Scottish Borders Council

Wind Energy Consultancy

Update of Wind Energy Landscape Capacity and Cumulative Impact Study

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Study Purpose and Objectives

The purpose of this study is to provide detailed technical assessment and guidance on landscape, visual and cumulative development matters for Scottish Borders' Wind Energy Supplementary Guidance; part of the Borders Local Development Plan. This study follows on from the Wind Energy Consultancy study of July 2013 which provided detailed information on landscape and visual; economic and public opinion matters. Specifically, it updates the landscape, visual and cumulative situation in the context of current wind energy development and changes to Scottish Planning Policy in 2014.

The main objectives of the study brief are:

- *Updating the study to take cognisance of turbines approvals since January 2013, adopting new turbine size typology ranges as follows: 15m –<35m, 35m –<50m, 50m –<80m, 80m –<120m, 120m+ to allow more detailed consideration of greater turbine heights which are becoming more prevalent.*
- *Inclusion of a "How to Use this Guidance" at the front as a simple to follow guide of the main parts of the study and where they can be found*
- *Updating of the landscape capacity and guidance summary tables; including turbine distribution maps accompanying the analysis of Regional Landscape Areas and landscape analysis and guidelines for each landscape character area*
- *Consideration and guidance given to repowering and extension opportunities for large scale commercial wind farm sites*
- *Update and appraisal of cumulative impact issues, taking cognisance of updated approvals. Reference to be made emphasising support for development around the more appropriate sites.*
- *Consider the potential to protect particular areas from inappropriate development*
- *Give further clarity as to how the boundaries of potential cumulative capacity areas have been identified within the relevant figures.*

The following is a summary of the key findings and recommendations of the study.

Approach to the Study

This study considers the capacity of the Scottish Borders landscape to accommodate onshore wind energy development. The landscape capacity assessment is based on an assessment of landscape sensitivity and value of the different landscape character types and areas in Scottish Borders. The key stages and outputs are:

- *Carrying out an assessment of the key landscape characteristics within the Scottish Borders using a robust methodology identifying sensitivity criteria;*
- *Setting out a clearer vision for onshore wind farm development and allowing better understanding of the opportunities and constraints on wind energy in the Scottish Borders and how these can or should be addressed;*
- *Determining the thresholds of acceptable change and identifying critical factors which are likely to present an eventual limit to development;*
- *Identifying areas most suitable for wind energy development and areas which are less suitable.*
- *Identifying where remaining capacity for development lies*

This strategic-level study is based on the premise that, given current renewable energy targets, there will be a need to both acknowledge and manage future landscape change and effects on visual amenity resulting from wind energy development, and to identify where change is acceptable and where it is not acceptable. In applying the assessment process, the study has addressed a number of concepts and issues that affect the perceived significance and acceptability of cumulative changes caused by multiple wind energy developments in the landscape.

Landscape Character

Scottish Borders covers a large area of south east Scotland to the south of Edinburgh. At its core is a series of river valleys, including the River Tweed, flowing eastwards into a broad undulating lowland area that has the Lammermuir and Moorfoot Hills to the north and northwest, the Central Southern Uplands to the west and south and the Cheviot Hills to the south and south east. To the east the study area borders the North Sea in a dramatic coastal zone. The border with England, Northumberland and the Northumberland National Park is to the south east and south. The majority of the medium sized regionally significant settlements are either found within sheltered valleys surrounded by upland landscapes or within the broad flatter lowland landscapes.

Scottish Borders is divided into 30 distinctive landscape character types, most of which are subdivided into further geographically separate landscape character areas (LCAs), as detailed in the Borders Landscape Assessment*. These LCAs have been assessed for their sensitivity to wind energy development and their capacity to accommodate wind turbines.*

Landscape Capacity and Cumulative Development

This study resolves landscape capacity with levels of cumulative development and involves three stages:

- *Firstly identifying the underlying capacity of the Scottish Borders landscape to accommodate wind turbine development;*
- *Secondly, assessing the degree of cumulative change resulting from operating and consented wind turbines in the study area and in specific areas of Scottish Borders;*
- *Thirdly, assessing the level of further development that could acceptably be accommodated within areas of Scottish Borders thereby identifying remaining capacity.*

The underlying capacity for different sizes of turbine across the landscape character types of the Scottish Borders is shown in detail in figures 6.1 a - e. Extensive upland areas such as the Moorfoot and Lammermuir Hills and parts of the Southern Uplands tend to have the highest underlying landscape capacity for the largest size turbines and windfarm developments. This reflects the suitable characteristics of scale, simplicity of

landform and lack of small scale built development. Nevertheless, many smaller or more topographically distinctive upland areas, such as the Pentland Hills, have greater prominence and visibility in the landscape or have national or local designations in recognition of their intrinsic scenic, cultural or recreational qualities, greatly limiting underlying capacity. Other areas, including much of the Central Southern Uplands and Cheviot Hills have combinations of scenic, recreational and/or wildness qualities, often recognised by designation, which also limit underlying capacity.

Upland Fringe areas are suitable for more modest levels of development including smaller windfarms or single turbines. Lowland areas are most suitable for smaller turbines, singly or in smaller groupings. Extensive areas, including river valleys, prominent hills, highly visible escarpments and the coastline, have little or no capacity for wind energy development.

Consented Developments at July 2016

The emerging pattern of development in and around the Scottish Borders reflects the wider pattern of Scottish wind energy development, where the majority of windfarms and turbines are located in upland areas, with smaller developments in lowland areas.

There are, at July 2016, a total of 479 operational or consented turbines of 15m or greater height and 128 in planning or S36 applications awaiting a decision in Scottish Borders area. Of those turbines consented, a significant proportion (50%) are 80m or more to blade tip, and 22% are below 35m in height. In the applications the vast majority of proposed turbines (96%) are 80m or more in height. This represents an increase from the 2013 study in which 311 turbines of 25m+ height were recorded, even accounting for inclusion of turbines between 15m and 25m.

At or before July 2016 there are also very significant numbers of operational, consented and proposed wind turbines within 15km of Scottish Borders (Approximately 600 existing/consented and 74 proposed). This is particularly due to parts of the Crystal Rig/ Aikengall cluster extending into East Lothian; and Clyde windfarm and extension on the boundary with South Lanarkshire and significant developments in Dumfries and Galloway. Most of these turbines are 80m or taller to blade tip.

The majority of turbines are located within windfarms north of the River Tweed in the Upland landscapes, with small groups or individual turbines in the agricultural lowlands and river valleys. Most of the largest turbines are located in the Dissected Plateau Moorland areas of the Lammermuir and Moorfoot Hills and Plateau Grasslands of Lauder Common. Two windfarms with larger turbines also lie in the Upland Fringe and Coastal Moorland landscape character types. The largest windfarm fully within the Scottish Borders is at Dun Law (comprising 61 turbines). There are only two existing relatively small sized windfarms in the Southern Uplands, south and west of the River Tweed, with one more consented at Windy Rig in the south.

In areas adjacent to Scottish Borders there are two clusters that introduce significant landscape and visual impacts into the Scottish Borders: Clyde Windfarm in South Lanarkshire and the Crystal Rig/Aikengall development which straddle the Scottish Borders/ East Lothian boundary.

There are currently no wind turbines in the Cheviot Hills or Upper Tweed and Teviot Valleys and only minimal turbine development within the majority of the Southern Uplands. However, there is and has been development pressure from applications in or near these areas.

Analysis of Capacity and Cumulative Development

The current levels of development have led to a landscape in which wind turbines are a key landscape feature developing across the Lammermuir and Moorfoot Hills Region Uplands in the north of the Borders, from Lauder Common through to the northern edge of the Lammermuirs and southeast into the Upland Fringes and Coastal Zone, with a smaller area in the Central Southern Uplands on the western boundary with South Lanarkshire. Within these areas there are some locations with very high concentrations of turbines that can be considered as wind turbine dominated landscapes.

A wider area in which wind turbines are occasional landscape features has developed around and south of this and into the coastal area and Tweed Lowlands and west into the northern edge of the Moorfoot Hills. A small area of wind turbine dominated landscape lies in the Coastal Zone. Smaller areas-with wind turbines as key landscape features have developed around smaller concentrations of turbines elsewhere in the Borders.

The study has identified the potential for wind energy development in the Borders through the detailed sensitivity and capacity assessments carried out for each landscape character area. This has identified that parts of upland areas in the north, extreme west and southwest have the highest capacity, being able to accommodate larger scale turbines in large commercial scale windfarms.

Much of the rest of Scottish Borders has limited capacity for smaller scale developments, ranging from small clusters of turbines to single turbines.

Significant areas, including much of the wilder more distinctive upland areas, prominent hills and scenic or small scale river valleys and the coastline, have little or no capacity for development without causing severe impacts on landscape character.

By comparing existing and potential future levels of development the study has identified areas in which there is remaining capacity for development and areas in which current cumulative development limits the capacity for further development.

Conclusions

The assessment indicates that there is most remaining capacity for further wind energy developments within areas of the Moorfoot Hills, and forested southern areas of the Central Southern Uplands and western Cheviot Hills. Conversely, there are also areas in the Lammermuirs, Coastal Zone and western Southern Uplands where current cumulative development is close to, or exceeds capacity and impacts limit further development. Further development across Scottish Borders needs careful consideration if undue levels of landscape change are to be avoided.

