South Lanarkshire Landscape Capacity Study for Wind Energy

February 2016 | 7948 GIS 108

Legend

- SLC Boundary
- Study Area 15km buffer
- Scottish Local Authority Boundaries

Settlements

- Settlements
- Settlements 2km Buffer

Routes

- Railways
- Motorway
- Primary Road
- A Road
- B Road
- Cycleroutes
- Long Distance Footpaths

Viewpoints

- Viewpoints

Ref:	Name
1	Cathkin Braes
2	East Kilbride
3	Chatelherault Country Park
4	Motherwell Heritage Centre
12	Loudoun Hill
9	Black Hill
16	Douglas Castle
10	A73
11	Hyndford Bridge
5	Forth
8	Little Sparta
15	Biggar Common
14	Tinto
17	Culter Fell
20	Abington Services
19	Red Moss
21	Crawford Footbridge
22	Leadhills
23	Green Lowther
6	West Cairn Hill
7	Blacklaw
13	Trumpeter's Well
18	Cairn Table
24	Devil's Beef Tub
25	Queensberry
26	Pykestone Hill

Figure 4.1

Visual Receptors

N

0 5 10 20 Km

5.0 WIND TURBINES IN THE STUDY AREA

The following section lists and describes the operating, consented and proposed wind turbine developments in South Lanarkshire at **March 2015** and the rest of the study area at January 2015 (refer to Appendix 5 and Figure 5.1 and 5.2 for details and location).

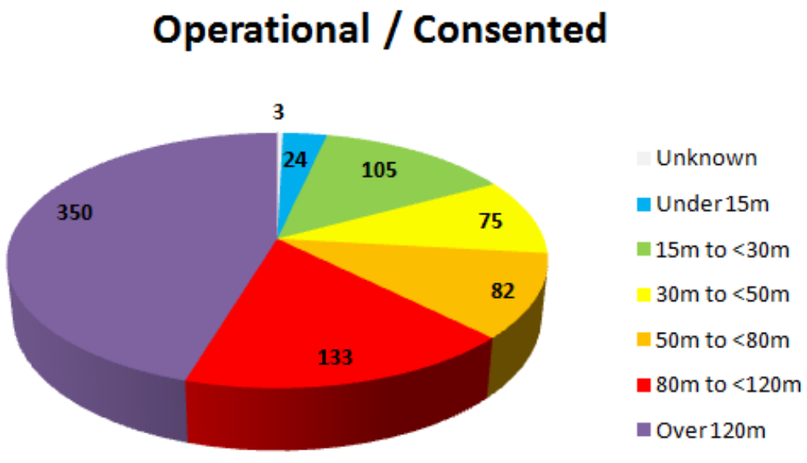
5.1 Turbine Numbers and Distribution

The study area, for the purposes of the assessment of visibility and landscape and visual impacts of turbines, includes South Lanarkshire plus a 15km buffer around its boundary taking in: Glasgow, most of Dunbartonshire, North Lanarkshire and West Lothian; western parts of Edinburgh and Midlothian; western Scottish Borders; northern Dumfries and Galloway; the northeast part of East Ayrshire most of East Renfrewshire and eastern parts of Renfrewshire and West Dunbartonshire.

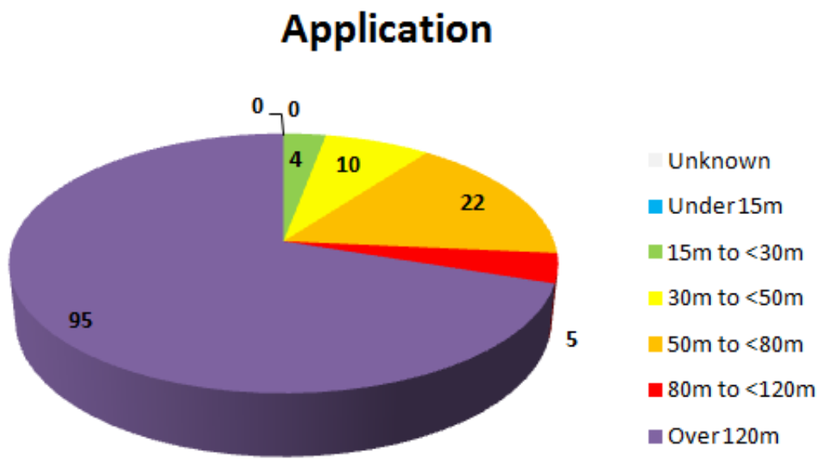
Consented and proposed wind energy developments of 4 or more turbines over 50m in height within the study area are listed in Appendix 5, together with details (where available) of location, number and height of turbines, status and landscape character type. The locations of all turbines (including those in groups of three or fewer and 15-50m) are shown in Figure 5.1 (South Lanarkshire) and 5.2 (whole study area). Turbines under 15m are not included in strategic guidance.

