ≤50	Small
0	None

Table 10.2 Magnitude of direct landscape change: medium-scale vertical infrastructure

Cumulative Height x Density	Direct Magnitude
>1000	Large
>100 and ≤1000	Medium
>0 and ≤100	Small
0	None

Table 10.3 Magnitude of direct landscape change: large-scale vertical infrastructure

Cumulative Height x Density	Direct Magnitude
>1500	Large
>150 and ≤1500	Medium
>0 and ≤150	Small
0	None

Magnitude of indirect landscape change

- 11.1.5 Indirect change was calculated in GIS as the degree of visibility from the cumulative ZTVs (scale) and proportion of the area with different degrees of visibility (geographic extent), averaged over each landscape area,
- 11.1.6 For each scale of vertical infrastructure, the following process was used to calculate an averaged visibility score to define the magnitude of indirect landscape change:
- Convert the cumulative ZTV from a raster grid to a polygon feature class;
 - Intersect the landscape area polygons with the cumulative ZTV polygons;
 - For each resultant polygon, multiply the area in m² of the polygon by the visibility score of the polygon;
 - Sum these values for each landscape area;
 - Divide this total by the area in m² of the landscape area polygon to give an average visibility score for the landscape area, and;
 - Assign the magnitude of indirect landscape change using the following classification:

Table 10.4 Criteria for assessing Magnitude of indirect landscape change

Magnitude	Criteria
Large	Many (51 or more) structures visible
Medium	Some (26 to 50) structures visible
Small	Few (1-25) structures visible
None	No structures visible

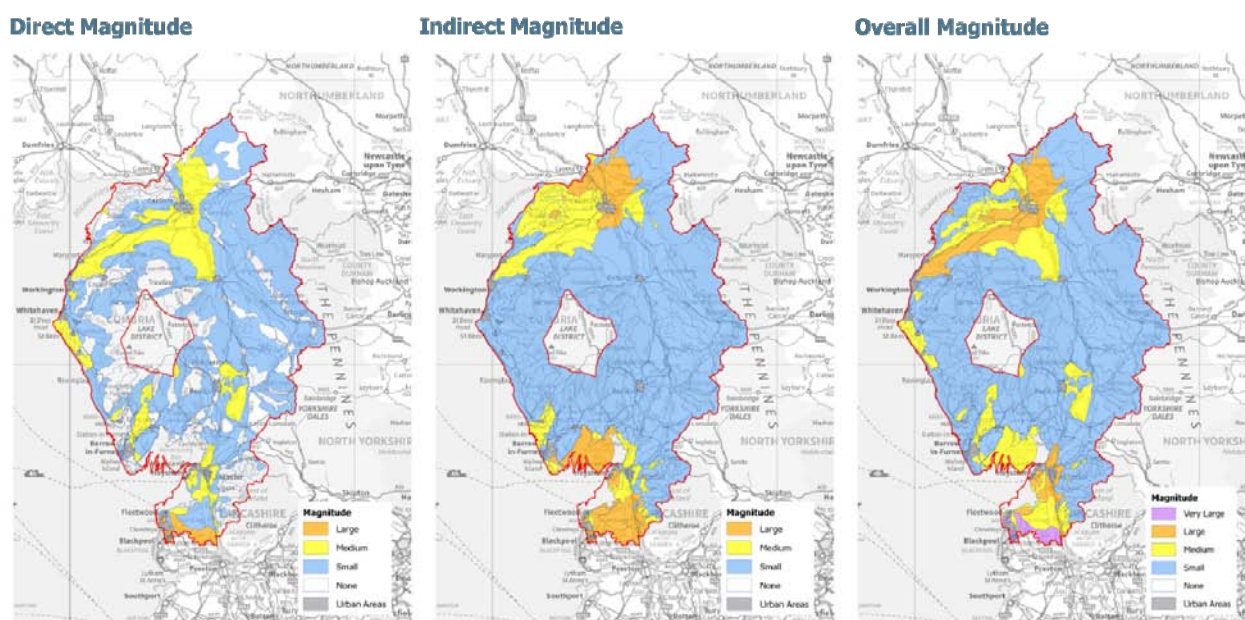
Overall magnitude of change

- 11.1.7 The Magnitude of the direct and indirect landscape change is combined into a measure of overall magnitude of change based on the following matrix:

Table 10.5 Matrix for assessing Magnitude of Cumulative Landscape Change

	Indirect landscape change			
Direct landscape change	Large	Medium	Small	None
Large	Very Large	Very Large	Large	Large
Medium	Large	Large	Medium	Medium
Small	Medium	Medium	Small	Small
None	Medium	Small	Small	None

11.1.8 A table join was used with a lookup matrix to automatically complete the overall magnitude of change fields for the landscape areas.



10-1 Combination of Direct Magnitude and Indirect magnitude to derive Overall Magnitude

11.2 Visual Receptors

Magnitude of Cumulative Visual Change

11.2.1 The Magnitude of Cumulative Visual Change for the visual receptors was determined by intersecting the relevant visual receptor GIS layer with the cumulative ZTV. The same definitions of “Many, Some, Few” are used as for indirect landscape change, as per the following table.

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Table 10.6 Criteria for assessing Magnitude of Cumulative Visual Change

Magnitude	Criteria
Large	Many (51 or more) structures visible
Medium	Some (26 to 50) structures visible
Small	Few (1-25) structures visible
None	No structures visible

11.2.2 For settlements the same procedure was used to calculate an average score for visibility as for the landscape areas. For the remaining visual receptors, the magnitude of cumulative visual change for each scale of vertical infrastructure is assigned using the following process:

- Reclassify the cumulative ZTV raster into 4 classes of visibility as per Table 10.6
- Convert the reclassified cumulative ZTV from a raster grid to a polygon feature class;
- Intersect the visual receptor feature class with the cumulative ZTV polygons

12. Significance of cumulative effects

12.1 Landscape areas

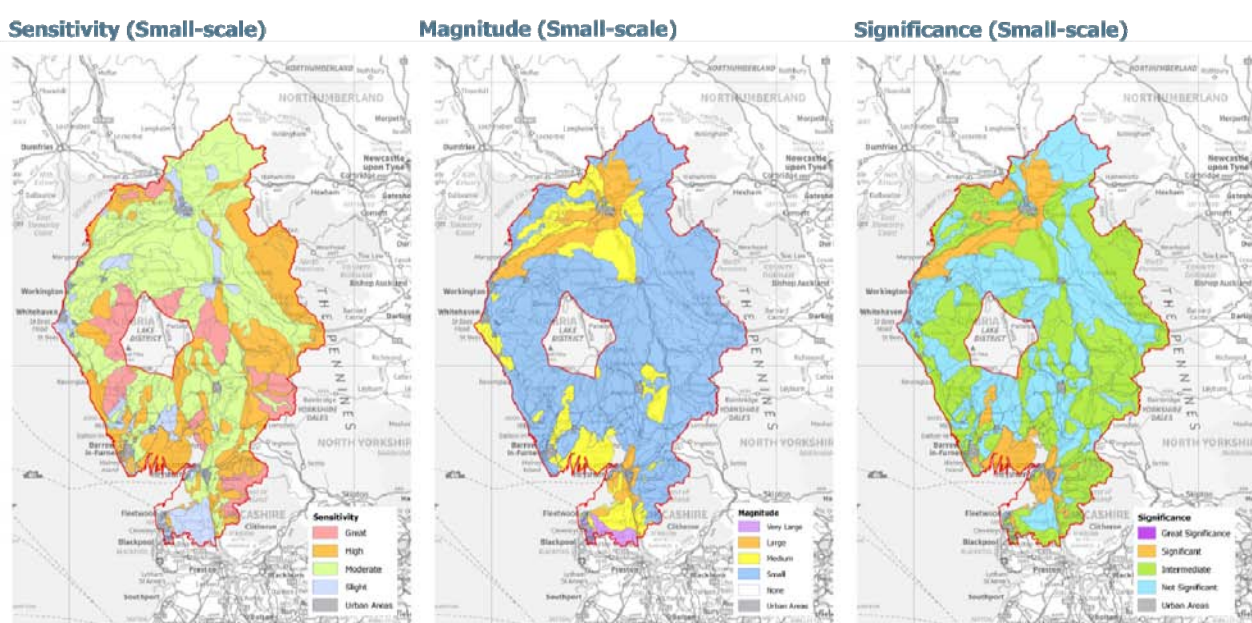
12.1.1 Final conclusions about significance relate the separate judgements about sensitivity of the receptors and magnitude of the changes combined, to judge whether the effect is significant or not.