1.0 INTRODUCTION

1.1 Background

Supplementary Guidance and Capacity Studies in Scottish Borders

Scottish Borders Council has been proactive in supporting the national policy for the positive provision for the development of onshore wind energy in locations where the technology can operate efficiently and environmental and cumulative impacts can be satisfactorily addressed.

Scottish Borders Council in preparation of planning policy and decision making on planning applications for developments must strike a balance between the objectives of conserving the environmental qualities of the area and the capture of renewable energy resources. SPG for wind energy was reviewed in 2011 in the light of increased proposals for wind energy projects, particularly single or small groupings of turbines as a result of the introduction of the Feed in Tariff.

Scottish Borders Council also commissioned research into economic impacts, public perception and the implications of further wind turbine development on the landscape. In 2013, Ironside Farrar Ltd carried out a robust independent assessment of the current and potential landscape impacts of future turbine development to inform the development of planning policy for onshore wind energy in the new Local Development Plan.

The 2013 landscape capacity study[1] assessed the capacity for different scales of wind energy development across Scottish Borders; based on analysis of landscape character, sensitivity and value and an assessment of significance of landscape change resulting from different potential scales of development. The study identified areas with capacity for different scales and levels of development. It also identified areas where the cumulative impacts of existing development limit the potential for further development.

The 2013 capacity study is a background paper informing the Local Development Plan and consultation process, and has also been used to inform Council decisions on onshore wind energy applications. The LDP is now adopted and therefore it is a material consideration to the planning decision-making process, as recognised within the new Renewable Energy policy ED9.

2016 Update to the Capacity Study

This update to the landscape capacity study for wind energy in Scottish Borders has been prepared in the light of policy changes detailed in the June 2014 Scottish Planning Policy (SPP 2014) and to address the continuing development pressure for wind energy in the local authority area. The study is prepared in line with the requirements of SPP 2014 and strategic guidance provided by SNH[2]. While taking a similar approach to the 2013 study, it is more detailed and nuanced taking changes to policy, national guidance and the wind energy baseline into account. It will supersede the 2013 capacity study and inform supplementary guidance for renewable energy.

Changes to SPP

SPP 2014 continues to emphasise the importance of accommodating renewable energy development. Paragraph 155 states that:

> *'Development plans should seek to ensure an area's full potential for electricity and heat from renewable sources is achieved, in line with national climate change targets, giving due regard to relevant environmental, community and cumulative impact considerations'.*

Paragraph 161 states that planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities, following the approach set out in Table 1 of the document. Figure 1.1 below is an extract of Table 1 from SPP, showing the specific designations and other key factors to be mapped and considered in the spatial framework. Development plans are also required to indicate the minimum scale of onshore wind development that their spatial framework is intended to apply to.

Figure 1.1: Extract from Scottish Planning Policy on Spatial Frameworks

Table 1: Spatial Frameworks

Group 1: Areas where wind farms will not be acceptable: National Parks and National Scenic Areas.		
Group 2: Areas of significant protection: Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.		
National and international designations: • World Heritage Sites; • Natura 2000 and Ramsar sites; • Sites of Special Scientific Interest; • National Nature Reserves; • Sites identified in the Inventory of Gardens and Designed Landscapes; • Sites identified in the Inventory of Historic Battlefields.	**Other nationally important mapped environmental interests:** • areas of wild land as shown on the 2014 SNH map of wild land areas; • carbon rich soils, deep peat and priority peatland habitat.	**Community separation for consideration of visual impact:** • an area not exceeding 2km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement.
Group 3: Areas with potential for wind farm development: Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.		

[1] Ironside Farrar (2013) *Scottish Borders Wind Energy Consultancy: Landscape Capacity and Cumulative Impact*

[2] SNH (June 2015) *Spatial Planning for Onshore Wind Turbines – natural heritage considerations guidance*

Paragraph 162 of SPP states that both strategic and local planning authorities should identify where there is strategic capacity for windfarms, and areas with greatest potential for wind development, considering cross-boundary constraints and opportunities. Development plans are also required to set out the criteria that will be considered in deciding *all* applications for wind farms of different scales – including extensions and re-powering – taking account of detailed considerations.

Paragraph 169 sets out a list of considerations for wind energy developments to be assessed against, which includes cumulative impacts and landscape and visual impacts:

- *'cumulative impacts – planning authorities should be clear about likely cumulative impacts arising from all of the considerations below, recognising that in some areas the cumulative impact of existing and consented energy development may limit the capacity for further development;'* and
- *'landscape and visual impacts including effects on wild land,'*[3].

1.2 Consultancy Appointment

Ironside Farrar has been appointed by Scottish Borders Council to carry out the update to the 2013 study. The key objectives and outputs of this study are:

- Updating the study to take cognisance of turbine approvals since January 2013
- Adopting new turbine size typology ranges as follows: 15m –<35m, 35m –<50m, 50m –<80m, 80m –<120m, 120m +. The first three ranges mirror those identified within the Berwickshire study[4], linking the two studies. The last two typology ranges allow more detailed consideration of greater turbine heights which are becoming more prevalent.
- Inclusion of a "How to Use this Guidance" at the front as a simple to follow guide of the main parts of the study and where they can be found
- Updating of the landscape capacity and guidance summary tables; including turbine distribution maps accompanying the analysis of Regional Landscape Areas and landscape analysis and guidelines for each landscape character area
- Consideration and guidance given to repowering opportunities for all large scale approved commercial wind farm sites
- Cumulative impact issues considered, taking cognisance of updated approvals. Text reference made emphasising support for development around what are considered to be the more appropriate sites.
- Appraisal of the potential to consider particular areas for non-development
- Further clarity as to how the boundaries of potential cumulative capacity areas have been identified within the relevant figures.

It is intended that the final study will be agreed by Scottish Borders Council as part of the updated SG on Wind Energy. In order for the Guidance to gain elevated status within the decision making process it is intended that it will ultimately be referred to the Scottish Government in order that it can formally become part of the Development Plan as Supplementary Guidance.

1.3 National and Local Policy

National and local planning policies in Scotland encourage the development of onshore wind energy. However, it is accepted that there are limitations imposed by environmental sensitivities and the capacity of areas to accept cumulative development. Therefore, the acceptability of multiple windfarms and turbines and the cumulative landscape and visual impacts of development has to be considered in the light of national and development plan policy. **Appendix 1** reviews current national policy and guidance including SPP 2014, SESPlan SDP 2013, SBC LDP 2016 and Supplementary Guidance.

1.4 The 2016 Capacity Study

In the light of the current SPP this landscape capacity study does not assess, but makes reference to, the specific designations and interests highlighted in Groups 1 and 2 of the Spatial Framework, mapping of which is a separate process. The study concentrates on landscape and visual capacity through assessing:

- the capacity of the landscape and visual environment of Scottish Borders to accommodate *all scales* of wind energy development; and
- cumulative impacts of existing and consented wind energy development in the light of the capacity assessment.

These issues are highlighted by paragraph 169 of SPP and are applicable to all areas of Scottish Borders, including areas lying within Groups 1 and 2 of the Spatial Framework, where they occur.

Critical to the current assessment is the fact that Scottish Borders already has a large number of operating and consented wind energy developments including several large commercial windfarms and a considerable number of smaller, mainly non-commercial developments. This has created more extensive areas of cumulative wind turbine development since the 2013 assessment, and ongoing consents and construction of schemes will continue to require assessment.

[3] (SNH 2015 Draft Guidance provides guidance on landscape capacity studies - refer to paragraph 1.6.2)

[4] Alison Grant & Carol Anderson (2012) *Landscape and Visual Guidance on Single and Small Groups of Wind Turbine Developments in Berwickshire, Scottish Borders*

1.5 Landscape Capacity and Cumulative Impacts

This study informs the Council on the issues of landscape capacity and cumulative impact. Accordingly, it comprises three main themes:

- A strategic landscape capacity study, investigating the underlying capacity of landscapes within Scottish Borders to accommodate wind energy development of all but the smallest domestic scale. This is reflected in detailed capacity maps for the five turbine size ranges listed in 1.2 above. This has a wider size range and is a more finely grained assessment than in the 2013 study, reflected in more detailed guidance and more geographically specific capacity mapping;
- A cumulative assessment examining the level of cumulative development of operating, consented and proposed wind turbines and wind farms in Scottish Borders, updating the database to July 2016;
- Guidance on remaining development capacity and on the size and types of wind energy development throughout Scottish Borders that would be acceptable in landscape terms, taking into account the first two considerations. This includes the potential for extension or repowering of currently operational sites.

This study specifically assesses landscape capacity and the impact of cumulative wind energy development in order to determine where there is existing capacity and where limitation of further development may be required through the development management process. The study addresses these requirements through a staged assessment process described in sections 2.0 to 6.0 of this report.

It is emphasised that this is a strategic level landscape and visual study, providing a context for considering the capacity for, and the cumulative effects of, existing and potential future wind turbine developments in Scottish Borders. No site specific conclusions should be drawn from it in relation to current, proposed or future wind energy schemes.

