Northumberland
County Council

Northumberland Local Plan
Technical document: Suitable areas for wind turbine development in Northumberland

March 2018

Contents

1. Introduction

Purpose of this document

1.1 The purpose of this document is to provide a high level assessment of the extent and distribution of planning and environmental considerations that could affect the suitability of areas of Northumberland for wind turbine development. This will be used to recommend whether it is appropriate to identify suitable areas for wind turbine development in the emerging Northumberland Local Plan.

1.2 This document responds to the policy and guidance in a Written Ministerial Statement (WMS)[1] and the Planning Practice Guidance. The WMS states that local planning authorities should only grant planning permission for proposals for wind energy development if the development site is in an area identified as suitable for wind energy development. It goes on to note that these areas need to be identified clearly in a Local or Neighbourhood Plan.

1.3 This report details the context for this study, its scope and the approach taken. The report also provides maps and makes recommendations on whether it is appropriate to identify suitable areas for wind turbine development in the Northumberland Local Plan.

Background

1.4 The Climate Change Act 2008 commits the UK to reducing its greenhouse gas emissions by 80% over 1990 levels by 2050. The development of renewable energy generation rather than using fossil fuels for energy generation is seen by Government as an important means of achieving this. This was reflected in the UK target for renewable energy generation of obtaining at least 15% of energy from renewable sources by 2020, which originates from the EU's Renewable Energy Directive (2009/08/EC). Wind, both onshore and offshore, was viewed by Government as the main renewable resource to achieve this target (see UK Renewable Energy Strategy 2009).

1.5 Northumberland has a wind resource that has been attractive to those wishing to construct and operate wind turbines. There are now a number of operational wind turbine developments in Northumberland, ranging from smaller single turbine schemes, typically under 25 metres in height, to larger developments with multiple turbines and heights in excess of 100 metres. Table 1.1 below summarises the wind

[1] A Written Ministerial Statement (WMS) relating to planning for wind turbine development was issued by the Secretary of State for Communities and Local Government on 18 June 2015

turbine development in Northumberland where the height of the turbines exceed 60 metres in height to the tip of the blade.

Table 1.1: Wind turbine development in Northumberland where the height of the turbine to the tip of the blade

Wind farm scheme	Number of turbines	Height of turbine (To blade tip)	Power per turbine
Barmoor	6	110 metres	2 MW
Bavington Mount	1	61 metres	0.5 MW
Bewick Drift	1	110 metres	2.3 MW
Blyth Harbour	1	130 metres	3.4 MW
Boundary Lane	3	110 metres	2 MW
Cramlington (MSD)	2	125 metres	2.5 MW
Green Rigg	18	100 metres	2 MW
Kiln Pit Hill	6	100 metres	2 MW
Kirkheaton	3	66 metres	0.6 MW
Low Horton Farm	1	71 metres	0.275 MW
Lynemouth	13	121.5 metres	2 MW
Middlemoor	18	125 metres	3 MW
North Steads	9	125 metres	2 MW
Ray	16	125 metres	3.4 MW
Sisters	4	125 metres	2 MW
Steps of Grace	1	74 metres	0.5 MW
Wandylaw	10	125 metres	2 MW
Wingates	6	110 metres	2.5 MW

1.6 There are also in excess of 80 wind turbines in Northumberland that are below 60 metres in height with the majority of these being below 25 metres in height. There are also additional ‘microgeneration’ wind turbines, both ground mounted and building mounted, that benefit from permitted development rights.

1.7 Northumberland has previously experienced significant development pressure in respect to wind turbine development but following the ending of subsidies the number of planning applications has fallen since 2015.

2. Policy context

2.1 This section of the report provides an overview of the policy context applicable planning for onshore wind turbine development. There is a positive approach to renewable energy in national policy, which largely reflects wider policies relating to climate change mitigation and reducing emissions of greenhouse gases from energy production.

National Planning Policy

2.2 National planning policy specifically relating to renewable and low carbon energy is set out in paragraphs 97 and 98 of the NPPF 2012. The NPPF states that local planning authorities should:

- Recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources;
- Have a positive strategy to promote energy from renewable and low carbon sources;
- Design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily, including cumulative landscape and visual impacts;
- Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure the development of such sources; and
- Support community-led initiatives for renewable and low carbon energy, including developments outside such areas being taken forward through neighbourhood planning.
- In addition, Paragraph 98 sets out that when determining planning applications, local authorities should:
- Not require applicants to demonstrate the overall need for renewable or low carbon energy and also recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- Approve the application if the impacts are (or can be made) acceptable.

2.3 A Written Ministerial Statement (WMS) relating to planning for wind turbine development was issued by the Secretary of State for Communities and Local Government on 18 June 2015. The WMS states that local planning authorities should only grant planning permission for proposals for wind energy development if the development site is in an area identified as suitable for wind energy development. It goes on to note that these areas need to be identified clearly in a Local or Neighbourhood Plan.

2.4 A draft revised NPPF, published for consultation in March 2018, incorporates the requirements of the above WMS.

Planning Practice Guidance

2.5 The Planning Practice Guidance (PPG) (2014) provides guidance to support the NPPF. It states that planning has an important role in the delivery of new renewable and low carbon energy infrastructure in locations where the local environmental impact is acceptable[2].

2.6 It reaffirms that, in the case of wind turbines, a planning application should not be approved unless the proposed development site is in an area identified as suitable for wind energy development and that suitable areas will need to have been allocated clearly in a Local Plan or Neighbourhood Plan[3].

2.7 In terms of technical considerations relating to the siting of wind turbines, the PPG[4] gives the following examples:

- Site size;
- Proximity of grid connection infrastructure;
- Predicted wind resource;
- Air safeguarding;
- Electromagnetic interference; and
- Access for large vehicles.

2.8 Support for criteria based policies is given in the PPG[5] where they are clear and expressed positively. In shaping the criteria in local plans the PPG outlines the following factors should be taken into account:

- the need for renewable or low carbon energy does not automatically override environmental protections;
- cumulative impacts, particularly in respect to landscape and local amenity;
- local topography;
- Heritage assets and their setting;
- proposals in National Parks and Areas of Outstanding Natural Beauty, and in areas close to them where there could be an adverse impact on the protected area, will need careful consideration;
- Local amenity and its importance when making planning decisions.

2.9 In terms of buffer zones/separation distances between renewable energy development and other land uses, the PPG[6] advises that otherwise acceptable

[2] Planning Practice Guidance. Planning for renewable and low carbon energy. Paragraph 001. Reference ID: 5-001-20140306, Revision Date: 06/03/2014.
[3] Planning Practice Guidance. Planning for renewable and low carbon energy. Paragraph 005. Reference ID: 5-005-20150618, Revision Date: 18/06/2015.
[4] Planning Practice Guidance. Planning for renewable and low carbon energy. Paragraph 006. Reference ID: 5-006-20140306, Revision Date: 06/03/2014.
[5] Planning Practice Guidance. Planning for renewable and low carbon energy. Paragraph 007. Reference ID: 5-007-20140306, Revision Date: 06/03/2014.

renewable energy developments should not be ruled out through inflexible rules on buffer zones or separation distances. Distance is part of the assessment but the local context such as the topography, the local environment and near-by land-uses are also important. Set-back distances for safety are the exception to this.

Northumberland Local Plan

2.10 Northumberland County Council is currently preparing a new Local Plan document for Northumberland. It will include the planning policies that will be used to guide and determine future planning applications in Northumberland, detail the scale and distribution of new development and include land allocations and designations.

2.11 The new local plan will replace existing planning policies for Northumberland that are contained in the adopted core strategies and 'saved' policies of the local plans of the former local planning authorities that made up Northumberland prior to local government reorganisation in 2009. The current planning policies do not identify suitable areas for wind turbine development. The Alnwick Core Strategy identifies areas of least constraint and the Castle Morpeth District Local Plan identifies areas of search.

2.12 This study will form part of the evidence base to inform the policy approach to wind turbine development in the Northumberland Local Plan. It will provide recommendations on whether it is appropriate to identify suitable areas for wind turbine development.

[6] Planning Practice Guidance. Planning for renewable and low carbon energy. Paragraph 008. Reference ID: 5-008-20140306, Revision Date: 06/03/2014.

3. Approach

3.1 This section of the report provides an overview of the study and the methodology used. It includes details of the broad scope of the study, the environmental considerations mapped and those considerations that are not within the scope of this study.

Broad scope of study

3.2 This takes the form of a desk-based study using a Geographical Information System (GIS) to map the location of a range of planning and environmental considerations that will influence the suitability of locations for wind turbine development in Northumberland.