12.1.2 The following matrix has been used in GIS to determine the significance of the effect of the cumulative developments at each scale on the landscape character of each landscape area by combining the magnitude of change and sensitivity of the landscape receptor:

Table 11.1 Matrix for assessing Significance of landscape effects

	Magnitude			
Sensitivity	Very Large	Large	Medium	Small
Great	Great significance	Great significance	Significant	Intermediate
High	Great significance	Significant	Significant	Intermediate
Moderate	Significant	Significant	Intermediate	Not Significant
Slight	Intermediate	Intermediate	Not Significant	Not Significant

12.1.3 A table join was used with a lookup matrix to automatically complete the significance of landscape effects fields for the landscape areas.



11-1 Spatial interaction of Sensitivity and Magnitude to derive Significance of

12.2 Visual receptors

- 12.2.1 The following matrix has been used in GIS to determine the significance of visual effects of the cumulative developments, combining the magnitude of change and sensitivity of the visual receptor:

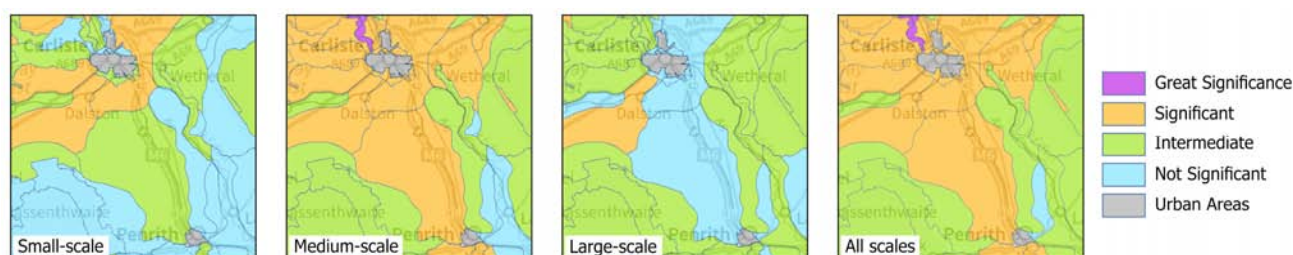
Table 11.2 Matrix for assessment of Significance of visual effects

	Magnitude		
Sensitivity	Large	Medium	Small
Great	Great significance	Significant	Intermediate
High	Significant	Significant	Intermediate
Moderate	Significant	Intermediate	Not Significant
Slight	Intermediate	Not Significant	Not Significant

- 12.2.2 A table join was used with a lookup matrix to automatically complete the significance of visual effects fields for the visual receptor feature classes.

12.3 Significance of cumulative effects for all scales of vertical infrastructure

- 12.3.1 The significance of effects for the three scales of vertical infrastructure have been combined to provide an overall assessment of significance for all scales of vertical infrastructure. For both landscape areas and visual receptors, the highest level of significance across the three-scales takes precedence as shown in 11-2 below:



11-2 Determining Significance of cumulative effects for all scales of vertical infrastructure

13. Mapping Vertical Infrastructure through Time

- 13.1.1 Temporal maps are included in the study to illustrate the pattern of vertical infrastructure developments through the period 2010 to 2020. Two sets of temporal maps have been created; the first illustrating developments which are currently operational, under-construction or with planning consent, and a second set of maps which also include developments submitted for planning.
- 13.1.2 All vertical infrastructure developments in the study are considered to be either:
- Permanent development – electricity transmission infrastructure, telecommunication masts and transmitters; or
 - Temporary development – onshore and offshore wind turbines with a 25 year development lifespan
- 13.1.3 Operational start dates for wind energy developments were collected as part of the data collation phase of the study. This information was stored in the **Year_Operating** field in the attribute data table. In addition, data for the year planning consent was granted (**Year_Consented**) was gathered for those schemes which are not yet operational. Similarly, data for the year the application was submitted (**Year_Submitted**) was gathered for those developments in the planning process that have not yet been determined.
- 13.1.4 Two attribute fields have been created to store the operating start (**T_COMMENCE**) and end (**T_END**) dates for all wind energy developments, where the end date is equal to the start date plus 25 years.

Table

Onshore Wind: Turbine Locations

NAME	STATUS	Application_Ref	Year_Submitted	Year_Consent	Year_Operating	T_COMMENCE	T_END
Fairfield	Operational	4/06/2684/0	<Null>	2008	2011	2011	2036
Fairholme, Shard Lane	Consented	11/00541/FUL	<Null>	2011	<Null>	2012	2039
Field No 3721	Consented	7/2010/2038	<Null>	2012	<Null>	2013	2039
Field to the west of Tempest Tower, Little Orton	Submitted	13/0739	2013	<Null>	<Null>	2016	2041
Firs Farm	Consented	2/2012/0753	<Null>	2014	<Null>	2015	2040
Flimby	Operational	2/2007/1255	<Null>	2008	2013	2013	2038

(0 out of 354 Selected)

Onshore Wind: Turbine Locations

12-1 Extract from GIS database showing temporal attribute fields

- 13.1.5 The following assumptions have been made to assign notional operational start dates for those developments which are not currently operational; with regards consented developments:
- If known, the operational start date is set to that stated on the developer's website
 - For small-scale and medium-scale single or pairs of turbines, a notional operational start date has been assumed to be one year after consent was granted.

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- For large-scale turbines, and medium-scale and large-scale windfarms, the notional operational start date has been assumed as two-years after consent was granted.
- If the above rules give a start date of 2014 or earlier the notional start date has been set to 2015.

With regards submitted applications:

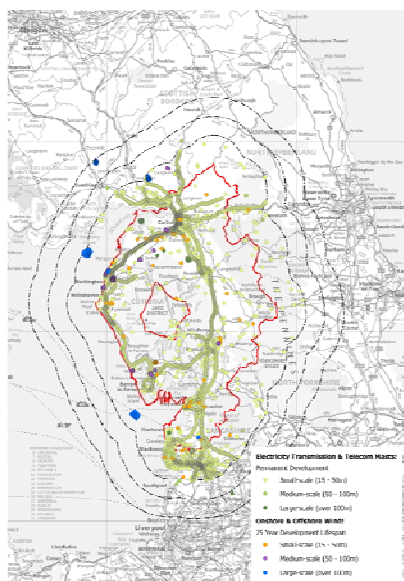
- An operational start date of three years from the date of submission is assumed;
- If the above rules give a start date of 2014 or earlier the notional start date has been set to 2015.

13.1.6 In addition, for some operational developments, the date that operations commenced was unavailable. For these developments, start dates have been estimated with reference to Google Earth aerial photography captured at various intervals from 2000 onwards.