As a strategic landscape and visual study this does not address specific localised impacts such as effects on individual residential receptors or other sensitive receptors. All wind energy proposals should be considered on their own unique locational and design characteristics as well as their strategic context. All proposals should be subject to landscape, visual and cumulative impact assessment including (if required) a full environmental assessment, taking due cognisance of up to date guidance on the landscape and visual assessment and design of wind energy schemes.

2.0 CUMULATIVE IMPACT AND CAPACITY ASSESSMENT METHOD

2.1 Purpose of Assessment

The purpose of the following assessment is to determine the landscape capacity of Scottish Borders to accommodate wind energy development and to determine the levels of cumulative development that would be acceptable across the local authority area. The assessment takes into account current cumulative development within and around Scottish Borders and is based on the premise that current renewable energy policies will lead to a future level of landscape change within Scottish Borders that requires careful management.

The key objectives of the study are outlined in Chapter 1. The methodology serves these objectives through a clear assessment of landscape and visual sensitivity and capacity across Scottish Borders; together with an assessment of the cumulative effects of current consented wind energy development and the potential for accommodating future development, including extension or repowering of currently operating schemes.

Nevertheless, it is recognised in guidance that the assessment of landscape capacity and cumulative impacts is not a straightforward exercise. The background considerations and detailed methodology for this process are detailed in **Appendix 2** of this report. The following summarises the methodology and explains how the findings and recommendations are presented.

2.2 Study Stages

The assessment is a staged process comprising:

1) Define study area and characterise landscape and visual baseline and scope of wind energy types to be included in the strategic study.

2) Assess landscape sensitivity based on landscape character types (LCTs) and landscape character areas (LCAs) in Scottish Borders. This assessment considers landscape character sensitivity, visual sensitivity and landscape value.

3) Assess the capacity of the Scottish Borders landscape to accommodate wind energy development of different types and scales based on the assessment of sensitivity and value of the LCAs and LCTs. This is an assessment of the *underlying* landscape without taking the effects of existing or consented wind turbines into account.

4) Record the current type and extent of operational and consented wind energy development in Scottish Borders and the surrounding local authorities.

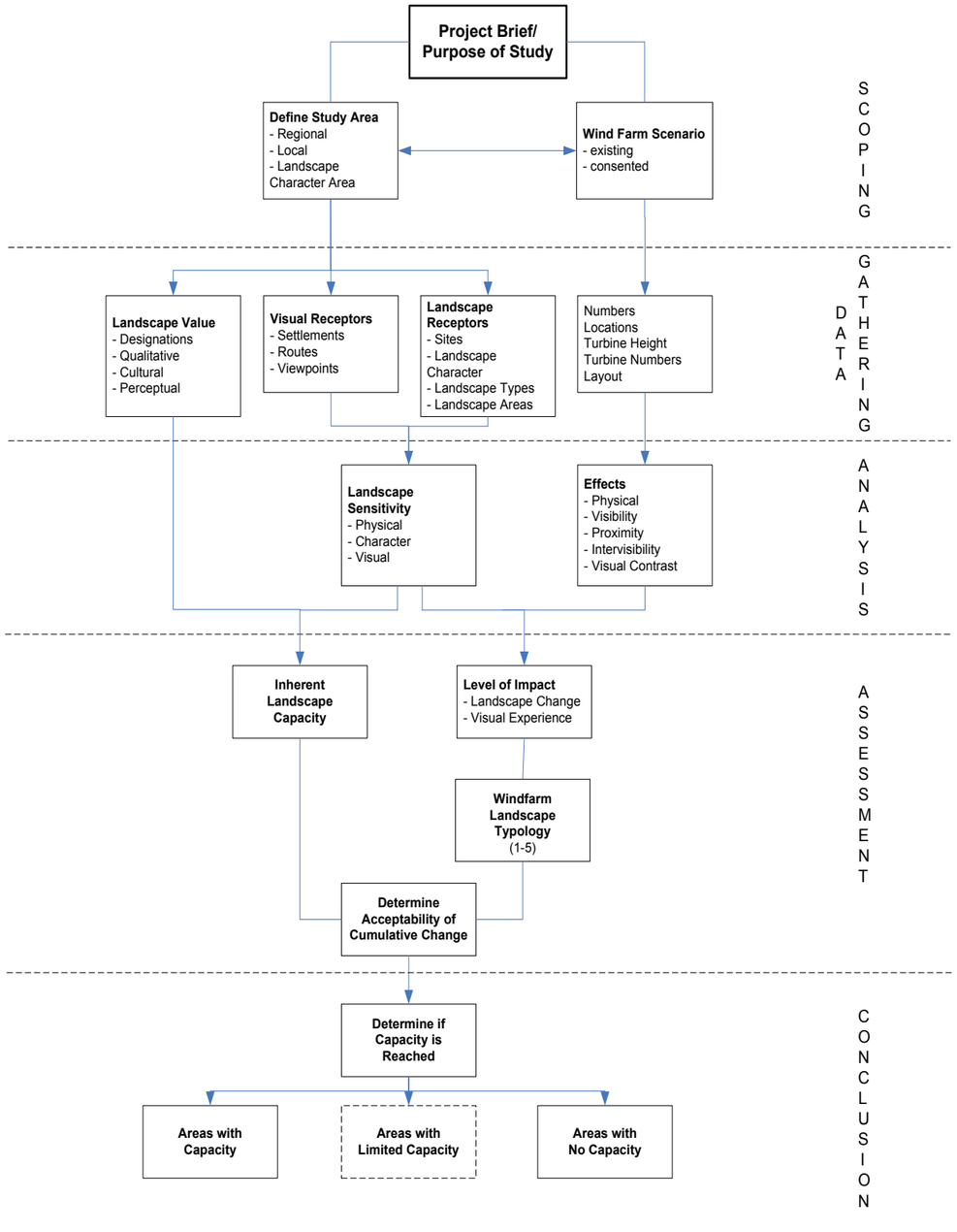
5) Determine the extent to which cumulative consented development has occupied the underlying capacity of the landscape to accommodate wind energy developments.

6) Further to the assessment of landscape capacity and cumulative development, identify areas in which:
   - there is no underlying landscape capacity for wind energy development;
   - cumulative consented development limits landscape capacity for further wind energy development.
   - there is remaining landscape capacity for wind energy development.

The assessment process is summarised as a flow chart in Figure 2.1 below.

FIG 2.1 METHODOLOGY FLOWCHART FOR CUMULATIVE ASSESSMENT

Figure 2.1. Cumulative Impact and Landscape Capacity Assessment Flowchart



The resulting spatial strategy is supported by guidance on appropriate types and levels of wind energy development for the areas in which there is capacity, taking note of the potential limitations imposed by already consented development.

2.3 Scope of Assessment

2.3.1 Area Covered

The study focuses primarily on the local authority area of Scottish Borders. However, an area of a minimum 15km beyond the boundary is considered, because of the potential landscape and visual effects on Scottish Borders of wind energy developments in neighbouring landscape areas.

2.3.2 Wind Energy Development Types

The study considers all sizes of turbines and wind energy developments operating, consented or proposed, as well as potential future scenarios where appropriate. This refines the 2013 assessment which used fewer size categories.

The height categories of wind turbines reflect those used in the Berwickshire Landscape Capacity study[5], with an additional category for turbines of greater than 120m, reflecting the wider scope of this assessment for the whole Scottish Borders.

Table 2.1. Turbine Size Categories

Blade Tip Height	**Typical Use** (in a Scottish context)
15m to <30m	Typically used for domestic and farm FiT schemes
30m to <50m	Typically used for farm and industrial FiT schemes
50m to <80m	Single turbine FiT schemes and smaller turbines used in commercial schemes
80m to <120m	Many current commercial windfarms and some single turbines
120m and greater	Many current and most proposed commercial windfarms

Turbines less than 15m to blade tip are not considered to have the same qualities of scale, prominence and widespread visibility that lead to the wider cumulative impacts of larger turbines with a blade tip higher than 15m. Assessment and guidance for turbines less than 15m to blade tip is limited to localised generic siting and design considerations.

2.3.3 Use of Geographical Information Systems

The study has used the GIS application; Arcview 10.3.1. It is emphasised that this application is used only as a tool to manage, map and illustrate spatial data. The capacity assessment process is not based on GIS and is described in the following sections.

2.4 Landscape and Visual Baseline

The landscape baseline assessment includes a description and classification of landscape character and records of designations and other features that contribute to landscape value.

The **landscape character assessment** is based on landscape character types (LCTs) and landscape character areas (LCAs) in Scottish Borders described in section 3.2 and Table 3.1 of this report. These are based on the SNH landscape character assessment[6].

Landscape value is determined partly through landscape designations. There are two nationally designated areas in Scottish Borders. Local landscape designations have recently been reviewed and cover extensive parts of the local authority area. There are also many Historic Gardens and Designed Landscapes throughout Scottish Borders. Related designations that can contribute to landscape value and character are recorded. These include natural and cultural heritage designations, recreational/ visitor facilities and core paths. Other factors affecting perceptions of value include wildness which has recently been assessed across Scotland, with a Wild Land Area within the study area.

The **visual baseline** assessment is detailed in **Chapter 4**. It involves a computer-based intervisibility assessment based on turbine heights and receptor types. This helps to identify areas where wind turbines of different heights are most likely to be visible to receptor groups, or areas where they could be more easily concealed. This approach should not be considered in isolation from other factors determining capacity, such as landscape character.