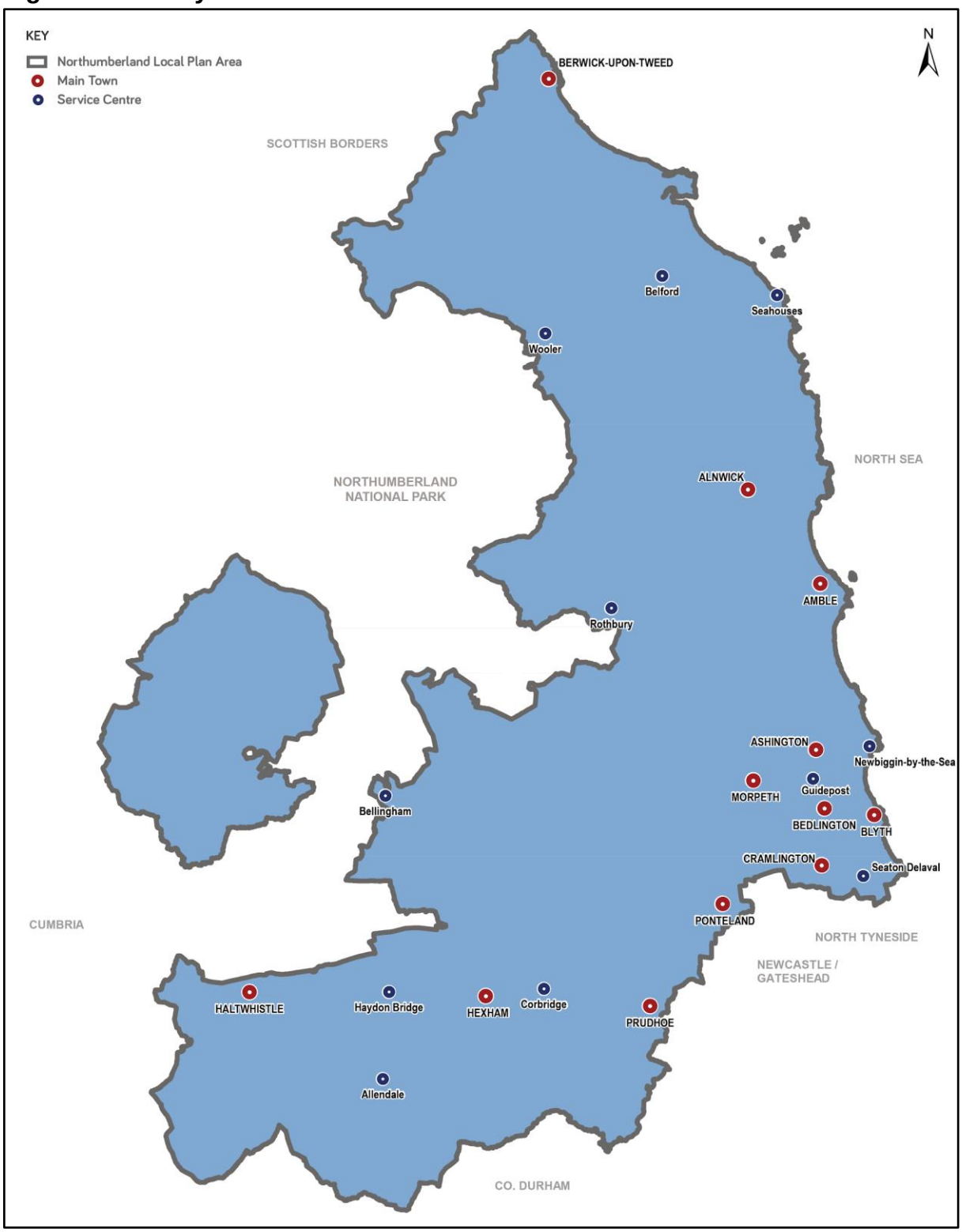
3.3 It is acknowledged that there are factors not covered in this study that will influence the suitability of locations for wind turbine development but these are considered to be matters that are best dealt with as part of more detailed site-specific investigations and/or factors that are not readily mapped at the scale of this study due to various limitations. Mapping data in GIS has its technical limitations but it can, nonetheless, give an understanding of the considerations that will influence the suitable of locations for wind turbine development.

3.4 The study outputs will show those areas that are unlikely to be suitable for wind turbine development and those areas that are potentially suitable for wind turbine development.

Geographical coverage of the study

3.5 The study covers the area of Northumberland outside the Northumberland National Park (see Figure 3.1). The area covered is consistent with the plan area for Northumberland Local Plan.

Figure 3.1: Study area



Wind turbine types to be covered by the study

3.6 Different sizes of wind turbines are likely to have different planning impacts. As such, it is considered important for this study to identify different scales of wind turbine in order to recognise these differences.

3.7 A review of previous planning applications for wind turbines in Northumberland has given some indication of the range of wind turbine heights most likely to come forward in Northumberland, notwithstanding future technological changes. Table 3.1 provides details of the wind turbine typologies that have been used in this study.

Table 3.1: Wind turbine typologies to be used in this study

Typology	**Height of turbine (to blade tip)**
Small	Less than 25 metres
Small-Medium	26 to 40 metres
Medium	41 to 65 metres
Medium-Large	66 to 100 metres
Large	101 to 135 metres

3.8 The typologies set out in Table 3.1 also reflect those used in a study looking at the sensitivity of landscapes in Northumberland to wind turbine development[7].

3.9 Smaller standalone wind turbines that do not exceed 11.1 metres in height and building mounted wind turbines that do not exceed an overall height of 15 metres do not generally require planning permission under permitted development rights contained within the Town and Country Planning (General Permitted Development) (England) Order 2015.

[7] The Planning and Environment Studio and BAYOU Bluenvironment (2018). *Assessment of the sensitivity of the landscapes in Northumberland to wind energy development.* Report for Northumberland County Council, January 2018. Available at: http://www.northumberland.gov.uk/Planning/Reports.aspx

Planning and environmental features and designations to be considered

3.10 The considerations mapped in this study are detailed in Table 3.2 and Appendix A. It is acknowledged that there are factors not covered in this study that will influence the suitability of locations for wind turbine development but these are considered to be matters that are best dealt with as part of more detailed site-specific investigations and/or factors that are not readily mapped at the scale of this study or in a GIS due to various limitations.

Table 3.2: Considerations mapped in this study

Consideration	Features mapped	Data source	Notes
Residential amenity	Noise Shadow flicker Visual amenity	Northumberland Local Land and Property Gazetteer (LLPG)	To protect residential amenity from noise, shadow flicker and visual impacts, appropriate distances should be maintained between wind turbines and sensitive premises. In this study a distance of six times the turbine height from a residential address has been mapped. This is considered to provide a reasonable proxy for when the effects of noise and visual dominance would prevent development.
Infrastructure	Railways Roads: ● A roads ● B roads ● C roads Public Rights of Way	Northumberland County Council	This is mapped as a safety consideration. A buffer of the turbine height plus 10% is applied reflecting Highways England advice. It has been applied to all turbine typologies used in the study with the buffer adjusted to reflect turbine height.
	Overhead electricity transmission lines: ● 400 kV ● 275 kV	National Grid	This is mapped as a safety consideration. A buffer of the turbine height plus 10% is applied. It has been applied to all turbine typologies used in the study with the buffer adjusted to reflect turbine height.

Consideration	Features mapped	Data source	Notes
Biodiversity	International designations: ● Special Areas of Conservation (SACs) ● Special Protection Areas (SPAs) ● Ramsar sites National designations: ● Sites of Special Scientific Interest (SSSIs) ● National Nature Reserves (NNRs) Other designations: ● Local wildlife site ● Ancient woodland	Natural England	The study maps the designated areas for each of these. These considerations are mapped as constraints to wind turbine development in this study as in most cases the presence of these designations would prevent development. There could be circumstances where development outside of the designated area could have adverse effects on the designation. The presence of protected species would be a matter for detailed assessment at the planning application stage. Comprehensive data is not available to map these.

Consideration	Features mapped	Data source	Notes
Historic environment	• World heritage site • Historic Parks and Gardens • Scheduled Monuments • Registered Battlefields • Conservation areas	Historic England	This study maps the designated areas for each of these features. These considerations are mapped as constraints to wind turbine development in this study as in most cases the presence of these designations would prevent development. There could be circumstances where development outside of the designated area could harm the significance of the designated heritage asset. The effects on the setting of the heritage assets are considered to be a matter for detailed assessment at the planning application stage and therefore mapped here. The exception is the World Heritage Site associated with Hadrian's Wall where the buffer zone is also mapped. World Heritage Site lies within the study area. Listed buildings are not mapped. It is considered that the effect of a proposal on a setting of a listed building is a matter for detailed assessment at the planning application stage.
Landscape	Landscape Character Areas with a moderate-high or high landscape sensitivity to wind turbine development.	Northumberland County Council	The study maps the landscape character areas that were assessed as having a moderate-high or high sensitivity to wind turbine development in the study to assess the sensitivity of the landscape in Northumberland to wind turbine development[8].