At March 2015 there were within South Lanarkshire a total of 745 turbines of 15m or greater that are operational or consented and 136 that are in planning or S36 applications pending a decision.

Of those turbines consented, the majority (483 or 65%) are 80m or more to blade tip, and some 14% are in the smallest 15-<30m category. The following chart shows the distribution of sizes.



In the applications the vast majority (95 or 70%) of proposed turbines are in the >120m to blade tip range, as the following chart shows:



There are also significant numbers of operational, consented and proposed wind turbines in the 15km buffer (Approximately 939 existing/consented and 270 proposed). This is particularly due to parts of the Whitelee cluster extending into East Ayrshire and East Renfrewshire; Black Law and extension extending into North Lanarkshire and West Lothian and significant developments in Scottish Borders and Dumfries and Galloway.

5.1.1 Operating and Consented Wind Turbines

South Lanarkshire and the study area have a relatively large number of turbines when compared to most other areas in Scotland. This is particularly the case with larger turbines in windfarms.

There have been very significant changes to the baseline of operating and consented turbines over the five years to March 2015. The main changes are as follows:

- Whitelee extensions (75x140m in East Ayrshire) are now operational
- Calder Water (13x147m) and West Browncastle (12x136.5m), southeast of Whitelee, are now operational
- Blantyre Muir (6x115m) between Hamilton and East Kilbride is operational
- The single 125m turbine at Cathkin Braes above Glasgow is now operational
- Black Law Extension (23x126m) in West Lothian and North Lanarkshire is consented

- Muirhall (6x125m) is now operational and has two further operational147m turbines and three more consented.
- Pearie Law (6x125m) and Harburnhead (22x126m) in West Lothian are consented
- Nutberry (6x125m), northwest of Hagshaw Hill is operational
- Galawhistle (22x125m) west of Hagshaw Hill is consented
- Dalquhandy (15x126.5m) north of Hagshaw Hill is consented
- Bankend Rig (11x76m), south of Drumclog, is operational
- Dungavel (13 x 120m), south of Drumclog is now under construction
- Kype Muir (26x132m) and Auchrobert (12x132m), northeast of Dungavel are now consented
- Andershaw (14x125m) and Middle Muir (15x125m) south of the Douglas Water valley are consented
- Clyde (152x125m) is now operational
- Clyde Extension 54x142m turbine extension to the north and east of Clyde, with 3 turbines extending into Scottish Borders, is now consented
- Harestanes (71x125m in Dumfries and Galloway) is now operational
- Glenkerie in Scottish Borders (11x120m) is now operational
- Crookedstane (4x125m) that extends Clyde Windfarm is consented

A significant number of smaller non-commercial/FiT developments, single, 2 or 3 turbine developments have also become operational or are consented.

5.1.2 Proposed Windfarms and Turbines (at March 2015)

There are many further proposals in South Lanarkshire that are at the application stage. In the last five years the main changes to applications in the study area are:

- Kennoxhead (26x126.5m) between Galawhistle and Penbreck
- Broken Cross (7x126.5m) near Coalburn
- Glentaggart (6x135m) west of Andershaw
- Leadhills (12x137m) to the southwest of Crawfordjohn
- Lion Hill (4x125m) that would extend Clyde windfarm
- Kype Extension (10x132m and 8x152m) to south-west of consented Kype Muir Windfarm
- Harrow's Law (17x115m), and Fauch Hill (23x125m) in the Pentland Hills have been dismissed at appeal
- Windfarms at Calla and Crofthill near Carnwath have been refused by South Lanarkshire Council

There are many applications for smaller non-commercial/FiT developments of single and paired turbines of varying sizes across the northern part of the area. There are also scoping requests for significant sized windfarms including Heathlands near Black Law and Cumberhead, extension of Nutberry Windfarm.