2.5 Method for Determining Landscape Sensitivity and Capacity

The method for determining landscape sensitivity and capacity is detailed in **Appendix 2**. This involves consideration of the two main elements discussed in 2.4 above:

[5] Alison Grant & Carol Anderson (2012) *Landscape and Visual Guidance on Single and Small Groups of Wind Turbine Developments in Berwickshire, Scottish Borders*

[6] *Borders Landscape Assessment* (ASH Consulting Group for SNH, 1998)

1) The sensitivity of the landscape fabric and character to turbine development, which includes landscape features, elements and characteristics and its visual sensitivity, including intervisibility and affected receptor types.

2) The value of the landscape as determined by stakeholders. This may include national or local recognition by landscape designation or cultural association, or value to a community of interest such as local residents or an interest group.

Appendix 2 describes a breakdown of the physical and perceptual characteristics that contribute to landscape character, visual sensitivity and value. Each criterion is described and evaluated in terms of its sensitivity to wind energy development. An overall assessment of **high, medium** or **low** is derived from a composite of all the criteria. There is no consistent relative weighting of criteria as, in the case of each landscape type or area, different criteria are likely to be critical in the sensitivity assessment.

Following the above assessment, an overall professional judgement on capacity for developments of different types is made on the basis of sensitivity and value. Landscape capacity is rated according to the degree to which wind turbines may be accommodated without significant and/or adverse effects on sensitivity and value. The descriptive criteria below for **high, medium** and **low** describe the main thresholds on a continuum between no capacity and high capacity:

Low Capacity: A landscape that is both sensitive to wind turbine development and has a high value, where only a slight level of change can be accommodated without significantly affecting any of the key defining criteria

Medium Capacity: A landscape that has some sensitivity to wind turbine development and has some aspects of value, where a moderate level of change can be accommodated which may significantly affect some of the defining criteria

High Capacity: A landscape that has low sensitivity to wind turbine development and has low value, and can accommodate change that significantly affects most of the key defining criteria

Broadly speaking there is an inverse relationship between landscape sensitivity/value and capacity. However, this is not a simple relationship that can be expressed in a matrix: a balance of judgement is made in each case as landscape value may be a more important factor than sensitivity in some cases; and vice versa in others.

Turbine height and the size and layout of types of turbine development may relate better to some LCTs than others and the geographical extent of LCAs within some otherwise suitable LCTs may limit capacity for development.

2.6 Defining Landscape Change and Cumulative Capacity

An understanding of cumulative impacts and change in the landscape is key to determining acceptable levels of development and whether or not areas have reached cumulative capacity. This is discussed below and in further detail in **Appendix 2**.

2.6.1 Cumulative Change

Appendix 2, section 2.7 discusses in detail the issues involved in determining cumulative change thresholds and the acceptability of these changes. It refers to SNH siting and design guidance[7] and cumulative guidance for onshore wind energy developments[8]. Key factors that affect the perception of cumulative change include:

- the distance between individual windfarms and/or turbines;
- the distance over which they are visible;
- the overall character of the landscape and its sensitivity to windfarms;
- the siting and design of the windfarms and/or turbines themselves (particularly turbine height and windfarm size); and
- the way in which the landscape is experienced.

In determining an acceptable level of development, it is necessary to clearly define what differing levels of development actually entail. The methodology therefore sets out, in Table 2.1 opposite, defined levels of change to the landscape and visual environment that might occur or be experienced depending on the size, number and location of turbines to be built within an area.

The descriptions in Table 2.2 set out a gradated landscape typology that defines increasing levels of cumulative landscape and visual impact of turbines by describing their effect on landscape character and the experience of those living in or travelling through the landscape. These descriptions are used without prejudice as a tool to illustrate cumulative landscape change to all parties involved in planning wind energy development.

Further generic illustration of the concept is provided in Section 4 of SNH's 2014 siting and design guidance (paragraphs 4.5 and 4.6 and illustrative sketches, reproduced in Figure 2.2 below Table 2.1). The extent of current and potential future wind turbine landscape types in Scottish Borders is described in detail in chapter 6 and illustrated in Figures 6.2 and 6.3.

[7] SNH (2014). *Siting and Designing Windfarms in the Landscape*

[8] SNH (2012) *Assessing the cumulative impact of onshore wind energy developments: March 2012*

2.6.2 Determining Acceptable Levels of Change

SNH's siting and design guidance identifies three broad levels of cumulative change in the landscape that may be set by local authorities depending on landscape sensitivity and value and local policy objectives:

- **Landscape Protection:** Maintain existing landscape character.
- **Landscape Accommodation:** Accept a degree of change providing this does not fundamentally alter key landscape characteristics and visual resources.
- **Landscape Change:** Accept large amounts of change that may fundamentally alter key landscape characteristics and visual resources.

The descriptions in Table 2.2 provide a basis on which to understand and determine levels of change. However, it is the collective decision of stakeholders including local authorities and their population that ultimately determines the levels of cumulative landscape change, that are acceptable across their area, and thereby the capacity.

2.7 How to Use the Assessment Findings and Guidance

The study assessment, findings and guidance are presented in the following chapters which also refer to figures, tables and appendices:

Chapter 3: Landscape Baseline

This chapter defines and describes the study area, including the geographical extent and landscape character of Scottish Borders and its surroundings. It also reviews other relevant information including landscape-related constraints, such as wildness, natural heritage and cultural heritage designations.

The assessment of landscape capacity and cumulative landscape change is based on the six Regional Landscape Areas further divided into Landscape Character Areas (LCAs). These are based on thirty Scottish Borders Landscape Character Types (LCTs) which are represented across the Regional Landscape Areas as detailed in the published Scottish Borders Landscape Character Assessment.

The information in chapter 3 informs the assessment of the sensitivity and value of each landscape character type and areas detailed in chapter 6.

Chapter 4: Visual Baseline

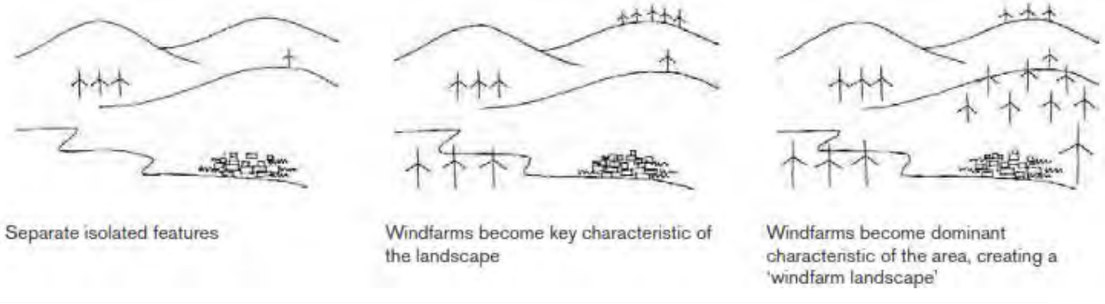
This chapter details the analysis carried out to establish the relative visibility and visual sensitivity of different parts of Scottish Borders. This involves a computer-based intervisibility assessment, based on different turbine heights and receptor types. The resulting maps are shown in **Appendix 3.**

The information in chapter 4 informs the assessment of landscape sensitivity as detailed in Chapter 6.

Table 2.2: Description of Levels of Cumulative Wind Turbine Development

Landscape Type	Landscape Character	Visual Experience
Landscape with no Wind Turbines	A landscape type or area in which no, or a minimal number/size of wind turbines is present, or clearly visible from neighbouring areas.	There would be no, or negligible, effects on visual receptors.
Landscape with Occasional Wind Turbines	A landscape type or area in which windfarms or wind turbines are located and/or are close to and visible. Turbines are not of such a size, number, extent or contrast in character that they become one of the defining characteristics of the landscape's character.	Visual receptors would experience very occasional close-quarters views of a windfarm or turbines and more frequent background views of windfarms or turbines. Some of the turbines would not be perceived as being located in the landscape character type or area. No overall perception of wind turbines being a defining feature of the landscape.
Landscape with Wind Turbines	A landscape type or area in which a windfarm, windfarms or wind turbines are located and/or visible to such an extent that they become *one* of the defining characteristics of the landscape character. However, they are clearly separated and not the single most dominant characteristic of the landscape.	Visual receptors would experience frequent views of windfarms or wind turbines as foreground, mid-ground or background features, affecting their perception of the landscape character. However there would be sufficient separation between windfarms and turbines and sufficient areas from which wind turbines are not visible such that they would not be seen as dominating the landscape over all other landscape features.
Wind Turbine Landscape	A landscape type or area in which windfarms or wind turbines are extensive, frequent and nearly always visible. They become the dominant, defining characteristic of the landscape. Nevertheless there is a clearly defined separation between the principal developments.	Visual receptors would experience views of windfarms and wind turbines as foreground, mid-ground and background features, to the extent that they are seen as the most dominant aspect of landscape character. Few areas would be free of views of wind turbines, although the principal groupings would appear separated.
Windfarm	Landscape fully developed as a windfarm with no clear separation between groups of turbines. Few if any areas where turbines not visible.	Visual receptors would always be close to and nearly always in full view of wind turbines, with no clear separation between groups of turbines.