[8] The Planning and Environment Studio and BAYOU Bluenvironment (2018). *Assessment of the sensitivity of the landscapes in Northumberland to wind energy development.* Report for Northumberland County Council, January 2018. Available at: http://www.northumberland.gov.uk/Planning/Reports.aspx

Consideration	Features mapped	Data source	Notes
Natural features and land use	Bodies of water	Ordnance Survey mapping	The study maps the extent of water bodies based on the mapped feature.
	Green Belt	Northumberland County Council	Wind turbine development could have a harmful effect on Green Belt. The study maps Green Belt as a constraint for >25m in height. Effects on Green Belt will depend to a large extent on the scale of the turbine proposed. Green Belt would still be a matter for assessment at the planning application stage for turbines under 25m.
Wind speed	Areas with a wind speed of 5.0 metres per second above ground level.	NOABL	This factor is not a technical limit to wind turbine development but could affect how viable or commercially attractive a proposal is. A DECC methodology[9] for quantifying opportunities and constraints for renewable energy development recommends using a wind speed of 5.0 metres per second at 45 metres above ground level. For smaller wind turbines that are linked to individual properties and businesses, wind speed is likely to be less critical in terms of viability. Therefore a speed of 5.0 metres per second at 45 metres above ground level have been made for medium sized turbines and above.

[9] Department of Energy Climate Climate (DECC) and Department for Communities and Local Government (DCLG) (2010). Renewable and low carbon energy capacity methodology: Methodology for the English Regions. SQW Energy and Land Use Consultants.

4. Analysis

4.1 This section of the document shows the extent of the considerations mapped in this study for each of the wind turbine typologies used in this study.

Extent of the planning and environmental considerations mapped in this study

Residential amenity

4.2 The most populous areas are the south east of County, where the larger settlements include Ashington, Bedlington, Blyth, Cramlington, Morpeth and Seaton Delaval amongst others. Across the north and west of the County the most populous areas include the settlements of Alnwick, Berwick- upon-Tweed, Hexham, Ponteland and Prudhoe as well as a number of other smaller settlements. While many areas of Northumberland are rural in nature and have a lower population density, there are still many small hamlets and isolated properties where the development of wind turbines could have an unacceptable adverse effect in respect to amenity from noise, shadow flicker and visual intrusion, for example.

Infrastructure

4.3 The principal road transport links include the A1, A19 and A69. The principal railways include the East Coast Mainline Railway, which runs north-south in the east of the County and the Newcastle-Carlisle railway which runs through the Tyne Valley via Prudhoe, Hexham and Haltwhistle. The considerations mapped in this study are other A, B and C class roads, Public Rights of Way and major overhead electricity lines.

Biodiversity

4.4 Northumberland contains a number of designated areas relating to biodiversity, wildlife and nature conservation. This includes Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, Sites of Special Scientific Interest (SSSIs), Ancient Woodland and local wildlife and geological sites. Some of the most noteworthy designations include the international designations along the Northumberland coast, in the North Pennines area and the Border Uplands.

Historic environment

4.5 Northumberland contains a large number of designations relating to the historic environment. This includes the scheduled monuments that form part of World Heritage Site associated with Hadrian’s Wall, 18 Registered Park and Gardens, Registered Battlefields, nearly 1,000 Scheduled Monuments and 69 Conservation Areas.

Landscape

4.6 Figure 4.1a to Figure 4.1e show the sensitivity of each of the landscape character areas in Northumberland to wind turbine development. These illustrate that the level of sensitivity of the landscape character areas to wind turbine development increase as the size of the wind turbines increase with more landscape character areas being assessed as having a high sensitivity to wind turbine development as the height of the turbines increase.

4.7 There are number of landscape designations in Northumberland, including two Areas of Outstanding Natural Beauty (AONB) (Northumberland Coast AONB and North Pennines AONB), Areas of High Landscape Value (AHLV) and Heritage Coast. Wind turbine development of some scales and at some locations (both inside and outside of these designated areas) could have significant effects on their special qualities and purposes of designation. These designated areas are not included on the maps as the landscape sensitivity work has considered the qualities and sensitivities that underpin the designations.

Northumberland National Park is also not included in this study as it is not within the area covered by the Northumberland Local Plan. Notwithstanding this it is recognised that wind turbine development can have impacts on the special qualities of the Northumberland National Park even if it is located outside of this area and, as with the AONB designations, the landscape sensitivity work has considered the qualities and sensitivities that underpin the designations.

Technical considerations

4.8 The wind speeds at a 45 metre level in Northumberland have been mapped. The wind resource in Northumberland is such that there are large parts of the plan area that have speeds of five metres per second and above.

Figure 4.1a: Map showing the landscape sensitivity of the landscape character areas in Northumberland to small wind turbines (<25 metres in height to the tip of the blade)

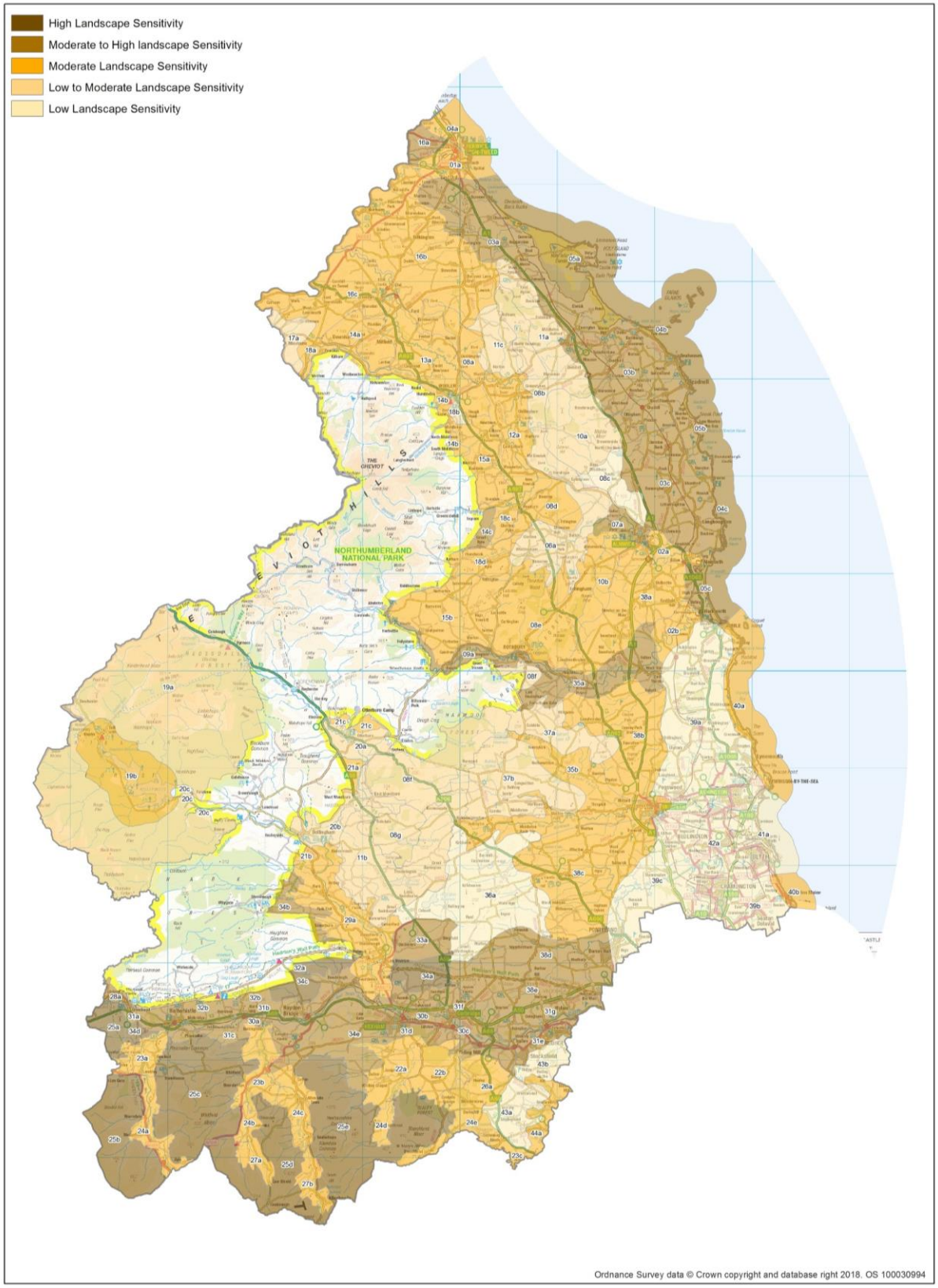


Figure 4.1b: Map showing the landscape sensitivity of the landscape character areas in Northumberland to small to medium wind turbines (25 to 40 metres in height to the tip of the blade)