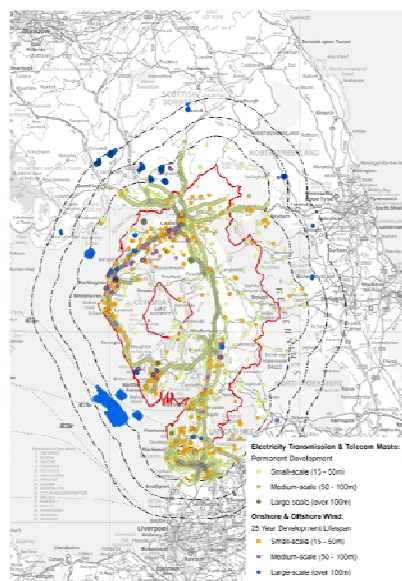
13.1.7 The developments displayed on each temporal map for a specific year X are drawn using a definition query of the form:

"T_COMMENCE" <=X AND "T_END" >=X

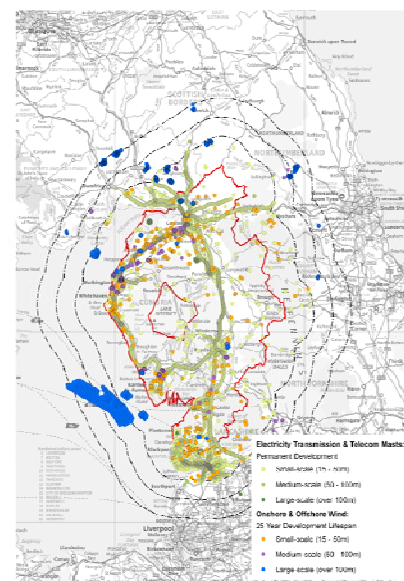
2010 (Including developments in planning)



2015 (Including developments in planning)



2020 (Including developments in planning)

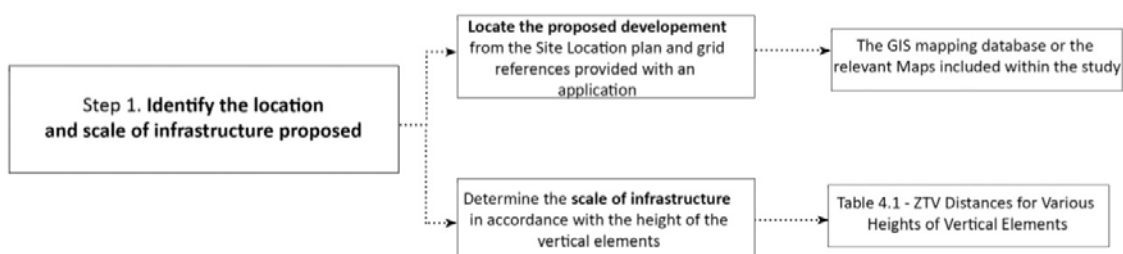


12-2 Temporal plans showing pattern of vertical infrastructure development for the period 2010 to 2020

14. Guidance on using the datasets for assessment

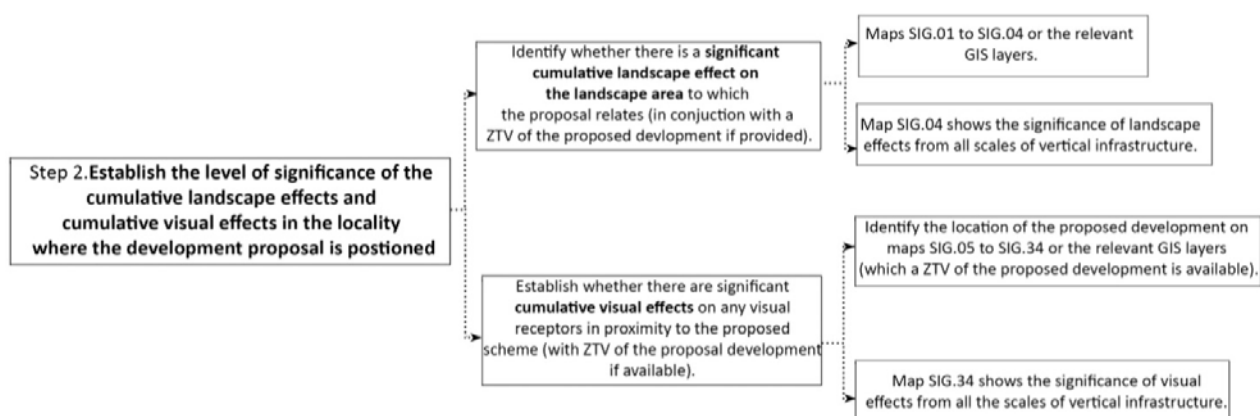
14.1.1 General guidance on using the Study datasets and maps for the assessment of development proposals is provided in Section 4 of the Part 1 Key Findings & Guidance report. The Guidance seeks to offer a step-by-step approach which can be applied by local authority planning officers, developers and the public, when using the Study. Set out below is a more technical version of this guidance targeted at GIS users.

1. Establish the location of the proposed development and the scale of its vertical components.



14.1.2 In the first instance the location of the proposed development should be determined. A site location plan and grid references should have been provided with an application in order to locate the proposed development in GIS. Proposed vertical infrastructure elements can be plotted in GIS from OS coordinates, or if only a site plan has been received, a raster copy of this can be geo-referenced and the proposed structures digitised as point data and saved as a new GIS layer. If only a site boundary has been provided then this can be digitised in GIS as a polygon.

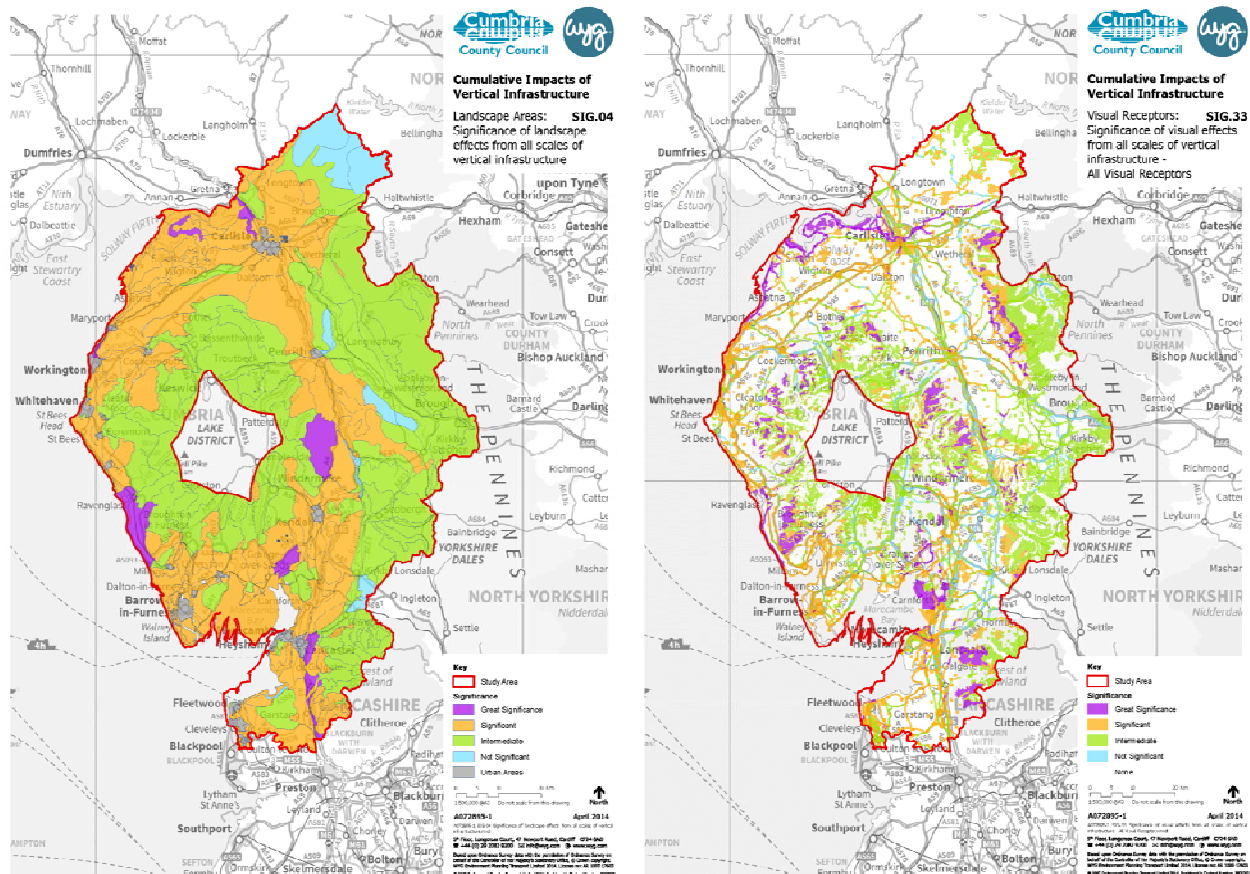
2. Initial appraisal; establish the significance of existing cumulative landscape effects and cumulative visual effects in the locality of the proposed development