Figure 2.2: Illustrative Sketches of Wind Turbine Development (from SNH)



Chapter 5: Wind Turbines in the Study Area

This chapter describes the operating, consented and proposed wind turbine developments in Scottish Borders at **July 2016**, and the wider study area at July 2016 or earlier. There is a detailed breakdown of numbers and sizes of turbines and windfarms in Scottish Borders and the surrounding study area. Locations of turbines are illustrated in Figures 5.1 and 5.2. There is also an analysis of turbine size ranges and distribution in relation to landscape character.

Appendix 4 reviews the factors involved in wind turbine location, size, design and distribution that affect landscape, visual and cumulative impacts.

Details of individual developments are given in **Appendix 5**

Chapter 6: Assessment of Landscape Capacity and Cumulative Change

This chapter analyses and assesses the information in the previous chapters to determine the landscape and visual impacts of, and capacity for, wind energy development across Scottish Borders. The assessment is summarised in **Table 6.1** and **Figures 6.1 to 6.3.** The capacity assessment is informed by the detailed assessment of landscape sensitivity and value in **Appendix 6**. A desk and field based assessment was carried out. The assessment informs the subsequent spatial strategy and includes guidance on turbine size and distribution. Further details of how to use Table 6.1 together with the figures are given at the start of Chapter 6.

This assessment is carried out for each of the six main regional landscape areas of Scottish Borders. The assessment includes each of their component LCAs. The capacity assessment and current level of development for the LCAs is combined to come to an overall assessment of capacity and cumulative effects in each regional area.

Finally the regional assessments are combined to make an assessment for the whole local authority area. Further spatial guidance regarding areas with restricted capacity and areas with capacity for further development are given at the end of Chapter 6**.**

2.8 Detailed Guidance

Chapter 6 also gives guidance on turbine sizes, cluster sizes and separation between groups of turbines for each landscape type and/or area that would limit cumulative development to the proposed acceptable level. This relates to turbines of 15m and taller. As highlighted in 2.3.2, guidance on small turbines below 15m to blade tip applies at a local level and is generic.

Appendix 4 of this report contains detailed discussion of how turbine size, group size and group separation affects perceptions of wind energy and landscape character. Further guidance is given in SNH's siting and designing guidance[9]. Chapter 6 also briefly outlines the main considerations in developing the specific guidance.

2.9 Potential Opportunities and Constraints

The main spatial findings of the detailed assessment are summarised on a map in **Figure 6.4.** This shows the distribution of the following areas:

- Areas with the highest underlying landscape capacity
- Areas with some underlying landscape capacity
- Areas with little or no underlying landscape capacity
- Areas of significant cumulative development (which may overlap with parts of some or all of the above areas)

Finally, it is emphasised that this assessment is focused on landscape and visual issues. Areas which have been identified as suitable on this basis may be restricted by other unrelated factors such as impacts on wildlife, impact on residential amenity, tourism and recreation, aviation restrictions or effects on the water environment. These issues are not the subject of this assessment and guidance across the full range of environmental categories is provided in the Council's Renewable Energy Supplementary Guidance.

[9] SNH (2014). *Siting and Designing Windfarms in the Landscape*

3.0 LANDSCAPE BASELINE

The following section defines and describes the study area, including the geographical extent and landscape character of the Scottish Borders and its surroundings. It also reviews other relevant information including landscape-related designations, natural heritage and cultural heritage constraints. Most of these constraints are identified in Stages 1 and 2 of the spatial framework. However, it is the extent to which may have a bearing on landscape character and value that is the primary consideration in this cumulative impact study.

3.1 Study Area

The study area for this assessment is shown in Figure 3.1. The Scottish Borders covers southeast Scotland to the south of Edinburgh. The local authority area comprises extensive uplands to the north, west and south draining into the central lowlands of the River Tweed, which itself drains east into the North Sea. The majority of settlements are either found within sheltered valleys surrounded by upland landscapes or within the broad lowland landscapes. East, Mid- and West Lothian and Edinburgh lie on the northern border of the Scottish Borders area. To the west is South Lanarkshire, to the south west is Dumfries & Galloway. The English border and Northumberland are to the south east.

The study focuses on the local authority area of Scottish Borders Council for the purposes of determining landscape capacity. Nevertheless, there are a number of existing, consented and proposed wind energy schemes in neighbouring authority areas. Some consideration has been given to these, due to the extensive visual influence exerted by most wind turbines. The study area therefore includes a 15km buffer around its boundary.

3.2 Baseline Landscape Character Assessment

3.2.1 Landscape Context

The Scottish Borders area is predominantly an inland landmass with a comparatively short coastal zone. The total land area is 4,732Km² and has a population of approximately 113,870 (2011). There are no large urban areas in the Scottish Borders; the landscape comprising extensive areas of farmland and sparsely populated upland areas supporting moorland and forestry.

The landscape of the Scottish Borders is diverse with the extensive upland environments enclosing narrow valleys that open onto the agricultural lowland basin. The variety of landscapes within the Scottish Borders is illustrated in Figure 3.3 and 3.4.

- To the north lies the elevated incised plateau landscape of the Lammermuir and Moorfoot Hills.
- To the northwest the landscape takes in part of the broad MidlandValley, rising up to the ridge line summit of the Pentland Hills.
- To the west and south west lie the Southern Uplands
- To the south/ south east lies the Cheviot Hills upland landscape.

Within the central area surrounded by the uplands lies the broad lowland landscape of the Tweed Valley; this landscape character continues across the River Tweed into the lowland area of Northumberland towards Berwick-upon-Tweed and the North Sea Coast.

To the north and west the Lammermuir and Moorfoot Hills and the Southern Uplands are formed from folded resistant Sandstones, Limestones, Shales, Grits and Greywackles. The Eastern Cheviot massif in contrast is of volcanic origin. The lowland Merse is underlain by limestones and sandstones. The Merse landscape is interrupted by igneous intrusions that have been weathered into prominent landmarks such as the Eildon Hills, and features rounded glacial Drumlins in the east.

The upland landscapes are contiguous within the neighbouring council areas of East Lothian, Midlothian and West Lothian to the north to north west; South Lanarkshire to the west and Dumfries and Galloway to the south west. The Cheviot Hills upland landscape is contiguous with the upland landscape within Northumberland and the Northumberland National Park to the south and south east.

The majority of Scottish Borders is drained by the extensive River Tweed catchment, which captures the Teviot, Yarrow, Leader, Whiteadder and many other rivers draining the uplands. However, the Liddel water drains the southern extremity towards the Solway and Irish Sea to the south west. The Eye Water is also a separate and smaller watershed to the Tweed, draining the north east into the North Sea at Eyemouth.

Throughout Scottish Borders there are important strategic transport corridors, most notably the A1/ east coast mainline along the eastern area. Secondary, slightly less important routes between England and Scotland passing through the Scottish Borders includes the A697, A68 and the A7.

3.2.2 Landscape Character

The *Borders Landscape Character Assessment* (ASH Consulting Group 1998), published by SNH, identifies 6 regional landscape character areas which are primarily determined by elevation, landform, land use and proximity to the coast. These are:

i. **Midland Valley**
ii. **Lammermuir and Moorfoot Hills**
iii. **Central Southern Uplands**
iv. **Cheviot Hills**
v. **Tweed Lowlands**
vi. **Coastal Zone**

The 6 regional character areas have been divided into 5 regional landscape character types (**Uplands, Upland Fringe, River Valley, Lowlands**, and **Coastal**) with further subdivisions into 30 local landscape character types (LCTs) as set out in Table 3.1 below.

Most of the types are subdivided further into geographically separated landscape character areas (LCAs). Regional and local landscape character types and areas are shown in Figures 3.3 and 3.4.

Table 3.1. Landscape Character Areas in Scottish Borders (based on *Borders Landscape Assessment* (ASH Consulting Group for SNH, 1998)**)**

Regional Character Areas	Regional Landscape Character Types	Local Landscape Character Types
THE MIDLAND VALLEY		
	Uplands	***1*** *Dissected Plateau Moorland*
	Upland Fringe	***8*** *Rolling Farmland*
		11 *Grassland with Hills*
LAMMERMUIR & MOORFOOT HILLS		
	Upland	***1*** *Dissected Plateau Moorland*
		2 *Plateau Grassland*
	Upland Fringe	***13*** *Poor Rough Grassland*
		12 *Undulating Grassland*
		8 *Rolling Farmland*
		14 *Upland Fringe Moorland*
		11 *Grassland with Hills*
		9 *Platform Farmland*
	River Valley	***26*** *Pastoral Upland Fringe Valley*
		28 *Wooded Upland Fringe Valley*
		24 *Upland Valley with Farmlands*
		23 *Pastoral Upland Valley*
		25 *Upland valley with Woodland*
CENTRAL SOUTHERN UPLANDS		
	Upland	***3*** *Plateau Outliers*
		4 *Southern Uplands with Scattered Forests*
		5 *Southern Uplands Forest Covered*
	Upland Fringe	***11*** *Grassland with Hills*
		10 *Grassland with Rock Outcrops*
		8 *Rolling Farmland*
	River Valley	***22*** *Upland valley with Pastoral Floor*
		25 *Upland Valley with Woodland*
		27 *Upland Fringe Valley with Settlements*
		28 *Wooded Upland Fringe Valley*
		26 *Pastoral Upland Fringe Valley*
CHEVIOT HILLS		
	Upland	***5*** *Southern Uplands Forest Covered*
		7 *Cheviot Foothills*
		6 *Cheviot Uplands*
	Upland Fringe	***11*** *Grassland with Hills*
		8 *Rolling Farmland*
	River Valley	***28*** *Wooded Upland Fringe Valley*
		26 *Pastoral Upland Fringe valley*
TWEED LOWLANDS		
	River Valley	***29*** *Lowland valley with Farmland*
	Lowland	***17*** *Lowland Margin Platform*
		18 *Lowland Margin with Hills*
		16 *Rolling Lowland Margin*
		15 *Lowland with Drumlins*
		16 *Rowling lowland Margin*
COASTAL ZONE		
	Coastal	***19*** *Coastal Farmland*
		21 *Coastal Moorland*
		20 *Coastal Pasture*
	River Valley	***30*** *Coastal Valley*

3.3 Landscape Designations

Landscape designations are an indication of landscape value as determined by society. Landscape designations form part of the baseline for both the assessment of landscape capacity, and the preparation of a spatial framework. Landscape designations within the study area are noted below, and are shown in Figure 3.5, in relation to landscape character areas.