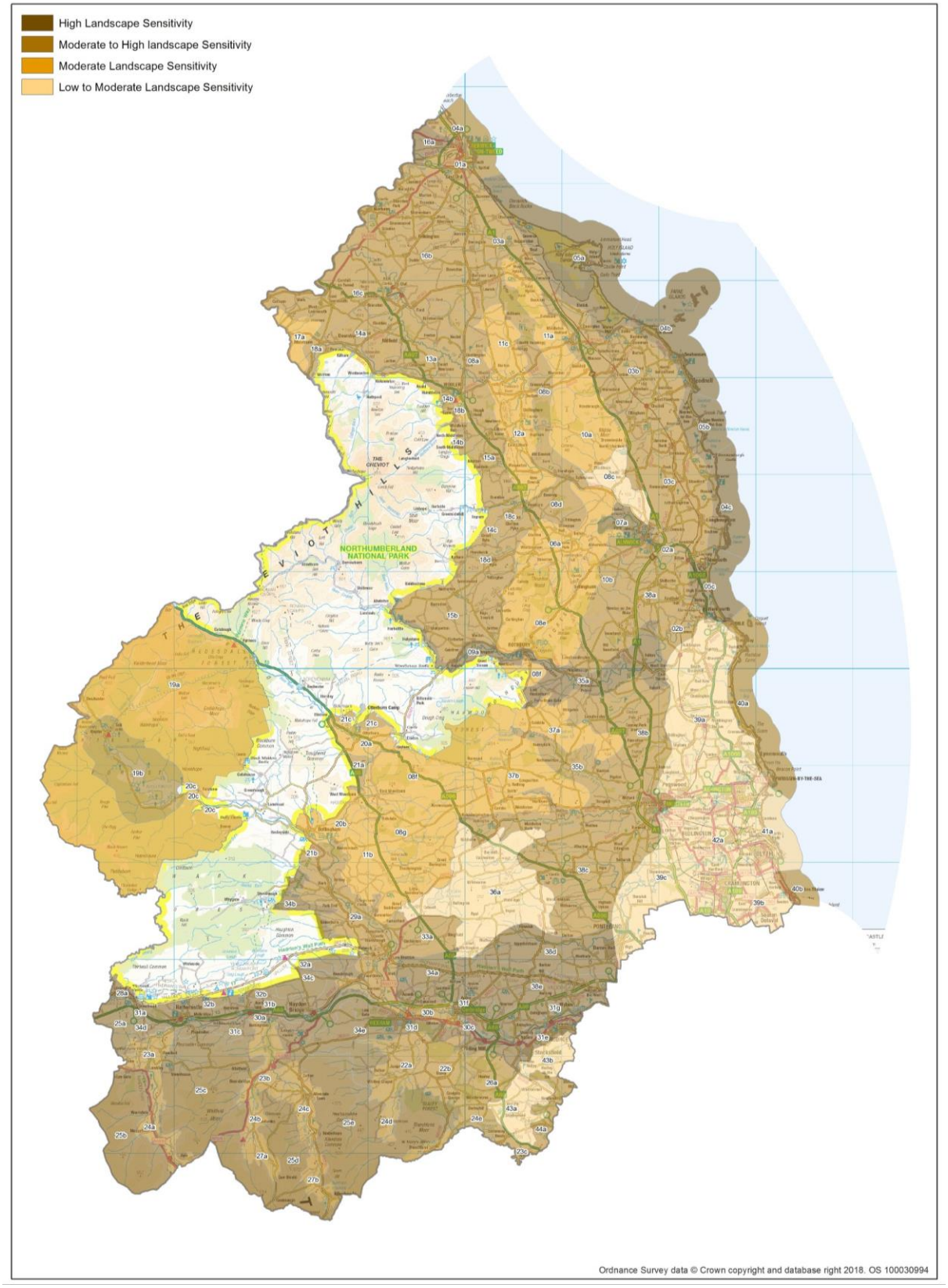


Figure 4.1c: Map showing the landscape sensitivity of the landscape character areas in Northumberland to medium wind turbines (40 to 65 metres in height to the tip of the blade)

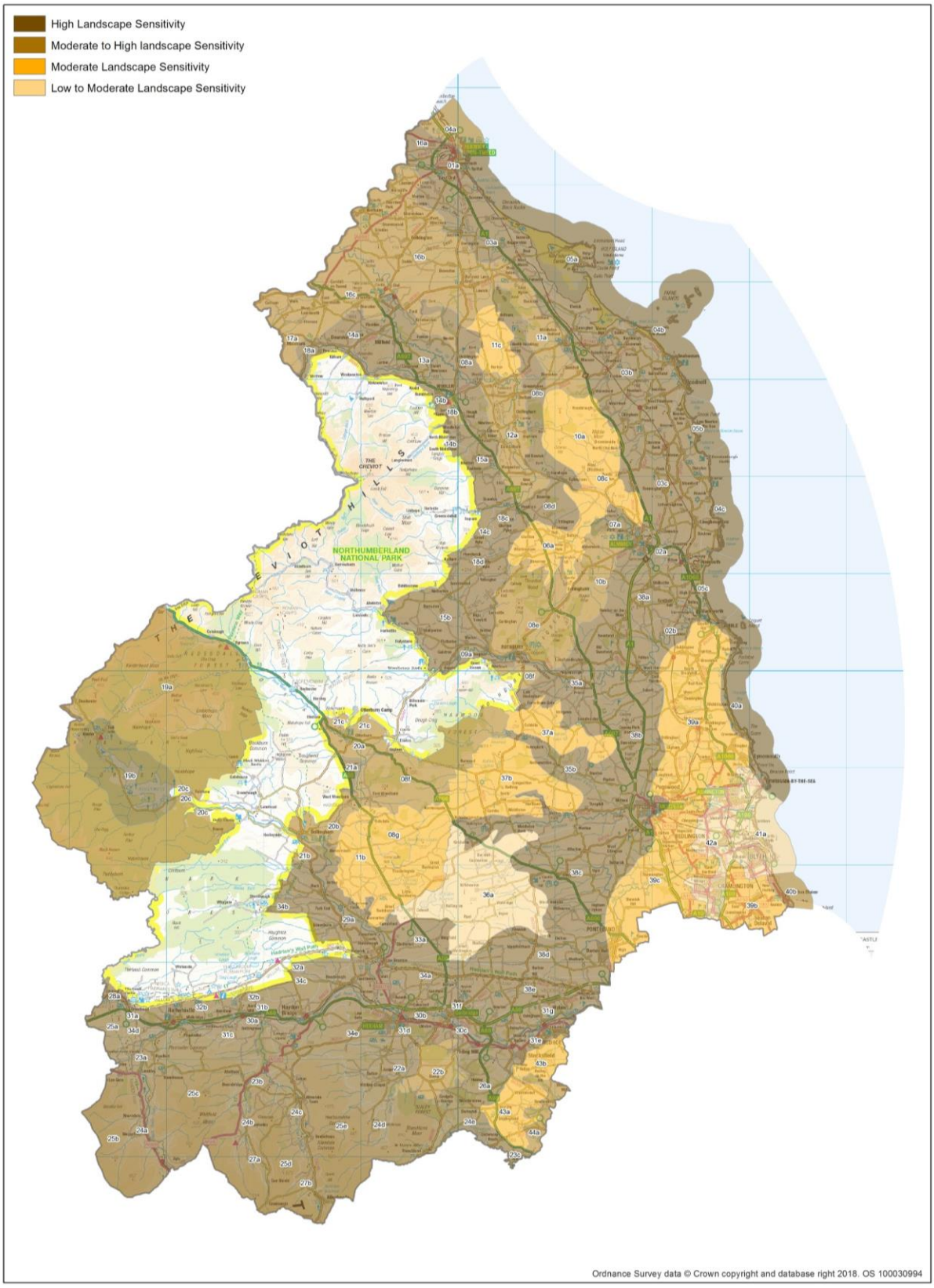


Figure 4.1d: Map showing the landscape sensitivity of the landscape character areas in Northumberland to medium wind turbines (66 to 100 metres in height to the tip of the blade)