14.1.3 If a plan showing the ZTV of the development proposal has been provided by the applicant, a copy of the ZTV plan can be either saved as an image (e.g. JPEG, TIFF or PNG format) using

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Adobe Acrobat or equivalent software, or scanned from a paper copy, and this image can be georeferenced/registered in GIS. Alternatively, a GIS version of the ZTV can be requested from the applicant either in the form of a georeferenced image or as a polygon dataset. The ZTV can be overlaid on the visual receptor GIS layers symbolised using the **Sig_All** attribute field (as on Map SIG.33) to understand the interaction of the visibility of the proposal with existing levels of cumulative visual effects within the area influenced by the development proposal.



- 13-1 Significance of landscape effects and visual effects from all scales of vertical infrastructure
- 14.1.4 The definitions used in the assessment for the different scales of infrastructure and the appropriate extents for ZTVs in relation to the height of the vertical element are as follows:

Table 13.1 Scale and ZTV Distances for Various Heights of Vertical Elements

Height of vertical element (m)	Scale of infrastructure	ZTV distance (km)
up to 50	small-scale	15
51-100	medium-scale	25
Over 100	large-scale	35

Source: Table 3.1 of Part 2: The Assessment

Please note that for wind turbines the height to blade-tip (not the height to hub/nacelle) determines the scale of infrastructure.

- 14.1.5 These definitions can be used by officers to define the scale and associated ZTV of the proposal they are assessing. The landscape areas affected, the visual receptors affected, and existing visibility of vertical infrastructure in the relevant area, (which will contribute to the overall cumulative effect locally), can then be identified.
- 14.1.6 It is possible that, at this stage, the initial appraisal will have provided enough contextual information to enable a decision to be made about the cumulative effects of the proposal under consideration. However, a more detailed appraisal is likely to be required for more complex projects or where there are pressure points affecting decision-making. Then it is advisable to proceed through each step of the assessment process and build up evidence and justification for judgements made about the additional effects of the development proposal and to inform the decision to be made.

3. Identify the landscape and visual receptors relevant to the development proposal and their sensitivity

- 14.1.7 In order to assess the impact of a proposal for vertical infrastructure development, both the landscape and visual receptors which have the potential to be affected by the proposal should be identified. Landscape receptors are the defined aspects of the landscape resource that have the potential to be affected by a proposal and visual receptors are individuals and/or defined groups of people who have the potential to be affected by a proposal.

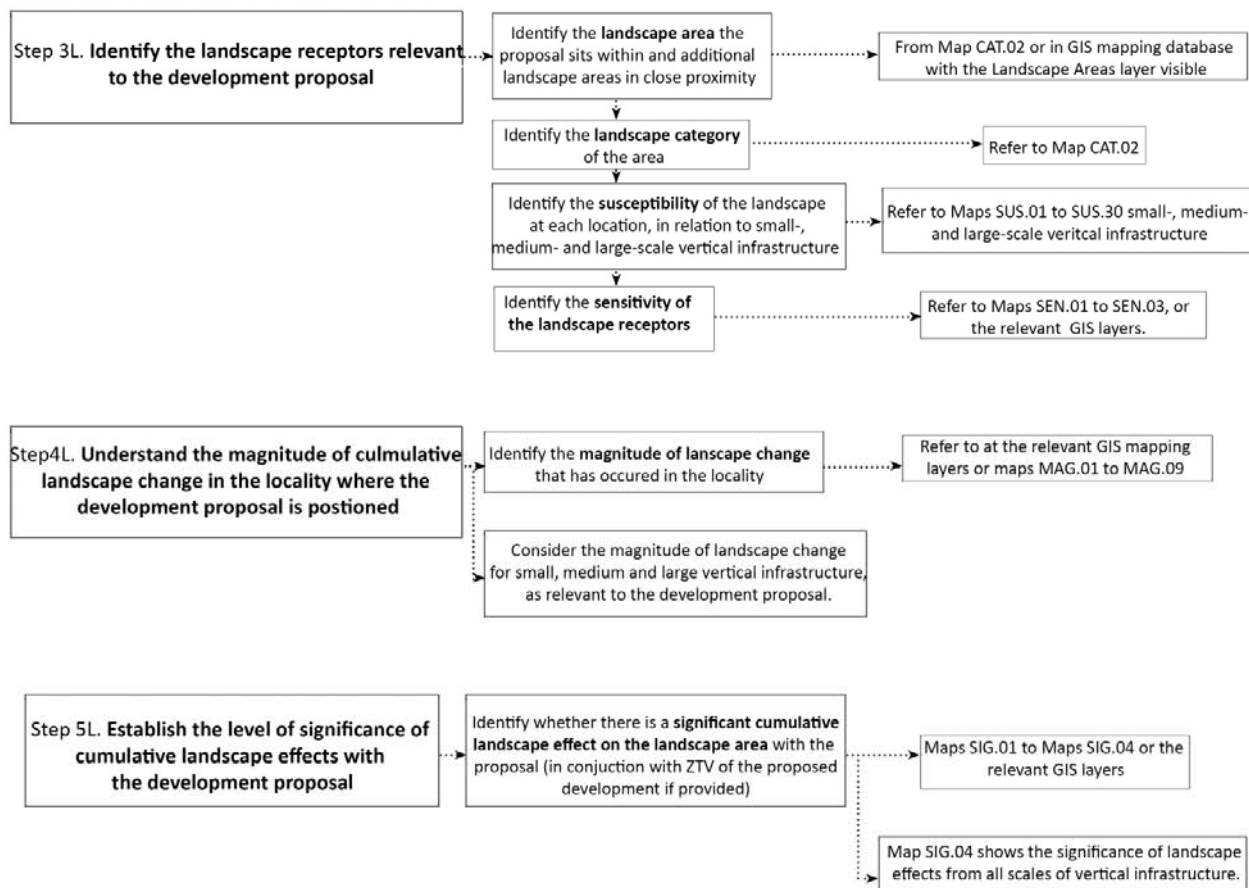
Landscape Receptors

- 14.1.8 The next step is to identify which landscape area the proposal sits within and any additional landscape areas which adjoin or fall within the ZTV of the development proposal and which therefore have the potential to be impacted upon. This can be achieved by overlaying the development proposal GIS layer and geo-referenced ZTV on the Landscape Areas layer and selecting those landscape areas which intersect.
- 14.1.9 The attribute data table associated with the Landscape Areas GIS layer identifies the overall sensitivity of the landscape area in relation to small, medium and large scale vertical infrastructure contained in the fields **Sens_Small**, **Sens_Med** and **Sens_Large** respectively. The tables detailing how the assessments of landscape sensitivities for each area have been concluded are included in [Appendix 4: Landscape Character Assessment Tables](#) and summarised in the attribute data linked to the Landscape Areas GIS layer. These factors include:
- The key sensitive elements of the landscape area (fields **Sens_1** to **Sens_5**)
 - The susceptibility of the landscape area to vertical infrastructure (fields **Sus_Small**, **Sus_Med** and **Sus_Large**)
 - Guidance for future decision making for the landscape character area (fields **Guidance1** to **Guidance5**)
 - The category of the landscape area (field **Category**)