3.3.1 National Designations

Within the Scottish Borders area there are two National Scenic Areas (NSAs). Within the study area but outwith the Scottish Borders region there is the Northumberland National Park which borders an eastern section of the Cheviot Uplands area.

3.3.2 National Scenic Areas

The two NSAs within the Scottish Borders are located along the River Tweed. The westernmost, Upper Tweeddale NSA, is located to the west of Peebles to an area of hills surrounding the upper Tweed. The Eildon and Leaderfoot NSA is centred on the confluence of the Leader Water and River Tweed, extending east along the Tweed to Melrose and Darnick, the Eildon Hills and south to the outskirts of Newtown St Boswells. Recent legislation defines a NSA as an area *"of outstanding scenic value in a national context "*. The purpose of a NSA designation is to identify the finest scenery within Scotland and to ensure it is protected from inappropriate development.

3.3.3 Local Landscape Designations

Within Scottish Borders there are nine Special Landscape Areas (SLAs) as illustrated within the Supplementary Planning Guidance[10]:

1) Tweedsmuir Uplands SLA;

[10] SBC Supplementary Planning Guidance: Local Landscape Designations August 2012

2) Tweed Valley SLA;

3) Tweed, Ettrick and Yarrow Confluences SLA;

4) Tweed Lowlands SLA;

5) Teviot Valleys SLA;

6) Lammermuir Hills SLA;

7) Berwickshire Coast SLA;

8) Cheviot Foothills SLA;

9) Pentland Hills SLA.

There are a number of local landscape designations within the surrounding areas that are contiguous with Scottish Borders SLAs. The Pentlands SLA is contiguous with local designations in West Lothian, Midlothian and South Lanarkshire; The Lammermuir Hills SLA with an SLA to the north into East Lothian; The Cheviot Hills SLA is contiguous with the Northumberland National Park over the English border to the east and south; The Tweedsmuir Uplands SLA is contiguous with an area to the south into Dumfries & Galloway and to the west with an SLA in South Lanarkshire. The coastal zone SLA within the Scottish Borders continues north along the coast into East Lothian.

3.3.4 Historic Gardens and Designed Landscapes

There are 31 Inventory-listed Gardens and Designed Landscapes (GDL) within the Scottish Borders area and a total of 33 within the whole study area. Whilst not a statutory designation, it is a factor that contributes to the assessment of landscape character and value (as well as being a Spatial Framework Group 2 consideration). Furthermore, there are an identified 186 designed landscapes (including the 31 identified in the Inventory) within the Scottish Borders. While the majority of these are not on the Inventory, they nevertheless contribute to landscape value and character.

3.3.5 Wild Land Areas

SNH has recently completed an assessment of relative wildness across Scotland[11]. The assessment uses a detailed analysis of four main attributes (Perceived naturalness; rugged/ challenging terrain; remoteness from roads and lack of human artefacts) to establish relative wildness across Scotland which is expressed as a map.

This mapping has been used to identify the largest areas of wild land, which have been selected as Wild Land Areas (WLAs), of which there are 42 in Scotland, mainly in the Highlands and Islands[12]. Wild Land Areas are in Group 2 of the Spatial Framework

[11] *SNH's Mapping of Scotland's Wildness and Wild Land: Non–technical Description of the Methodology (June 2014)*

[12] *SNH's Wild Land Areas Map, June 2014*)

There is one WLA partly within Scottish Borders; Area 2: Talla - Hart Fell in the southwest, which extends into Dumfries and Galloway. The wild land mapping also highlights a number of higher and more remote areas of Scottish Borders as having relatively high wildness values. This is shown in Figure 3.6, together with the WLA.

The relative wildness maps and WLA have been factored into the assessment of sensitivity and capacity for the LCAs (see Appendix 6 tables).

3.4 Other Designations

There are a number of designations that, whilst not solely landscape related, clearly indicate landscape value and inform the assessment process. These are shown in Figures 3.5 & 3.7. Many of these areas are likely to be significant constraints in themselves, but are not part of the landscape capacity assessment. Nevertheless, the most extensive and sensitive areas are highlighted in the detailed analysis. This is not a systematic exercise and is undertaken only order to inform users of the guidance that, where there is landscape capacity, other constraints may apply.

3.4.1 Countryside Around Towns

Countryside around towns (CAT) has been created within a core area of Central Borders, this has been created around the settlements of Galashiels, Tweedbank, Melrose, Gattonside, Dingleton, Newtown St Boswells and St Boswells. The designation seeks the protection and enhancement of this area and recognises the importance of this area as a landscape and recreational resource for the settlements. The central Borders has a number of settlements separated by short distances and the designation seeks to prevent any further or potential visual or physical coalescence of these settlements and supports the NSA in the protection and enhancement of this area.

3.4.2 Regional Park

The Pentlands Regional Park is not located within the Scottish Borders. However it is located within Midlothian, City of Edinburgh and West Lothian to the north, northeast and northwest of the Scottish Borders Midland Valley area. This designation is partly related to scenic quality and partly to recreation and contributes to landscape value in this area.

3.4.3 Historic and Cultural Designations

Scheduled Ancient Monuments (SAMs) are primarily a historic or archaeological designation. However, they can be of landscape significance in their own right and contribute to the character and value of a landscape. Furthermore, effects on their setting can be a consideration for neighbouring development proposals e.g. Castles, Monuments and Cairns.

Conservation Areas are primarily an urban designation. Nevertheless, the appearance of a settlement can be a key feature contributing to the surrounding rural landscape and equally the setting of a Conservation Area can be affected by developments in the surrounding countryside.

There are a total of 43 conservation areas within the Scottish Borders; these are concentrated throughout the sheltered valleys and agricultural lowlands within the historic population centres.

Listed Buildings feature throughout the urban and rural areas. The greatest concentrations are located within settlements found within the sheltered valleys and broad fertile farmland areas. Listed buildings contribute to landscape character and value and effect on their setting is a consideration for neighbouring development proposals.

3.4.4 Nature Conservation Designations

Areas designated for their nature conservation interest and importance include SPAs SACs, Ramsar Sites, SSSIs and National Nature Reserves (NNRs). All are national or international designations and are a Group 2 Spatial Framework consideration. Whilst these constraints are primarily related to nature conservation interests, such designated areas often contribute to the character and value of a landscape through its relatively undisturbed natural features and potential visitor interest.

In Scottish Borders, these designations are found throughout the region. The main rivers and tributaries, including the River Tweed, are SSSI's and SACs. Within the upland areas of the Moorfoot Hills and Southern Uplands there are larger areas designated as SSSIs and SACs. There is a large SPA and SSSI that is partly within the Scottish Borders and partly within Dumfries and Galloway in the southern area of the Scottish Borders region.

3.5 MOD Eskdalemuir Seismological Array

The Eskdalemuir seismological array is an MOD facility located within Dumfries and Galloway within the Eskdale Forest in the valley of the White Esk. This facility has no bearing on landscape quality or sensitivity. However, it is currently surrounded by a 10km exclusion zone within which no turbine development can occur. This exclusion zone comes into Scottish Borders area occupying a large area of the *Southern Uplands Forest Covered* (*Craik Forest) LCA*. A further consultative area of 50km extends from the facility in which turbine development is limited to a 'noise budget' that has already been reached. Applications for turbine developments in this area are subject to mitigation measures that must be agreed with the MOD/ Eskdalemuir seismological array to reduce/ eliminate noise that would interfere with the seismological array. The location and zones are shown in Figure 3.8.