5.1.3 Pattern of development

The vast majority of the operating and consented turbines are located in the upland areas; particularly the *Plateau Moorlands*, *Rolling Moorlands* and *Southern Uplands*. This pattern has not changed in last five years and is further reinforced by the applications. However what is noticeable is the appearance of a sizeable number of consents and applications for FiT turbines and groups of 1-3 in the lowland areas. These turbines range between 15m to over 100m in height to blade tip.

5.2 Landscape Character of Turbine Locations

At March 2015 there were 745 turbines over 15m tall operating, under construction or consented in South Lanarkshire. If all the proposed turbines in South Lanarkshire were constructed as well this would amount to a total of 881 wind turbines. Another 1209 operational, consented, and proposed turbines lie within 15km of the South Lanarkshire boundary.

A clear pattern of wind power development emerges: a chain of consented and operational windfarms on upland areas stretching from Whitelee in the north-west, to Clyde in the south-east. Beyond South Lanarkshire, several developments along the East Ayrshire/ East Renfrewshire border extend the chain northwest, and Harestanes continues it to the south. This chain has been reinforced by the consents of Calder Water, West Browncastle, Dungavel, Kype Muir, Auchrobert, Middle Muir and Andershaw which reduce gaps between the main clusters of Whitelee, Hagshaw Hill and Clyde.

A second area of concentration in the northeast corner includes Black Law, Muirhall. Pate's Hill and Tormywheel. This has been added to by the Black Law and Muirhall extensions. The dismissal of Harrows Law and Fauch Hill indicates there is unlikely to be eastward extension beyond the A70 into the Pentland Hills, although the consents for Pearie Law and Harburnhead indicate a potential concentration extending well into West Lothian west of the Pentlands.

The existing and continuing pattern of development reflects the prevalence of larger size windfarms in upland locations around the periphery of South Lanarkshire.

The central South Lanarkshire area along the Clyde Valley, around Biggar and into the Glasgow conurbation had few existing or proposed windfarms and turbines five years ago. Though this situation has now changed, with a significant number of consents and

applications for smaller scale projects for single, 2 or 3 turbine developments ranging from 15m to 100m or greater height to tip, as well as proposals for windfarms with several turbines. Nevertheless a significant part of the area around the Clyde and Biggar still has no significant scale of development, with consented turbines largely under 30m in height. This links areas of minimal turbine development in the Pentland Hills to the north with the foothills around Tinto to the south.

The main concentrations of larger operational and consented turbines within lowland and upland fringe areas include:

- 6x115m turbines at Blantyre Muir between East Kilbride and Hamilton;
- 5x100m turbines at Lochhead and other larger turbines between Larkhall and Kirkmuirhill;
- 15x126.5m turbines at Dalquhandy near Coalburn, of which 10 are in a restored opencast site, originally *Plateau Farmland*;
- Several consented turbines between 50m and 120m height around the M74 at Broken Cross;
- Many further consented turbines between 30 and 80m tall distributed widely across the *Plateau Farmlands* and *Rolling Farmlands* in the northern part of South Lanarkshire, with particular concentrations within 5km of Lesmahagow and to the north east of Lanark.

Current applications for windfarms and turbines in the lowlands and upland fringes are also located in or adjacent to the *Plateau Farmland* and *Rolling Farmland* in the north. The most notable proposal is the 7 turbines at Broken Cross a small area of *Plateau Moorland* surrounded by *Plateau Farmland* with several smaller turbines consented or at application. There have been applications for windfarms with smaller numbers of turbines at Croft Hill and Hill Rig northeast of Lanark.

The overall pattern of development reflects the divide between lowlands and uplands in South Lanarkshire, in that the largest developments with turbines mostly taller than 80m are located in the uplands. However the distinction is more blurred than five years ago as many turbines between 50m and 120m tall are now located in the lowlands.