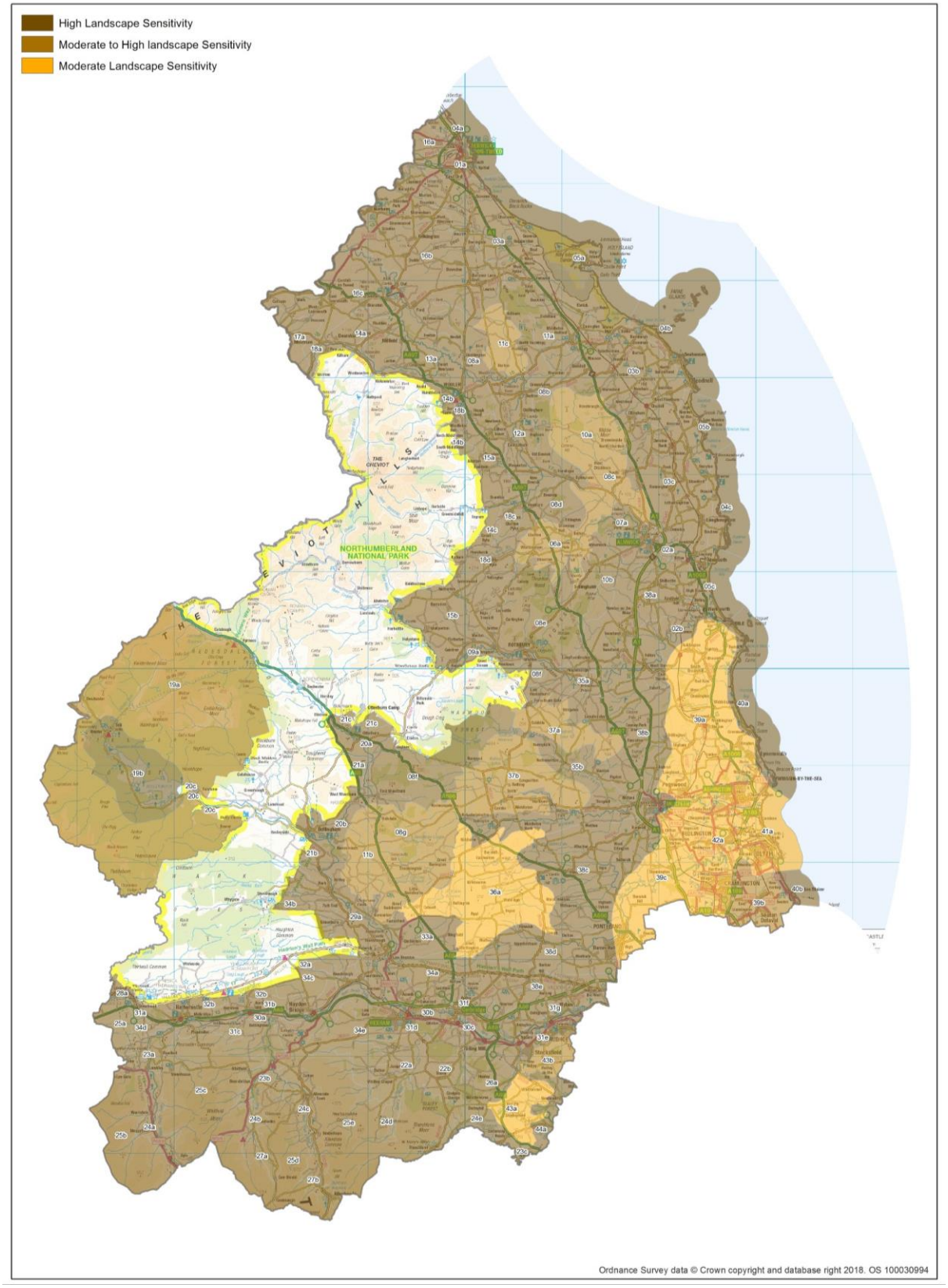
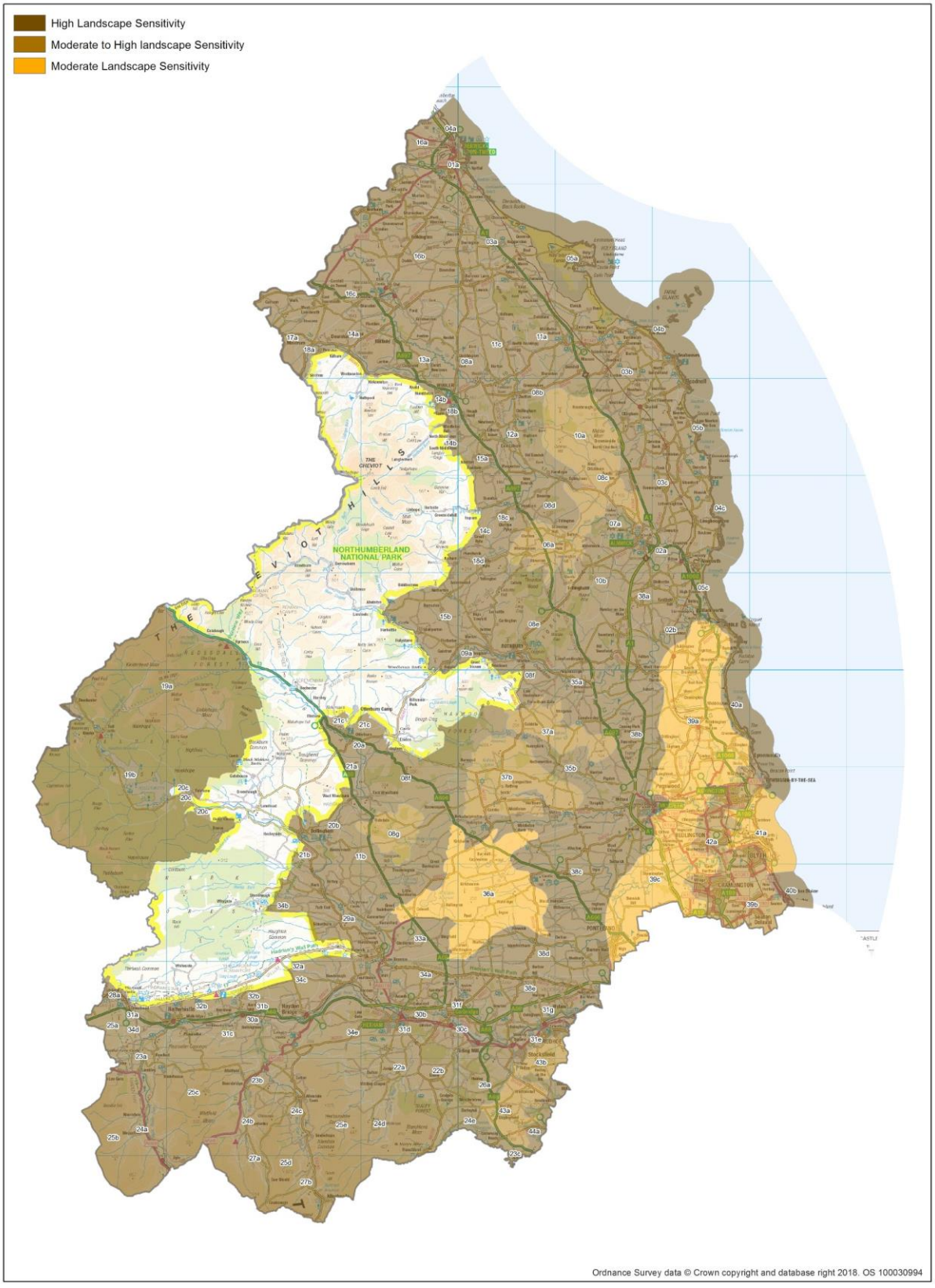


Figure 4.1e: Map showing the landscape sensitivity of the landscape character areas in Northumberland to medium wind turbines (100 to 135 metres in height to the tip of the blade)



Combined considerations for each wind turbine typology

4.9 The combined considerations for each of the turbine typologies used in this study have been mapped and the results are shown in Figures 4.2 to 4.6.

4.10 Analysis is also provided on whether the mapping indicates whether there are areas identified as being suitable or unsuitable for wind turbine development for each turbine typology.

4.11 The shaded areas on these maps are the areas that have planning and environmental considerations that mean in principle they would not be suitable for wind turbine. The areas shown in white within the plan area are those areas where no planning and environmental considerations have been mapped and could be suitable for wind turbine development.

Small (under 25 metres) and small to medium (25 to 40 metres) wind turbines

4.12 Figures 4.2 and 4.3 show the areas that could be suitable for these scales of wind turbine in Northumberland. For the small wind turbines in particular, Figure 4.2 shows that there are large areas across Northumberland where no applicable planning and environmental considerations have been mapped and could therefore be suitable for wind turbine development of this scale. There are also large areas for the small to medium turbines (Figure 4.3) but these are less extensive than those for the small turbines.