Fife
Falkirk
City of Edinburgh
West Lothian
East Lothian
Midlothian
Scottish Borders
South Lanarkshire
Dumfries & Galloway
Cumbria
Northumberland

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries

Figure 3.1

Study Area

N

0 5 10 20 30 Km

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Landscape Character Areas
- Settlements

Elevation

- 800 - 850mAOD Contours
- 750 - 800mAOD Contours
- 700 - 750mAOD Contours
- 650 - 700mAOD Contours
- 600 - 650mAOD Contours
- 550 - 600mAOD Contours
- 500 -550mAOD Contours
- 450 - 500mAOD Contours
- 400 - 450mAOD Contours
- 350 - 400mAOD Contours
- 300 - 350mAOD Contours
- 250 - 300mAOD Contours
- 200 - 250mAOD Contours
- 150 - 200mAOD Contours
- 100 - 150mAOD Contours
- 50 - 100mAOD Contours
- 0 - 50mAOD Contours

Code	Landscape Character Types
1	Dissected Plateau Moorland
2	Plateau Grassland
3	Plateau Outliers
4	Southern Uplands with Scattered Forest
5	Southern Uplands Forest Covered
6	Cheviot Uplands
7	Cheviot Foothills
8	Rolling Farmland
9	Platform Farmland
10	Grassland with Rock Outcrops
11	Grassland with Hills
12	Undulating Grassland
13	Poor Rough Grassland
14	Upland Fringe Moorland
15	Lowland with Drumlins
16	Rolling Lowland Margin
17	Lowland Margin Platform
18	Lowland Margin with Hills
19	Coastal Farmland
20	Coastal Pasture
21	Coastal Moorland
22	Upland Valley with Pastoral Floor
23	Pastoral Upland Valley
24	Upland Valley with Farmland
25	Upland Valley with Woodland
26	Pastoral Upland Fringe Valley
27	Upland Fringe Valley with Settlements
28	Wooded Upland Fringe Valley
29	Lowland Valley with Farmland
30	Coastal Valley
LOCH	Inland Loch
LOCH_ISLD	Loch Island

Figure 3.2

Topography

N

0 5 10 20 30 Km

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(i) Midland Valley

(ii) Lammermuir & Moorfoot Hills

(iii) Central Southern Uplands

(iv) Cheviot Hills

(v) Tweed Lowlands

(vi) Coastal Zone

Legend

- Regional Landscape Areas
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries

Regional Landscape Character Types

- Upland
- Upland Fringe
- Lowland
- Costal
- River Valley

N

0 5 10 20 Km

Figure 3.3

Regional Landscape Character Types

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Legend

SBC Local Authority Boundary
Local Authority Boundary 15km Buffer
Other Local Authority Boundaries

1 - Dissected Plateau Moorland
1 (i) Western Pentlands
1 (ii) Moorfoot Plateau
1 (iii) Lammermuir Hills

2 - Plateau Grassland
2 Lauder Common

3 - Plateau Outliers
3 (i) Eddleston / Lyne Interfluve
3 (ii) Broughton Heights

4 - Southern Uplands with Scattered Forest
4 (i) Broadlaw Group
4 (ii) Dun Knowe Group
4 (iii) Cauldcleuch Head Group

5 - Southern Uplands Forest Covered
5 (i) Craik
5 (ii) Wauchope / Newcastleton

6 - Cheviot Uplands
6 Cocklaw Group

7 - Cheviot Foothills
7 Falla Group

8 - Rolling Farmland
8 (i) Oxnam
8 (ii) Lempitlaw
8 (iii) Minto Hills
8 (iv) Westruther Platform
8 (v) West Linton Synclinal Belt

9 - Platform Farmland
9 Eye Water Platform

10 - Grassland with Rock Outcrops
10 (i) Whitehaugh
10 (ii) Midgard
10 (iii) Allan Water
10 (iv) Chisholme

11 - Grassland with Hills
11 (i) Bonchester / Dunion
11 (ii) Rubers Law
11 (iii) Eildon Hills
11 (iv) Knock Hill
11 (v) Skirling

12 - Undulating Grassland
12 (i) East Gala
12 (ii) West Gala

13 - Poor Rough Grassland
13 Leadburn

14 - Upland Fringe Moorland
14 Greenlaw Common

15 - Lowland with Drumlins
15 Lower Merse

16 - Rolling Lowland Margin
16 (i) Eye Water lowlands
16 (ii) Maxwellheugh

17 - Lowland Margin Platform
17 Gordon Platform

18 - Lowland Margin with Hills
18 Black Hill / Hume Crags

19 - Coastal Farmland
19 (i) Cockburnspath
19 (ii) Coldingham

20 - Coastal Pasture
20 Lamberton Moor

21 - Coastal Moorland
21 Coldinham Moor

22 - Upland Valley with Pastoral Floor
22 (i) Upper Tweed / Biggar Water
22 (ii) Lyne Water
22 (iii) Manor Water
22 (iv) Upper Yarrow
22 (v) Upper Ettrick
22 (vi) Liddel Water

23 - Pastoral Upland Valley
23 (i) Gala Water
23 (ii) Eddleston Water

24 - Upland Valley with Farmland
24 (i) Upper Leader
24 (ii) Upper Whiteadder

25 - Upland Valley with Woodland
25 (i) Middle Tweed
25 (ii) Lower Ettrick / Yarrow

26 - Pastoral Upland Fringe Valley
26 (i) Eye Water
26 (ii) Lower Leader
26 (iii) Bowmont Water
26 (iv) Kale Water
26 (v) Upper Teviot / Bothwick Water

27 - Upland Fringe Valley with Settlements
27 Tweed / Gala / Ettrick Confluence

28 - Wooded Upland Fringe Valley
28 (i) Middle Whiteadder
28 (ii) Ale Water
28 (iii) Jed Water
28 (iv) Rule Water
28 (v) Slitrig Water

29 - Lowland Valley with Farmland
29 (i) Lower Kale
29 (ii) Lower Teviot
29 (iii) Lower Tweed

30 - Coastal Valley
30 Lower Eye Water

Figure 3.4

Landscape Character Areas

N
0 5 10 20 Km

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Legend

- SNH Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Landscape Character Areas
- National Scenic Area:
  1. Upper Tweedsdale
  2. Eildon and Leaderfoot
- Regional Park
- Country Parks
- Countryside Around Towns Area
- SBC Designed Landscapes
- Historic Gardens and Designed Landscapes
- Special Landscape Areas
- Landscape Designations outside SBC
- National Park

Code	Landscape Character Types
1	Dissected Plateau Moorland
2	Plateau Grassland
3	Plateau Outliers
4	Southern Uplands with Scattered Forest
5	Southern Uplands Forest Covered
6	Cheviot Uplands
7	Cheviot Foothills
8	Rolling Farmland
9	Platform Farmland
10	Grassland with Rock Outcrops
11	Grassland with Hills
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25	Upland Valley with Woodland
26	Pastoral Upland Fringe Valley
27	Upland Fringe Valley with Settlements
28	Wooded Upland Fringe Valley
29	Lowland Valley with Farmland
30	Coastal Valley
LOCH	Inland Loch
LOCH_ISLD	Loch Island

Figure 3.5

Landscape Designations & Landscape Character Areas

N

0 5 10 20 30 Km

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Talla - Hart Fell Wildland Area
- Lochs

Level of Wildness

High

Low

Fife
Falkirk
West Lothian
City of Edinburgh
East Lothian
Midlothian
Scottish Borders
South Lanarkshire
Dumfries & Galloway
Cumbria
Northumberland

Figure 3.6

Scottish Borders: Relative Wildness

N

0 5 10 20 30 Km

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Landscape Character Areas
- Listed Buildings
- Special Areas of Conservation
- Sites of Special Scientific Interest
- RAMSAR Sites
- National Nature Reserve
- Special Protected Areas
- Scheduled Ancient Monuments
- Conservation Area
- Ancient Woodland Inventory
- Inventory of Historic Battlefields

Code	Landscape Character Types
1	Dissected Plateau Moorland
2	Plateau Grassland
3	Plateau Outliers
4	Southern Uplands with Scattered Forest
5	Southern Uplands Forest Covered
6	Cheviot Uplands
7	Cheviot Foothills
8	Rolling Farmland
9	Platform Farmland
10	Grassland with Rock Outcrops
11	Grassland with Hills
12	Undulating Grassland
13	Poor Rough Grassland
14	Upland Fringe Moorland
15	Lowland with Drumlins
16	Rolling Lowland Margin
17	Lowland Margin Platform
18	Lowland Margin with Hills
19	Coastal Farmland
20	Coastal Pasture
21	Coastal Moorland
22	Upland Valley with Pastoral Floor
23	Pastoral Upland Valley
24	Upland Valley with Farmland
25	Upland Valley with Woodland
26	Pastoral Upland Fringe Valley
27	Upland Fringe Valley with Settlements
28	Wooded Upland Fringe Valley
29	Lowland Valley with Farmland
30	Coastal Valley
LOCH	Inland Loch
LOCH_ISLD	Loch Island

Figure 3.7

Natural and Cultural Designations

N

0 5 10 20 30 Km

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Landscape Character Areas
- MoD EKA Seismological Array
- MoD EKA Seismological Array 10km Exclusion Zone
- MoD EKA Seismological Array 50km Statutory Safeguard Area

Code	Landscape Character Types
1	Dissected Plateau Moorland
2	Plateau Grassland
3	Plateau Outliers
4	Southern Uplands with Scattered Forest
5	Southern Uplands Forest Covered
6	Cheviot Uplands
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18	Lowland Margin with Hills
19	Coastal Farmland
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22	Upland Valley with Pastoral Floor
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24	Upland Valley with Farmland
25	Upland Valley with Woodland
26	Pastoral Upland Fringe Valley
27	Upland Fringe Valley with Settlements
28	Wooded Upland Fringe Valley
29	Lowland Valley with Farmland
30	Coastal Valley
LOCH	Inland Loch
LOCH_ISLD	Loch Island

Figure 3.8

MoD EKA Seismological Array

N 0 5 10 20 30 Km

4.0 VISUAL BASELINE

The following section details the analysis that was carried out to establish the relative visibility and potential visual sensitivity of different parts of Scottish Borders.