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Legend

- SLC Boundary
- Study Area 15km buffer
- Scottish Local Authority Boundaries
- Landscape Character Areas

Windfarm: Status, Height

- Operational / Consented, Unknown
- Operational / Consented, 15m to <30m
- Operational / Consented, 30m to <50m
- Operational / Consented, 50m to <80m
- Operational / Consented, 80m to <120m
- Operational / Consented, Over 120m
- Application, Unknown
- Application, 15m to <30m
- Application, 30m to <50m
- Application, 50m to <80m
- Application, 80m to <120m
- Application, Over 120m
- Scoping, Unknown
- Scoping, 15m to <30m
- Scoping, 30m to < 50m
- Scoping, 50m to <80m
- Scoping, 80m to <120m
- Scoping, Over 120m

Landscape Character Types	
Code	Type
1	Urban Fringe Farmland
2	Incised River Valley
2A	Incised River Valley Broad Valley Floor
3	Broad Urban Valley
4	Rolling Farmland
4A	Plateau Farmland Forestry
5	Plateau Farmland
5A	Plateau Farmland Forestry
5B	Plateau Farmland Opencast Mining
5C	Plateau Farmland Windfarm
6	Plateau Moorland
6A	Plateau Moorland Forestry
6B	Plateau Moorland Forestry Windfarm
6C	Plateau Moorland Windfarm
6D	Plateau Moorland Opencast Mining
7	Rolling Moorland Foothills
7A	Rolling Moorland Forestry
7B	Rolling Morrland Windfarm
8	Upland River Valley
8A	Upland River Valley Incised
8B	Upland River Valley Opencast Mining
9	Broad Valley Upland
10	Foothills
10A	Foothills Forestry
11	Prominant Isolated Hills
12	Old Red Sandstone Hills
13	Southern Uplands
13A	Southern Uplands Forestry
13B	Southern Uplands Windfarm
13C	Southern Uplands Leadhills
14	Upland Glen

Figure 5.1

Operational, Consented & Proposed Wind Turbines in South Lanarkshire (March 2015)

N

0 2.25 4.5 9 Km

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Legend

- SLC Boundary
- Study Area 15km buffer
- Landscape Character Areas
- Scottish Local Authority Boundaries
- Older Data

Windfarm: Status, Height

- Operational / Consented, Unknown
- Operational / Consented, 15m to <30m
- Operational / Consented, 30m to <50m
- Operational / Consented, 50m to <80m
- Operational / Consented, 80m to <120m
- Operational / Consented, Over 120m
- Application, Unknown
- Application, 15m to <30m
- Application, 30m to <50m
- Application, 50m to <80m
- Application, 80m to <120m
- Application, Over 120m
- Scoping, Unknown
- Scoping, 15m to <30m
- Scoping, 30m to < 50m
- Scoping, 50m to <80m
- Scoping, 80m to <120m
- Scoping, Over 120m

Landscape Character Types	
Code	Type
1	Urban Fringe Farmland
2	Incised River Valley
2A	Incised River Valley Broad Valley Floor
3	Broad Urban Valley
4	Rolling Farmland
4A	Plateau Farmland Forestry
5	Plateau Farmland
5A	Plateau Farmland Forestry
5B	Plateau Farmland Opencast Mining
5C	Plateau Farmland Windfarm
6	Plateau Moorland
6A	Plateau Moorland Forestry
6B	Plateau Moorland Forestry Windfarm
6C	Plateau Moorland Windfarm
6D	Plateau Moorland Opencast Mining
7	Rolling Moorland Foothills
7A	Rolling Moorland Forestry
7B	Rolling Morrland Windfarm
8	Upland River Valley
8A	Upland River Valley Incised
8B	Upland River Valley Opencast Mining
9	Broad Valley Upland
10	Foothills
10A	Foothills Forestry
11	Prominant Isolated Hills
12	Old Red Sandstone Hills
13	Southern Uplands
13A	Southern Uplands Forestry
13B	Southern Uplands Windfarm
13C	Southern Uplands Leadhills
14	Upland Glen

Figure 5.2

Operational, Consented & Proposed Wind Turbines in Study Area (March 2015)

N 0 5 10 Km 20

6.0 ASSESSMENT OF LANDSCAPE CAPACITY AND CUMULATIVE CHANGE

6.1 Assessment Purpose and Process

The purpose of the following assessment is to determine the capacity of the South Lanarkshire landscape to accommodate wind turbine development and to determine, in landscape terms, what levels of cumulative development would be acceptable across South Lanarkshire. The assessment also takes into account the level of cumulative development that already exists within and around South Lanarkshire and is based on the premise that current renewable energy policies have and will lead to an inevitable level of landscape change within South Lanarkshire. SPP highlights that cumulative impacts may present a limit to the extent of onshore wind development and the need to consider cumulative impacts in the decision making process.