4.13 Some of the more extensive areas of Northumberland that have been mapped in this study as having planning and environmental considerations that mean they would be unsuitable for the development of small wind turbines include areas along the North Northumberland coast, Coquetdale, North Pennines and Tyne. For small to medium wind turbines, the areas mapped as have planning and environmental considerations that make them unsuitable for development are more extensive and cover wider areas in the north of the county, the fringes of the Cheviot Hills and the wider area around the North Pennines AONB and the Tyne Gap. For the small turbines there are also more extensive areas in the south of the County as Green Belt is not mapped for this scale of wind turbine.

Medium (41 to 65 metres), medium to large (65 to 100 metres) and large (101 to 135 metres) wind turbines

4.14 Figure 4.4, 4.5 and 4.6 show there are extensive areas of Northumberland that would not be suitable for wind turbine development of these scales, particularly medium to large turbines and large wind turbines. There are some small areas on the coastal plain and around Kirkheaton where there is existing wind turbine

development. The areas become smaller and more fragmented for the large wind turbine typology.

Figure 4.2: Combined considerations for small turbines (up to 25 metres)

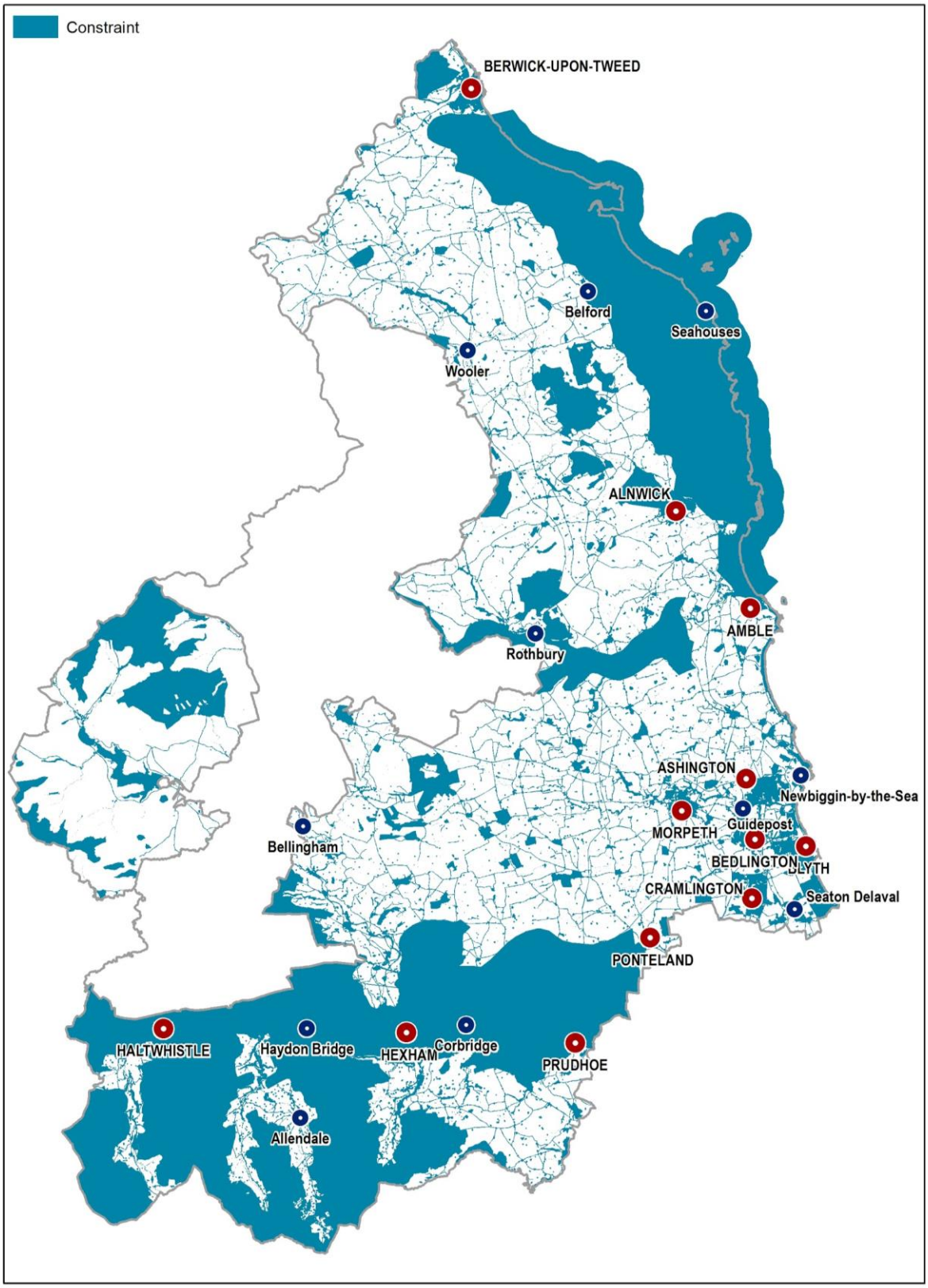


Figure 4.3: Combined considerations for small to medium turbines (26 to 40 metres)

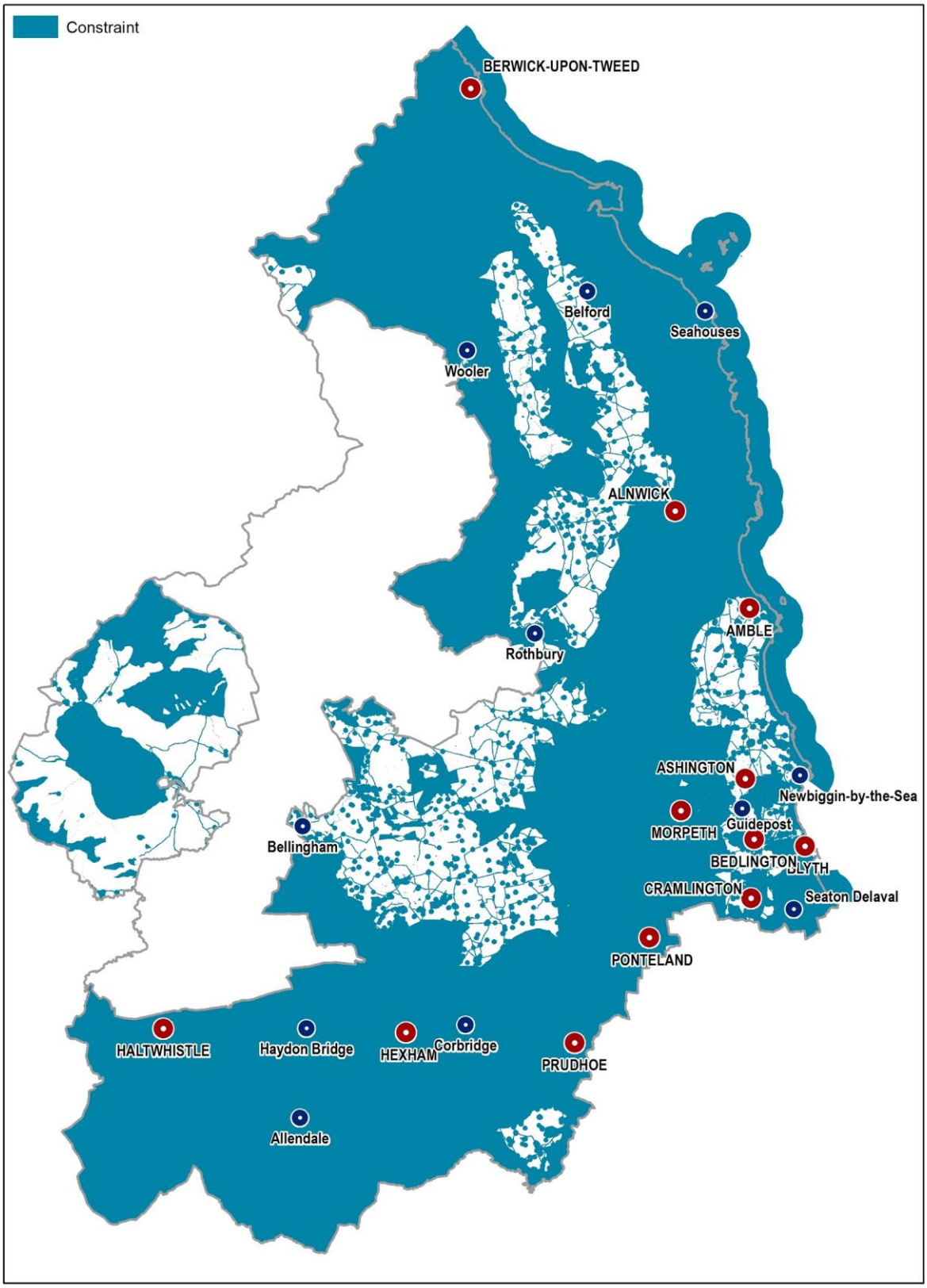


Figure 4.4: Combined considerations for medium turbines (41 to 65 metres)