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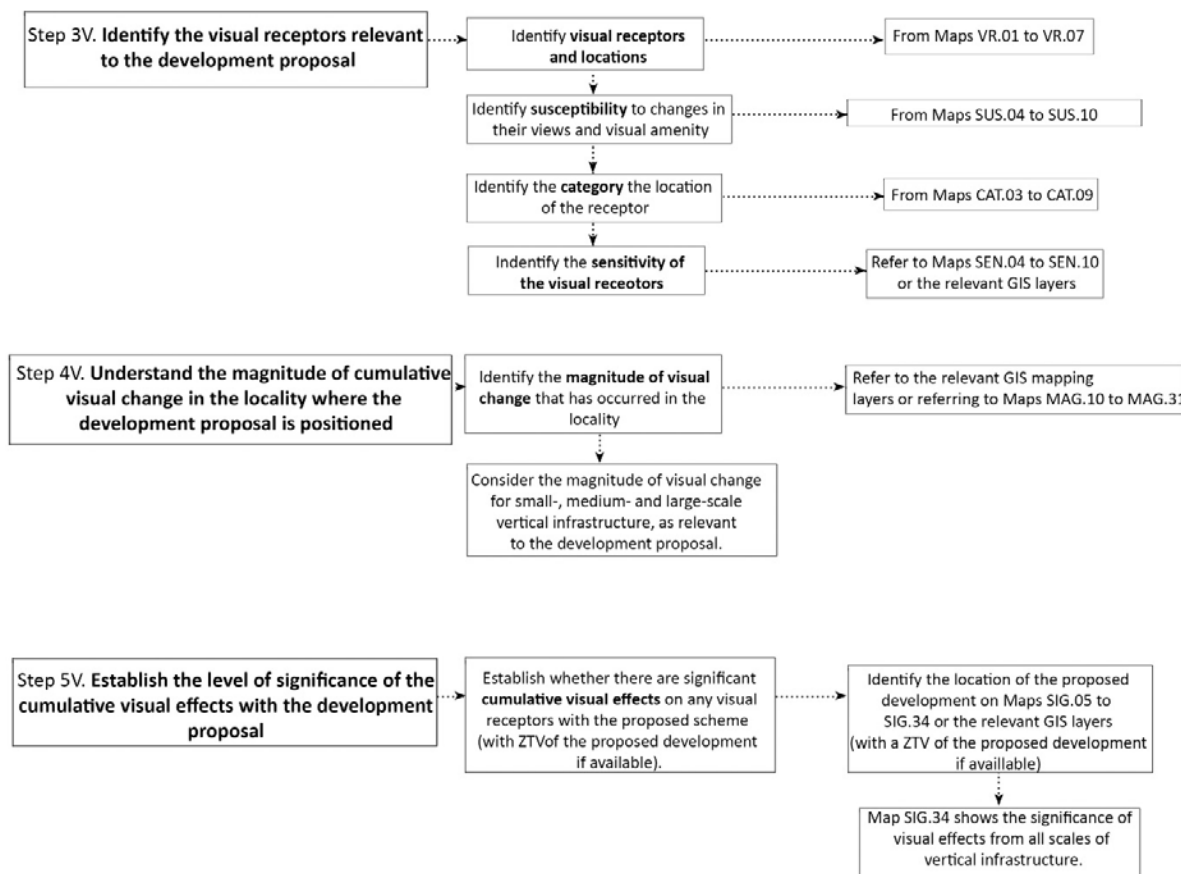
- 14.1.10 In assessing development proposals for vertical infrastructure officers should take into consideration the relative sensitivity of the landscape receptor to vertical infrastructure development as defined by the assessment (attribute fields **Sens_Small**, **Sens_Med** and **Sens_Large** as displayed on Maps SEN.01 to SEN.03), and the specific characteristics and sensitivities of the landscape receptors as set out in the relevant table which have determined this.



Visual Receptors

- 14.1.11 The Study identifies places where people viewing the landscape (the visual receptors), which are present throughout the Study area and include settlements, CROW access land, long distance walking routes, cycle routes, roads, railway lines and tourist attractions; these are identified on Maps VR.01 to VR.07 and GIS data layers are provided for each category of visual receptor.
- 14.1.12 To identify any visual receptors which are potentially impacted upon by the development proposal, overlay the geo-referenced ZTV onto the visual receptors layers and identify those visual receptors which fall within the ZTV. (If the ZTV has been provided as a polygon dataset it will be possible run a select by location query to identify the visual receptors which are within the ZTV). It should be noted that there may be additional places where visual receptors may be present in addition to those identified within the Study and therefore if the officer is aware of any

further visual receptor locations where there is potential for effects on visual amenity, then these should also be taken into account.



14.1.13 The Study identifies the sensitivity of visual receptors by considering their susceptibility to changes in their views and visual amenity (recorded in the field **Sus_All**), and the category attached to the location of the receptor (recorded in the field **Category**). The sensitivity of the visual receptors relating to the development which they are assessing can be determined by interrogating the field **Sens_All** in the GIS layers for the visual receptors. A matrix is detailed at Table 3.12 of Part 2: The Assessment which shows how susceptibility and the landscape category have been combined to determine sensitivity.

Table 13.2 Matrix for assessing Visual Sensitivity

	Landscape category of the location			
Susceptibility	A	B	C	D
High	Great	High	Moderate	Moderate
Moderate	High	High	Moderate	Slight
Slight	Moderate	Moderate	Slight	Slight

Source: Table 3.12 of Part 2: The Assessment

4. Understand the magnitude of cumulative landscape change and cumulative visual change in the locality where the development is proposed

- 14.1.14 The Study assesses the magnitude of cumulative landscape change on landscape receptors and the magnitude of cumulative visual change on visual receptors taking into consideration the size or scale of change, the geographical extent of the area influenced, and its duration and reversibility.
- 14.1.15 To identify the **existing magnitude of landscape and visual change** that has occurred in the locality of the development proposal for the three scales of vertical infrastructure, refer to the attribute fields **Mag_Small**, **Mag_Med** and **Mag_Large** included in the Landscape Areas and Visual Receptors GIS layers; thematic maps for these fields are included as Maps MAG.01 to MAG.09 in relation to the magnitude of landscape change and Maps MAG.10 to MAG.30 in relation to the magnitude of visual change.