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

1) Firstly identifying the *underlying* capacity of the South Lanarkshire landscape to accommodate wind turbine development;

2) Secondly, assessing the degree of cumulative change that has resulted from operating and consented wind turbines in the study area and across specific areas of South Lanarkshire;

3) Thirdly, assessing the level of further development that could acceptably be accommodated within areas of South Lanarkshire thereby identifying *remaining* capacity.

An assessment methodology is given in chapter 2.0 and further detailed in **Appendix 2**. The conclusion of the assessment is set out in Table 6.1(a)-(k) and illustrated in Figures 6.1 to 6.4, which show landscape capacity, landscape typology and opportunities and constraints for wind energy development.

The assessment of landscape capacity and cumulative landscape change is based on the fourteen South Lanarkshire landscape character types (LCTs) in the *South Lanarkshire Landscape Character Assessment (LCA) 2010.* These are divided into further landscape character areas (LCAs), as detailed in the LCA 2010 report. The location and extent of each LCT and the component LCAs is illustrated in maps in the following pages.

Detailed assessment of the sensitivity and value of each landscape character type is shown in a tabulated form in **Appendix 6** and summarised in left hand columns of Tables 6.1(a)-(k) which are interleaved with the relevant LCT maps. This information is used to determine the capacity for accepting different turbine sizes, detailed in Table 6.1(a)-(k) and as maps in Figures 6.1a – e.

This assessment accounts for the great range of turbine sizes and variations between areas of the same landscape character type as well as the underlying and remaining capacities. This is discussed further in 6.2.4 below.

An assessment is then made of the current level of cumulative change based on the distribution of operational and consented onshore wind energy developments, as listed in Table 5.1 and illustrated in Figures 5.1 and 5.2. The landscape character types are shown in Figure 6.2 as a map of current wind turbine landscape typologies.

The proposed acceptable landscape capacity for development is detailed in Table 6.1 and illustrated in Figure 6.3 as a map of proposed wind turbine landscape typologies, (incorporating the current typologies illustrated in Figure 6.2).

Guidance on wind turbine sizes, numbers and distribution is given in the right hand side of Table 6.1(a)-(k), for managing development to the appropriate level within each landscape type. Analysis of landscape character and guidance on landscape capacity are detailed in the right hand column.

The capacity assessment and current cumulative change for each of the landscape character types is then combined to come to an assessment of capacity and cumulative effects on the main regional landscape areas of South Lanarkshire (refer to section 6.3 and to Figure 3.3 and 3.4 for a map of the areas):

1) Clyde Basin Farmlands and Inner Clyde Valley;

2) Moorlands;

3) Southern Upland Foothills;

4) Pentland Hills; and

5) Southern Uplands.

The assessment concludes with a summary for the whole local authority area (refer to section 6.4). Spatial guidance regarding areas with residual capacity for further development is given at the end of this chapter (refer to section 6.5) and schematically illustrated in Figure 6.4.

6.2 Guidance

Table 6.1(a)-(k) also gives guidance on turbine sizes, cluster sizes and separation between groups of turbines for each landscape type that would limit cumulative development to the proposed acceptable level. This relates to turbines of 15m to blade tip and greater (refer to Table 5.2). Further detail, with location maps for individual landscape character areas, is provided within Table 6.1(a)-(k)**.** As highlighted in section 2.7 guidance on small turbines, below 15m to blade tip, applies at a local level.

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 Windfarms in the landscape 2014*. The following briefly outlines the main considerations in developing the specific guidance for this assessment given in Table 6.1(a)-(k).

6.2.1 Turbine Size

The guidance on turbine sizes generally relates most clearly to the horizontal and vertical scale of the landscape; complexity of landscape pattern and the presence or absence of smaller scale features and elements such as trees and houses.

Smaller size turbines are most able to be accommodated in smaller scale landscapes with more complex patterns and smaller scale reference features. Larger turbines are generally restricted to larger scale landscapes with simpler landforms and fewer small scale references. Smaller turbine sizes may also be accommodated in such landscape types although their proximity to any larger size turbines would need to be carefully controlled and large groups of such turbines would not be appropriate.