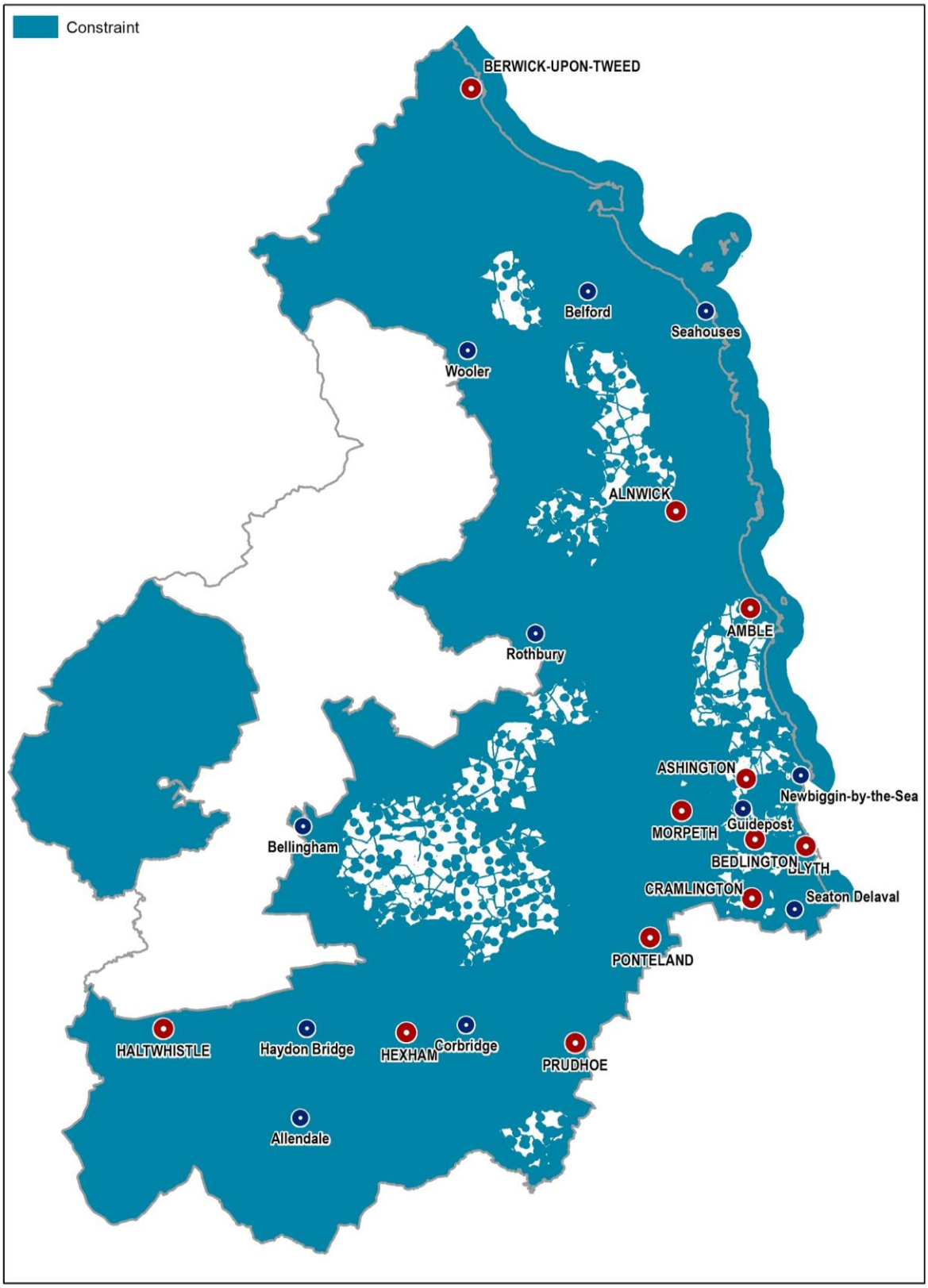


Figure 4.5: Combined considerations for medium to large turbines (66 to 100 metres)

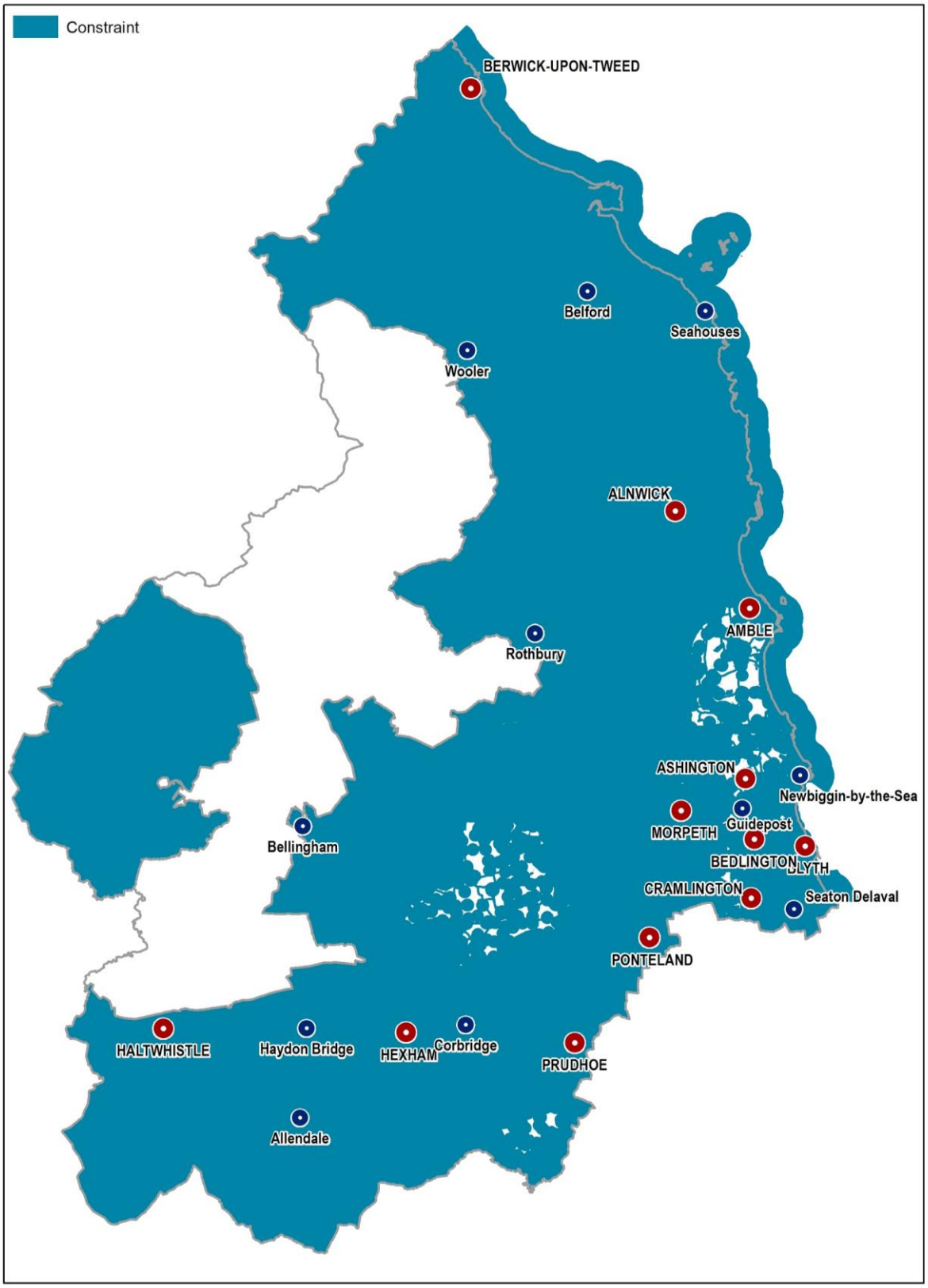
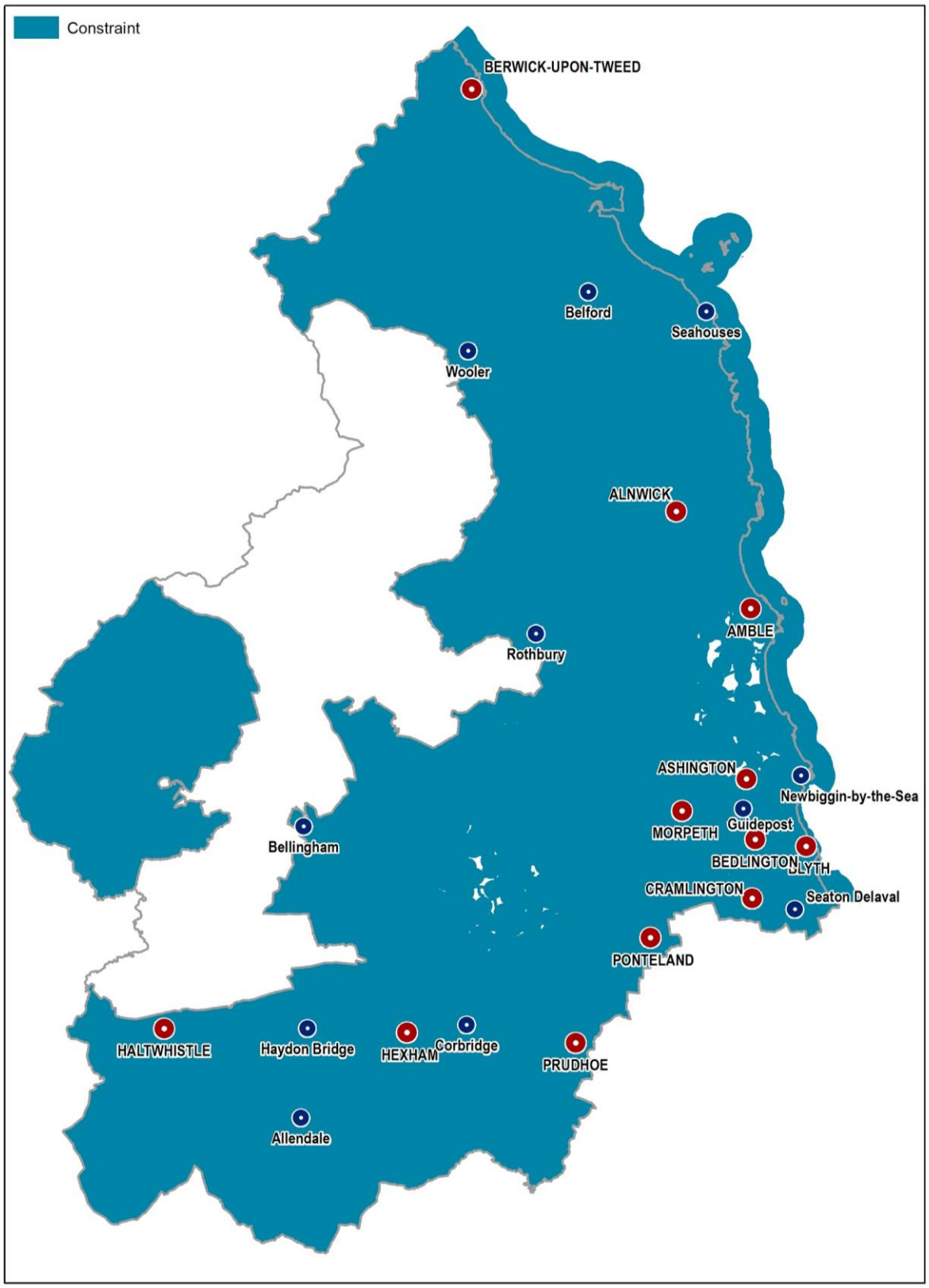