5. Establish the significance of existing cumulative landscape effects and cumulative visual effects in the locality where the development is proposed

- 14.1.16 The Study identifies the significance of cumulative landscape effects and visual effects by combining the conclusions made in relation to the sensitivity of receptors and magnitude of change. As explained at Step 2, cumulative landscape and visual effects are identified to be: of great significance, significant, of intermediate significance, or not significant, for each scale of vertical infrastructure.
- 14.1.17 With regards existing cumulative landscape effects, refer to the Landscape Areas GIS layer and fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** (shown on Maps SIG.01 to SIG.04). Map SIG.04 shows the significance of landscape effects from all scales of vertical infrastructure and the corresponding data is contained in the **Sig_All** field. With regards identifying cumulative visual effects, refer to the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** contained in the attribute data for the visual receptor layers (and shown on Maps SIG.05 to SIG.33). Map SIG.33 shows the significance of visual effects from all scales of vertical infrastructure and the corresponding data is contained in the **Sig_All** field.

6. Justify Judgements Utilising the Study Methodology

- 14.1.18 When considering proposals for vertical infrastructure development, officers should work through the steps detailed above in order to fully understand the baseline position at the location where the additional infrastructure development is proposed. By understanding the conclusions of the Study, the officer will be able to make a more informed assessment of the cumulative impact of additional vertical infrastructure development at the location proposed. The project environmental assessment (if provided as part of the planning application submission) will provide an assessment of the landscape and visual and cumulative effects of the proposal itself. By following through the CIVI assessment steps, the officer will be able to collate the evidence needed to justify the conclusion about whether there might be further cumulative effect arising from the proposed development in addition to those existing.
- 14.1.19 The following is a checklist of the detailed factors which are of relevance in determining cumulative impact (and associated GIS layers and attributes):

Scale of infrastructure proposed

- Small
- Medium
- Large

Landscape receptors

Landscape Areas dataset defined from analysis of landscape character assessments

Landscape category

Recorded in the **Category** field of the Landscape Areas dataset and determined in accordance with the indicators set out in Part 2 - The Assessment Table 3.3.

Landscape susceptibility

Recorded in the fields **Sus_Small**, **Sus_Med** and **Sus_Large** of the Landscape Areas dataset and determined in accordance with the criteria set out in Part 2 – The Assessment paragraph 3.2.45 – 3.2.52

Landscape sensitivity

Recorded in the fields **Sens_Small**, **Sens_Med** and **Sens_Large** of the Landscape Areas dataset and determined by a combination of judgements on landscape category and landscape susceptibility.

Magnitude of cumulative landscape change (direct and indirect)

Overall magnitude of cumulative landscape change is recorded in the fields **Mag_Small**, **Mag_Med** and **Mag_Large** of the Landscape Areas dataset and determined in accordance with criteria set out at Table 3.5 of Part 2: The Assessment. (Refer to the fields **DMag_Small**, **DMag_Med**, **DMag_Large**, **IMag_Small**, **IMag_Med**, and **IMag_Large** respectively for direct and indirect magnitude of cumulative landscape change).

Significance of cumulative landscape effects

Recorded in the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** and determined by considering a combination of landscape sensitivity and magnitude of change

Visual receptors

- Residents in and visitors to settlements
- Users of CROW/access land
- Users of long distance footpaths
- Users of cycle routes
- Travellers on roads
- Travellers on railways
- Visitors to tourist attractions

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Visual receptor susceptibility

For each group of visual receptors, recorded in the field **Sus_All** and determined in accordance with the criteria set out in Part 2 – The Assessment Table 3.11

Visual sensitivity

For each group of visual receptors, recorded in the field **Sens_All** and determined by a combination of judgements on landscape category and visual receptor sensitivity

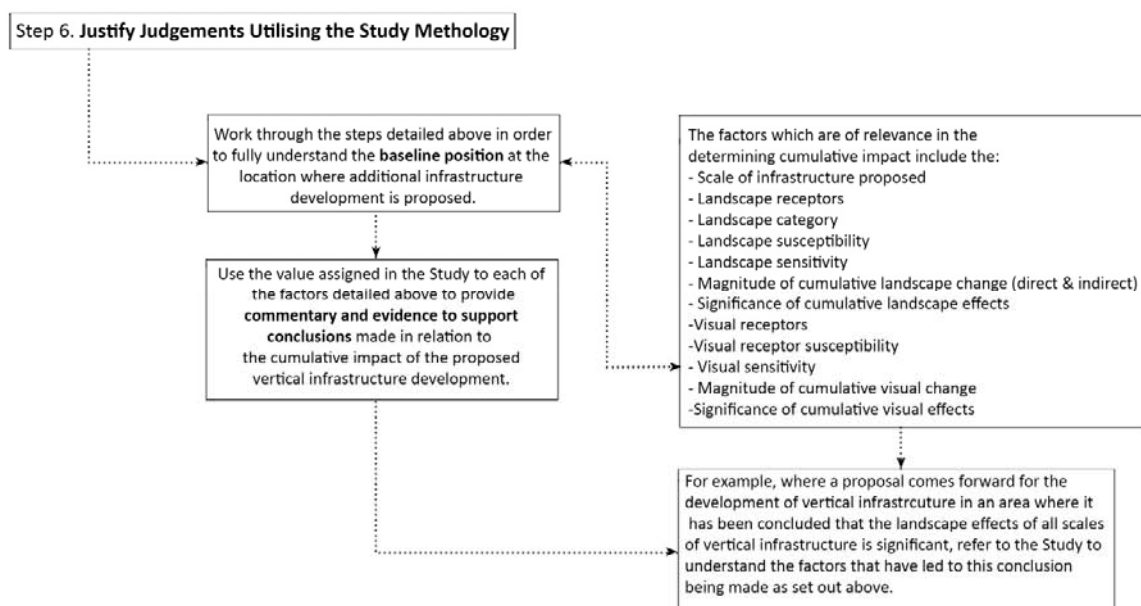
Magnitude of cumulative visual change

For each group of visual receptors, recorded in the fields **Mag_Small**, **Mag_Med** and **Mag_Large** and determined in accordance with the criteria set out in Part 2 – The Assessment Table 3.13

Significance of cumulative visual effects

For each group of visual receptors, recorded in the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** determined by the combination of visual sensitivity and magnitude of change.

- 14.1.20 The judgements set out in the Study assigning a value to each of the factors detailed above can be used by officers to provide commentary and evidence to support conclusions made in relation to the cumulative impact of vertical infrastructure development. For example, where a proposal comes forward for the development of vertical infrastructure in an area where it has been concluded that the landscape effects of all scales of vertical infrastructure is significant, the officer should refer to the Study to understand the factors that have led to this conclusion being made as set out above.



15. Maintaining and future-proofing the CIVI GIS

- 15.1.1 The datasets that constitute the CIVI database can be considered as a snapshot in time of the existing and proposed vertical infrastructure, the areas covered by relevant designations and policies, the location of visual receptors and the landscape character assessments in place as of February 2014.
- 15.1.2 In order for the GIS database to continue to be relevant, accurate and useful, it is recommended that a continuing programme of updates is undertaken. With regards the vertical infrastructure datasets, the updates would need to include the study area and the buffer zones.
- 15.1.3 The following schedule of updates to the datasets is suggested:

Regular updating of vertical infrastructure development data within the study area:

It is suggested this is carried out on a monthly basis for the study area. This would entail the LPAs recording when any enquires relating to vertical infrastructure come in at screening or scoping stages, or when planning applications have been permitted or refused, and the updates to the datasets undertaken at the end of each month.

6-monthly to annual updating of development data within the buffer zones:

There are 29 LPAs located within or partly within the buffer zones to the study area. Given the large geographical area for which data will be sought, it is suggested that development data within these zones is updated on a biannual or annual basis.

Annual updating of designations and landscape character information:

The data to be updated would include the variation orders associated with the National Park Boundaries, changes to other designated areas, updates to local development plans, , and updates associated with local character assessments. For these elements, it is recommended that a review is carried out of the designations and adoption of studies relating to Cumbria, Lancashire, National Parks and AONBs, on a yearly basis in order to identify relevant information and the value of updating the information at this stage in time. It is suggested that major changes are updated on a yearly basis, with minor changes updated on a 2-3 yearly basis.