The largest scale upland landscapes in South Lanarkshire are extensive and accommodate extensive developments with larger scale turbines. However many of the lowland types are of medium to large scale with a simple landform and pattern and could in places accommodate larger turbines but in much smaller numbers.

6.2.2 Turbine Group Size

Turbine group sizes relate to scale and complexity of the landscape, particularly to landform and pattern. In general larger scale more simple landscapes with gentle landforms and simpler patterns can accommodate larger groups of turbines, subject to having the physical capacity (i.e. available area). In the case of South Lanarkshire there are extensive areas with large scale and simple landform and pattern comparable to the uplands across Scotland which accommodate the largest windfarms. There are also small scale areas of restricted extent with very limited capacity for development of only the smaller turbines.

6.2.3 Separation between Turbine Groups

Turbine size and group size can be generically related to landscape character when applied to a single turbine or windfarm, or across a number of windfarms. However, separation between groups of turbines is the single most important factor in controlling cumulative effects. This is because of the high prominence and extensive visibility of most turbines leading to effects on landscape character well beyond the turbines, as discussed in detail in Appendix 4.

The guidance in Table 6.1 therefore gives approximate separation distances that should be applied between turbine groupings (including single turbines) in order to achieve the desired turbine landscape typology. The main factors controlling the proposed separation distance are:

1) Proposed Turbine Landscape Typology: each proposed typology detailed in Table 2.2 requires a different separation distance to achieve the landscape and visual criteria described.

2) Turbine Size: larger turbines require a greater separation than smaller turbines to achieve the same landscape typology.

3) Group Size: larger groups of turbines require a greater separation distance to achieve the same landscape typology.

4) Landscape character type: this has an effect on all the above criteria. In terms of visibility, more open landscapes with modest landforms are likely to require greater separation distances, whereas landscapes with significant topography and woodland cover give the potential to reduce visibility if the woodland is not due to be felled as part of a forestry cycle. Factors such as scale and pattern can have a more subjective effect. The presence of other tall objects, such as electricity pylons, and of built development also affects the perception of turbine development.

The distances given are approximate, relating primarily to all the above factors. Landscape character including topography is often important: where landforms are capable of visually separating turbine groups the distance between landforms is a consideration in setting distances. For example:

- In the *Rolling Moorlands*, the separation distances are designed to ensure a degree of separation between windfarms to maintain a *Landscape with Wind Turbines*. A distance of 5-10km is the separation required to ensure that the windfarms relate to significant hill and valley landforms; either providing screening or a physical separation between ridges.

- In contrast *Rolling Farmlands,* which is a proposed *Landscape with Occasional Turbines*, has lower landforms and smaller turbines in smaller groups and the separation distance of 8-12km is required to ensure that small groupings of larger turbines are sufficiently separated.

In the case of geographically small landscape character areas the separation distances for larger turbines could mean that potentially only one grouping would be comfortably accommodated within the area. The separation may then apply between a development in that landscape character area and one in an adjacent area.

As the recommended distances are an approximate range it is emphasised that separation distances between specific proposals should be considered in more detail on a case by case basis.

6.2.4 Other Factors which Influence Guidance

The generic capacity assessment for some landscape types does not cover the variation found between, or even within, individual areas of that type. This is usually because of one or two key landscape factors which override the characteristics including:

- All or part of the landscape character area is much more prominent and visible than is typical for the landscape character type;

- A particularly small area is covered by the character area compared with the main areas of the landscape character type;

- Some or all of the area lies in an area designated to protect a landscape or setting of a settlement (e.g. Special Landscape Area);

- Close proximity to other more sensitive areas which would be significantly affected by wind energy proposals otherwise suitable for the type;
- Close proximity to other landscape types, settlements or industry which reduce the sensitivity of a landscape character area, compared to what is typical for the landscape character type.

A combination of any of these factors may limit or enhance the ability of a specific landscape character area, or part thereof, to accommodate a level of development otherwise acceptable to the type. The main areas are identified in Figures 6.1 to 6.4 with more detailed guidance on individual landscape character types and areas in Table 6.1(a)-(k). Nevertheless, any specific development should be considered in more detail and assessed against local factors where appropriate.

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 is provided in the Council's Renewable Energy Supplementary Guidance.