Figure 4.6: Combined considerations for large turbines (101 to 135 metres)



5. Study findings and recommendations

5.1 This study mapped a number of planning and environmental considerations in Northumberland. The intention of this was to provide an indication of the areas where there are planning and environmental considerations that are likely to mean they are unsuitable for wind turbine development.

5.2 The aim was to give some understanding of those locations that could be suitable for wind turbine development and to assist in the development of the policy approach to wind turbine development in the Northumberland Local Plan.

Recommendations for small wind turbines (under 25 metres) and small to medium wind turbines (26 to 40 metres)

5.3 Based on the methodology of this study, there are large areas across Northumberland that could be suitable for wind turbine development for these scales of wind turbine development (turbines with a height to the blade of under 25 metres and 26 to 40 metres). It is, therefore, recommended that suitable areas for wind turbines of this scale could be identified in the Local Plan.

5.4 These areas would not provide a definitive assessment on the suitability of a particular location for wind turbine development where they fall within a suitable area and any proposals for wind turbine development in these areas would require more detailed assessment to inform and assess the acceptability of a proposal. This would include a range of issues, including those matters that this study has indicated would be best considered as part of a more detailed site appraisal and a more detailed consideration of some of matters included in this. It is, therefore, also recommended that the identification of suitable areas is accompanied by policy criteria to assess the merits of the proposal are considered at the site level.

Recommendations for medium wind turbines (41 to 65 metres), medium to large wind turbines (65 to 100 metres) and large wind turbines (101 to 135 metres)

5.5 These scales of wind turbines tend to be commercial in nature with a more significant power output aimed at generating energy to meet wider needs, rather than just the needs of individual households or businesses as is the case with the smaller scale wind turbines.

5.6 Based on the methodology used in this study, there are planning and environmental considerations and designations that rule out large areas of Northumberland for wind turbine development of these scales. It is, therefore,

recommended that suitable areas for wind turbines of this scale cannot be identified in the Local Plan using this approach.

5.6 Recognising that there are existing wind turbine developments of this scale in Northumberland, it is recommended that consideration is given to identifying the sites of the existing permitted developments as suitable for wind turbine development in principle. While there are existing developments in these locations, proposals could come forward during the plan period to upgrade or repower the existing wind turbines. The acceptability of such proposals would be considered against the policy criteria, which would include a range of issues, including those matters that this study has indicated would be best considered as part of a more detailed site appraisal.

Next steps

5.8 The recommendations from this study will be used to inform the approach to planning for wind turbine development in the Northumberland Local Plan. The wording of the policy relating to onshore wind turbine development would need to consider both the policy tests set out in the written ministerial statement and policy criteria to assess the detail of the proposals at the site level. The suitable areas for the different scales of wind turbine development also need be shown on the Policies Map.

5.9 The policy approach to onshore wind turbine development and the suitable areas will be subject to consultation through the Local Plan preparation process, which will provide an opportunity for interested parties to provide comments. This may lead to some refinement in the approach to this issue, the areas identified and the wording of policy.

Appendix A: Mapped constraints

Table A.1: Considerations mapped in this study by theme and wind turbine typology

Constraint	**Mapped feature**	**Mapped feature for each turbine typology**				
		Small turbines (<25 metres)	**Small to medium turbines (26 to 40 metres)**	**Medium turbines (41 to 65 metres)**	**Medium to large turbines (66 to 100 metres)**	**Large turbines (100 to 135 metres)**
Theme: Residential amenity						
Residential dwelling	6 times the turbine height from a residential address		240m	390m	600m	810m
Theme: Infrastructure						
Railways	Turbine height plus 10% from feature	27.5m	44m	71.5m	110m	148.5m
Roads: - A roads - B roads - C roads						
Public Rights of Way						
Higher voltage overhead power lines: - 400 kV - 275 kV						
Theme: Nature conservation						
International designations: - Special Protection Areas - Special Area for Conservation - Ramsar sites	Designated area					

Constraint	Mapped feature	Mapped feature for each turbine typology				
		Small turbines (<25 metres)	**Small to medium turbines (26 to 40 metres)**	**Medium turbines (41 to 65 metres)**	**Medium to large turbines (66 to 100 metres)**	**Large turbines (100 to 135 metres)**
National designations: - Sites of Special Scientific Interest - National Nature Reserves	Designated area					
Other designations: - Local Wildlife and Geological Site - Ancient woodland	Designated area					
Theme: Landscape						
Landscape sensitivity to wind turbine developments	Landscape Character Areas with a 'moderate to high sensitivity' or a 'high sensitivity' to wind turbine development.					
Theme: Historic environment						
Hadrian's Wall World Heritage Site	Designated area					
Conservation Area	Designated area					
Scheduled Monument	Designated area					
Registered parks and gardens	Designated area					
Registered battlefields	Designated area					
Theme: Natural features and land use						
Water bodies	Feature					
Green Belt	Designated area	Not mapped	Feature	Feature	Feature	Feature

Constraint	Mapped feature	Mapped feature for each turbine typology				
		Small turbines (<25 metres)	**Small to medium turbines (26 to 40 metres)**	**Medium turbines (41 to 65 metres)**	**Medium to large turbines (66 to 100 metres)**	**Large turbines (100 to 135 metres)**
Theme: Technical						
Wind speed	Wind speed 5m/s at 45 metres above ground level	Not mapped for these typologies	Not mapped for these typologies	Wind speed 5m/s at 45 metres above ground level	Wind speed 5m/s at 45 metres above ground level	Wind speed 5m/s at 45 metres above ground level