2-3 yearly updating of visual receptor information:

The data that may need updating includes any major residential developments or settlement expansions; new or amendments to cycle routes or footpaths; changes to the road and railway network, and any new major tourist attractions. It is suggested that these are reviewed in relation to their relevance and updated on a 2-3 year basis, with any major changes updated on a yearly basis.

6-monthly to annual updating of analysis and assessment datasets:

In addition to keeping the baseline datasets up to date, it is advised that the assessment datasets (relating to Category, Susceptibility, Sensitivity, Magnitude and Significance) are maintained at

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regular intervals in order that officers can continue to make valid judgements on the potential cumulative impacts of proposed vertical infrastructure

- 15.1.4 The CIVI Study methodology and GIS are designed to be flexible in that additional types of vertical infrastructure (such as tall chimneys and stacks if a reliable data source becomes available) or receptor (e.g. users of local rights of way) can be incorporated into the baseline datasets and into the analyses and assessment.



Appendix A: List of data providers

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Data used in this Study has been provided by:

- Cumbria County Council
- Lancashire County Council
- Lake District National Park Authority
- Yorkshire Dales National Park Authority
- Allerdale District Council
- Carlisle District Council
- Copeland District Council
- Eden District Council
- Lancaster District Council
- Wyre District Council
- Ordnance Survey
- Natural England
- English Heritage
- National Grid
- Electricity North West
- Sustrans



Appendix B: List of datasets used

Ordnance Survey Base mapping:

- OS MasterMap
- OS VectorMap District
- OS Meridian 2
- OS MiniScale
- OS Raster 250k
- OS Raster 50k
- OS Raster 25k
- OS Raster 10k
- OS Boundary Line
- OS Terrain 50

Landscape Character (provided by LPAs):

- Cumbria Landscape Types and Sub-Types
- Lake District National Park Landscape Types, Sub-Types and Areas of Distinctive Character
- Solway Coast AONB Landscape Types and Character Areas
- Yorkshire Dales National Park Landscape Character Areas
- Lancashire Landscape Types and Character Areas
- Forest of Bowland AONB Landscape Character Areas

Landscape Designations and Policies (Natural England data):

- National Parks
- National Parks Variation Orders
- Areas of Outstanding Natural Beauty
- Heritage Coast
- Landscape Policies (LPAs)

Cultural Landscape Designations (English Heritage data unless noted):

- World Heritage Sites
- Registered Parks and Gardens
- Registered Battlefields
- Scheduled Monuments
- Conservation Areas (provided by LPAs)
- Listed Buildings

Biodiversity Designations (Natural England data):

- Ramsar
- Special Protection Areas
- Special Areas of Conservation
- Sites of Special Scientific Interest

Access and Recreation:

- CROW Access Land (Natural England)
- National Trails (Natural England)
- Long Distance Footpaths (from OS mapping)
- Promoted Walking Routes (tourism websites)
- National Cycle Routes (Sustrans)

- Links to National Cycle Routes (Sustrans)
- National Byway (Sustrans)
- Regional Cycle Routes (Sustrans)
- Local Cycle Routes (LPAs)
- Country Parks (Natural England)
- Canals (from OS mapping)

Visual Receptors (not included in above listings):

- Settlements (LPAs, OS Meridian)
- Roads (OS VectorMap District)
- Railways (OS VectorMap District)
- Tourist Attractions (tourism websites, OS mapping)

Vertical Infrastructure:

- Onshore wind (LPA planning applications, developer websites, OS MasterMap)
- Offshore wind (LPA planning applications, developer websites)
- Pylons (National Grid, Electricity North-West, OS MasterMap)
- Telecommunication masts (LPA planning applications, Ofcom 'Sitefinder' database, OS MasterMap)

Appendix C: Settlements assessed in the Study



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Abbeystead	Biggar	Broadbwath	Clawthorpe
Abbeytown	Biglands	Bromfield	Cleator
Aglionby	Bigrigg	Broom	Cliburn
Aiketgate	Bilsborrow	Brough and	Clifton
Aikhead	Birkby	Church Brough	Clifton Dykes
Aikton	Blawith	Brough Soweby	Coast Road
Ainstable &	Bleatarn	Brougham	Cockerham
Towngate	Blencarn	Broughton-in-	Colby
Aldcliffe	Blencathra	Furness	Conder Green
Allerby	Blencogo	Broughton Cross	Coniston
Allithwaite	Blencow	Broughton Mills	Cotehill
Allonby	Blennerhasset	Broughton Moor	Coulderton
Alston	and Baggrow	Broughton Beck	Coupland Beck
Anthorn	Blindcrake	Brow Top	Cowan Head
Arkholme	Bolton	Burbanks	Cowgill
Arkleby	Bolton Low	Burgh-by-Sands	Crackenthorpe
Arlecdon	Houses	Burneside	Croft Ends
Armathwaite	Boltonfellend	Burnrigg	Crofton
Arrad Foot	Boltongate	Burns Farm	Croglin
Asby Workington	Bomby	Burrells	Crook Kendal
Askam & Ireleth	Boot	Burton-in-Kendal	Crookland &
Askham	Bootle	Butterwick	Millness
Aspatria	Borwick	Caldbeck	Crosby-on-Eden
Aughton	Bothel	Calder Bridge	Crosby Garrett
Ayside	Botton Head	Calder Vale	Crosby Maryport
Backbarrow	Boustead Hill	Calthwaite	Crosby Moor
Baldwinholme	Bouth	Camerton	Crosby
Bampton and	Bowgreave	Cantsfield	Ravensworth
Bampton Grange	Bowland Bridge	Capernwray	Crosby Villa
Bandrake Head	Bowness-on-	Cardewlees	Crosscanonby
& Oxen Park	Solway	Cardurnock	Crossgate
Banks	Bowscale	Cargo	Crossgill
Barber Green	Bowston	Cark in Cartmel	Crossmoor
Barbon	Braides	Carr Bank	Crosthwaites
Bardsea	Braithwaite	Cartmel	Culgaith
Barepot	Brampton	Carwath	Cumdivock
Barton	Appleby	Casterton	Cummerdale
Bassenthwaite	Branthwaite	Castle Carrock	Cumrew
Baycliff	Braystones	Catlowdy	Cumwhinton
Beaumont	Bridekirk	Catterlen	Cumwhitton
Beck Side	Bridgefoot &	Causewayhead	Dacre
Beckermest	Little Clifton	Chapels	Dean
Beckfoot	Brigham	Church Hill	Deanscales
Beetham Village	Brigsteer	Churchtown	Dearham
Berrier	Brisco	Claughton	Dendron