4.1 Visual Receptors

In a study of landscape capacity and cumulative landscape impacts, it is important to consider visibility, and the effects of cumulative impact on visual receptors. This not only feeds into the assessment of landscape sensitivity and capacity (see Section 2.2), but also builds up a picture of where visual receptors in and around Scottish Borders would perceive wind turbines within the landscape.

The types of potentially sensitive visual receptors within the Scottish Borders are broadly categorised into three groups:

- Residents (dwellings and settlements)
- Travellers (roads, railway)
- Visitors (visitor destinations, viewpoints, recreational footpaths and cycle routes)

Whilst there are working receptors in the Scottish Borders, these have not been included, as people at work are considered to be lower sensitivity visual receptors.

Based on desk study and site analysis, three groups of receptors were identified as proxies:

- Settlements, representing concentrations of residential receptors;
- Routes, representing travelling receptors, and including the main A roads, promoted tourist routes, railways, and long-distance footpaths and cycleways;
- Viewpoints, representing visitors and residents, selected from popular walking destinations and long distance footpaths, visitor attractions, and viewpoints identified on OS maps. Selected in consultation with officers of Scottish Borders Council.

The locations of the settlements, routes, and viewpoints are illustrated on Figure 4.1. The assessment includes receptors in the study buffer area up to 15km beyond the Scottish Borders boundary.

Individual residential properties are not included in the visibility mapping although notice is taken of the frequency and distribution of dwellings in the analysis of each landscape character type.

4.2 Visibility Analysis

An assessment of visibility was made from the settlements, routes and viewpoints illustrated in Figure 4.1. This was carried out using a computer based technique in which the intervisibility between receptors and topography, or objects of specific heights on the landform, is determined. The more intervisibility, the greater the visibility from receptors is likely to be. The method is described in more detail in **Appendix 2.**

The extent of the visibility assessment was limited to a 15km radius from the receptors. In our experience, this is the distance within which the great majority of significant impacts from wind farms are likely to occur. Whilst it is recognised that impacts occur beyond this distance, up to 35km and beyond, as recognised by EIA best practice, this is not an EIA assessment and the results are considered to adequately distinguish between locations of potentially greater or lesser sensitivity.

Results of the visibility analysis are illustrated in Figures 4.3 a-e, 4.4 a-e & 4.5 a-e (in **Appendix 3**). The colours show the differences in visual sensitivity across the Scottish Borders area. Red colours indicate areas that are most visible from the greatest number of receptors, grading through orange, yellow and green to blue/ purple areas that are seen by fewest receptors and uncoloured areas that would not be seen at all.

4.2.1 Settlements

Figures 4.3 a-e show that the areas most likely to be seen from settlements are located in the northern edge of the Pentland and Moorfoot Hills overlooking the Midland Valley; the Tweed lowlands and isolated landmark hills such as the Eildon Hills and Black Hill. These areas have visibility from the highest number of receptors due to elevation and proximity to centres of population. For all heights of turbine the most sensitive locations within Scottish Borders would be the Eildon Hills, Black Hill and the Scott's View area above the River Tweed. Turbines located around Hawick, Peebles, Kelso and Coldstream as well as the central Galashiels to Melrose cluster of settlements would also be more highly exposed to resident populations. Any height of turbine located on the Eildon Hills, Black Hill and the northern exposed slopes of the Moorfoot and Pentland Hills would be relatively more visible. The areas of least visibility from settlements are located within the core of upland areas including the Lammermuir Hills, Moorfoot Hills, Lauder Common, Southern Uplands and Cheviot Hills. The outer slopes of upland areas have a higher visibility than the core areas, reflecting the screening benefits of topographical containment as well as a much lower population density.

In terms of landscape character areas the most visually exposed to settlements are the Upland landscapes to the south of Edinburgh (*Upland and Upland Fringe*) and the central isolated hills (*Rolling Farmland* and *Lowland Margin with Hills*), followed by the slopes above settlements in the Upper Tweed and Teviot Valley's and the rolling Lowland landscapes of the Lowland with Drumlins around Kelso and Coldstream. These areas are visible from Edinburgh and the concentration of settlements within the Tweed Valley.

4.2.2 Routes

The routes (Figures 4.4 a-e) show a similar pattern of intervisibility as settlements, but with the areas of highest visibility shifting from the Moorfoot and Pentland Hills to the central lowland areas of Scottish Borders and much less area with no visibility. In particular the area around the Eildon Hills and Black Hill are highlighted. However, there are additional highly visible areas from Peniel Heugh to the area south of Kelso (Bowmont Forest), Dunion Hill (to the west of Jedburgh) and along the coastal border area around Ayton Hill

elevated above the A1. The Merse area also has a relatively high intervisibility. This visibility mapping reflects the concentration of important routes through the Scottish Borders, especially the A68, A7, A697 and the coastal A1 route. The mapping also takes account of the East Coast Mainline railway and the Borders Railway alongside the A7 between Edinburgh and Galashiels.

The landscapes types most visible from settlements are again the prominent isolated hills within the central *Lowlands* and *River Valleys* seen prominently from many roads and railway lines. However, there are areas within the uplands landscapes, especially on the northern border between East Lothian at the Lammermuir Hills either side of the A68 and the area of the Moorfoot Hills bordering Mid Lothian either side of the A7 and the A703. Areas of the Southern Uplands east of Biggar also have a higher visibility and sensitivity.

The areas of least visibility are in the core of more elevated upland areas including the Moorfoot and Lammermuir Hills (south of the Mid- and East Lothian boundaries), the Southern Uplands and the Cheviot Hills. Nevertheless, there is a small pocket of higher visibility around the Carter Bar England/ Scotland border through which the A68 passes.

4.2.3 Viewpoints

The viewpoints (Figures 4.5 a-e) show a similar story to that shown by the Settlements and Routes visibility mapping. Visibility from viewpoints is similar to the previous visibility mapping due to the topography of the central lowlands surrounded by *Upland Fringe* and *Upland Landscapes* roughly extending either side along the Tweed Valley.

There are however differences in the visibility within the Cheviot Hills area. This area has a higher visibility and sensitivity than the previous visibility mapping due to the location of the Pennine Way along the England/ Scotland Border and the number of viewpoints along this route looking onto the landscape. This includes the Carter Bar Viewpoint on the A68 England/ Scotland border which allows for a wide panoramic view over the Scottish Borders and provides a first impression of Scotland to visitors.

The central area between Selkirk and Jedburgh, south of Galashiels and Melrose is again of the highest visibility and sensitivity, this area includes the Eildon Hills and Black Hill. The higher ground either side of the A72 between Peebles and Selkirk has a higher visibility and sensitivity, due to the number of elevated viewpoints along the Southern Upland Way and the promoted viewpoints elevated above settlements in this area. There is again an area of higher visibility within the Lowland Merse area, coastal areas including Coldingham Moor and the area around Ayton Hill west of the A1 corridor.

On the basis of the viewpoints selected the areas with the least visibility are located in the upland areas of the Moorfoot Hills and Southern Uplands areas. This is closely followed by areas within the Lammermuir Hills and Pentlands.

4.2.4 Analysis of Visibility

The visibility analysis confirms empirical observations of visual sensitivity across Scottish Borders, i.e. that it is the central areas close to populated areas that have the highest visual sensitivity as well as the northern escarpments of the Moorfoot and Pentland Hills facing the Midland Valley. However this analysis gives a more refined and nuanced assessment, determining which geographical areas are likely to be the most and least visually sensitive.

Based on the computer assessment and on observation, the following areas are likely to be of highest visual sensitivity, a factor that will have a bearing on their capacity for wind turbine development:

- The summits and northern slopes of the Pentlands and Moorfoot Hills overlooking the Midland Valley;
- The Central lowlands between Selkirk and Jedburgh to the south of Galashiels and Melrose;
- Prominent landmark hills fringing the central lowland areas including the Eildon Hills and Black Hill around Melrose, Peniel Heugh and Dunion Hill by Jedburgh;
- The higher coastal land to the west of the A1 north of the England – Scotland border;
- The coastal zone bound by the A1 and East Coast Mainline;
- There are also smaller pockets of medium visual sensitivity within the Cheviot Hills, along the A7 between Selkirk and Peebles on the elevated land framing the valley and the higher land within the Scottish Borders north east of Biggar.

The areas likely to be least visually sensitive include:

- A large area of the Southern Uplands in the south west of the study area bordering South Lanarkshire in the west and Dumfries and Galloway in the south west;
- Areas of the Lammermuir and Moorfoot Hills bordering Midlothian and East Lothian;

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Legend

- SBC Local Authority Boundary
- Local Authority Boundary 15km Buffer
- Other Local Authority Boundaries
- Settlements

Viewpoints

- Within SBC Boundary
- Outwith SBC Boundary
- National Cycle Network and Borders Loop
- Long Distance Footpaths

Road Classifications

- Motorway
- Primary Road
- A Road
- Existing Railway

Figure 4.1

Transport Routes, Settlements & Viewpoints

N 0 5 10 20 30 Km