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Dent	Garnett Bridge &	Haile	Holme Mills
Distington	Watchgate	Hale	Holmrook
Dockray	Garrigill	Halfpenny	Hornby
Dolphinholme	Garsdale	Hall Dunnerdale	Hornsby &
Dovenby	Garsdale Head	Hallbank	Scarrowhill
Drigg	Garth ow	Hallbankgate	Houghton
Drumburgh	Gatebeck	Hallthwaites	How
Drybeck	Gawthrop	Hambleton	Howgate
Dubwath	Gawthwaite	Harker	Hunsonby &
Duddon Bridge	Ghyll head	Harrington	Winskill
and Bank End	Bowness	Harriston	Hutton
Dufton	Gilcrux	Hartley	Hutton Roof
Dundraw	Gilgarran	Haverigg	Kirkby Lonsdale
Durdar	Gilsland (Part)	Haverthwaite	Hycemoor &
Eagland Hill	Glasson	Hawksdale	Bootle Station
Eaglesfield	Glasson	Haws Bank	Ings
Eamont Bridge	Glassonby	Hayton	Inskip
Easton	Gleaston	Hayton Aspatria	Ireby
Edenhall	Glenridding	Heads Nook	Ireby
Ellonby	Goadsbarrow	Heaton	Irthington
Embleton	Goose Green	Helton	Irton Hall
Endmoor	Gosforth	Hesket	Isel
Ennerdale Bridge	Grayrigg	Newmarket	Ivegill
Eskdale Green	Great and Little	Hethersgill	Johnby
Fairfield	Broughton	Heversham	Kaber
Far Sawrey	Great Asby	Heysham	Kearstwick
Farlam	Great Clifton	Nuclear Power	Keekle &
Farleton	Great Corby	Station	Summergrove
Faugh	Great Eccleston	High Biggins	Keld Shap
Fenton	Great Musgrave	High Bankhill	Kelsick
Field Broughton	Great Ormside	High Bridge	Kentmere
Fingland	Great Orton	High Carley	Kershopefoot
Finsthwaite	Great Salkeld &	High Casterton	Killington
Flimby	South Dykes	High Cunsey	Kilnhill Bassenfell
Flookburgh &	Great Strickland	High Harrington	King's Meaburn
Ravenstown	Great Urswick	High Hesket	Kirkandrews-on-
Forton	Greenwell	High Ireby	Eden
Foxfield	Gressingham	High Newton	Kirkbampton
Friars Ground	Greysouthen	High Nibthwaite	Kirkbride &
Frizington and	Greystoke	High Wray	Angerton
Rheda	Grinsdale	Hilton	Kirkbride Airfield
Gaisgill and	Grizebeck	Hincaster	Kirkby-in-
Longdale	Grizedale	Hoff	Furness &
Gaitsgill	Guardhouse	Holbeck	Sandside
Galgate	Hackthorpe and	Holker	Kirkby Lonsdale
Gamblesby	Lowther Village	Holme	Kirkby Stephen



Kirkby Thore	Low Crosby	Moorhouse and	Newtown
Kirkcambeck	Low Hesketh	Bow	Lowther
Kirkhouse	Low Moresby	Moresby Park	Nook
Kirkland	Low Newton	Morland	North Side
Kirkland	Low Row	Mosedale	Oakencrough
Frizington	Low Stott Park	Motherby	Old Hutton
Kirkoswald	Low Whinnow	Muncaster	Old Town
Kirksanton	Lowca	Mungrisdale	Orton
Kit Brow	Lower Green	Murton	Orton Rigg
Knock	Bank	Myerscough	Oughterby
Lady Hall	Lower Thurnham	Nateby	Oughterside
Laithes Penrith	Loweswater	Nateby	Oulton
Lake Rigg	Lowgill	Natland	Ousby
Lakeside	Lowick Bridge	Nealhouse	Out Rawcliffe
Lamonby	Lowick Green	Near Sawrey	Outhgill
Lamplugh	Lupton	Nenthead	Mallerstang
Lanercost	Lynholmeford	Nether Burrow	Over Kellet
Langrigg	Marshaw	Nether Kellet	Overton
Langwathby	Marton	Nether Wasdale	Oxenholme
Laversdale	Matterdale End	Nethertown	Papcastle
Lazonby	Maulds Meaburn	New Hutton	Parsonby
Leasgill	Mawbray	Newbiggin	Parton
Leck	Meal Bank	Newbiggin	Patterdale
Lee	Mealsgate and	Newbiggin-on-	Patton Bridge
Leece	Fletcherstown	Lune	Pennington
Lees Hill	Meathop	Newbiggin	Penny Bridge &
Lessonhall	Melkinthorpe	Stainton	Greenodd
Levens	Melling	Newbiggin	Penruddock
Lindal in Furness	Melmerby	Temple Sowerby	Pica
Lindale	Middleshaw	Newbiggin	Pilling
Lingyclose Head	Middleton	Ulverston	Pilling Lane
Linstock	Middletown	Newby Bridge	Plantation Bridge
Little Asby	Milburn	Newby East	Plumbland
Little Bampton	Mill Houses	Newby Morland	Plumgarths
Little Musgrave	Mill Side	Newby West	Plumpton
Little Orton	Millbeck	Newland	Pooley Bridge
Little Salkeld	Millholme	Newland Bottom	Port Carlisle
Little Strickland	Millhouse	Newton	Priest Hutton
Little Urswick	Millthorp	Newton Arlosh	Prospect
Long Marton	Milnthorpe	Newton	Quernmore
Longburgh	Milton	Blackford	Rampside
Longdales	Moat	Newton in	Ratten Row
Longtown	Mockerkin	Furness	Raughton Head
Lorton	Monkhill	Newton Reigny	Ravenglass
Low Biggins	Moor Row	Newtown	Ravenstonedale
Low Braithwaite			and Greenside

Cumulative Impacts of Vertical Infrastructure

Appendix 1: GIS Technical Report

Reagill	Slack Head	Tatham	Warwick Bridge
Redmain	Sleagill	Tebay	& Little Corby
Renwick	Sleetbeck	Temple Sowerby	Watchill
Rigmaden	Smithfield	Thanet Well	Water Yeat
Roa Island	Sockbridge &	The Howe	Watermillock
Roadhead	Tirril	The Common	Waverbridge
Rockcliffe	Soulby	The Green	Waverton &
Rose Bank Castle	Soutergate	The Hill	Parkgate
Rosgill	Southwaite	Thornhill	Welton
Rosley	Spark Bridge	Thornthwaite	Wennington
Rosley Station	Spittal Farm	Thornton	West Curthwaite
Rosside	St Bees	Threapland	West Hall
Rottington	St Helens	Threlkeld	Westlakes
Row	St Michael's on	Thrushgill	Westlinton
Ruckcroft	Wyre	Thurnham	Westnewton
Rusland Cross	Staffield	Thursby	Wetheral
Ruthwaite	Stainburn	Thurstonfield	Wetheral Pasture
Salter	Stainton	Todhills	Whin Lane End
Sandale	Stainton Kendal	Torpenhow	Whitbeck
Sandford	Stainton with	Torver	Whitrigg
Sandside	Adgarley	Tower Wood	Kirkbride
Sandwith	Stair	Townhead	Whitrigg
Sandysike	Stake Pool	Ousby	Torpenhow
Santon Bridge	Stalmine	Troutbeck	Whittington
Satterthwaite	Staveley	Troutbeck	Wiggonby
Scaleby	Staveley and Fell	Troutbeck Bridge	Williamson Park
Scaleby Hill	Foot	Tunstall	Wilton
Scales	Staynall	Uldale	Winder
Scorton	Stockdalewath	Ullock	Winmarleigh
Scotby	Stodday	Ulpha	Winscales
Seascale	Stone House &	University of	Winster
Seathwaite	Cow Dub	Lancaster	Winton
Seaville	Storrs	Unthank	Witherslack
Sebergham	Storth	Gamblesby	Woodend
Sedbergh	Street	Unthank Skelton	Woodhouse
Sedgwick	Stubble Green	Waberthwaite	Woodville
Shap	Summerlands	Waitby	Wray
Siddick	Sunnyside	Walby	Wreay
Silecroft	Talkin	Walton	Wreay
Silverband	Tallentire	Warcop	Watermillock
Skelsmergh	Tarnacre House	Warwick-on-	Wythop Mill
Skelton	Farm	Eden	Yanwath
Skirwith	Tarnbrook		Yearngill