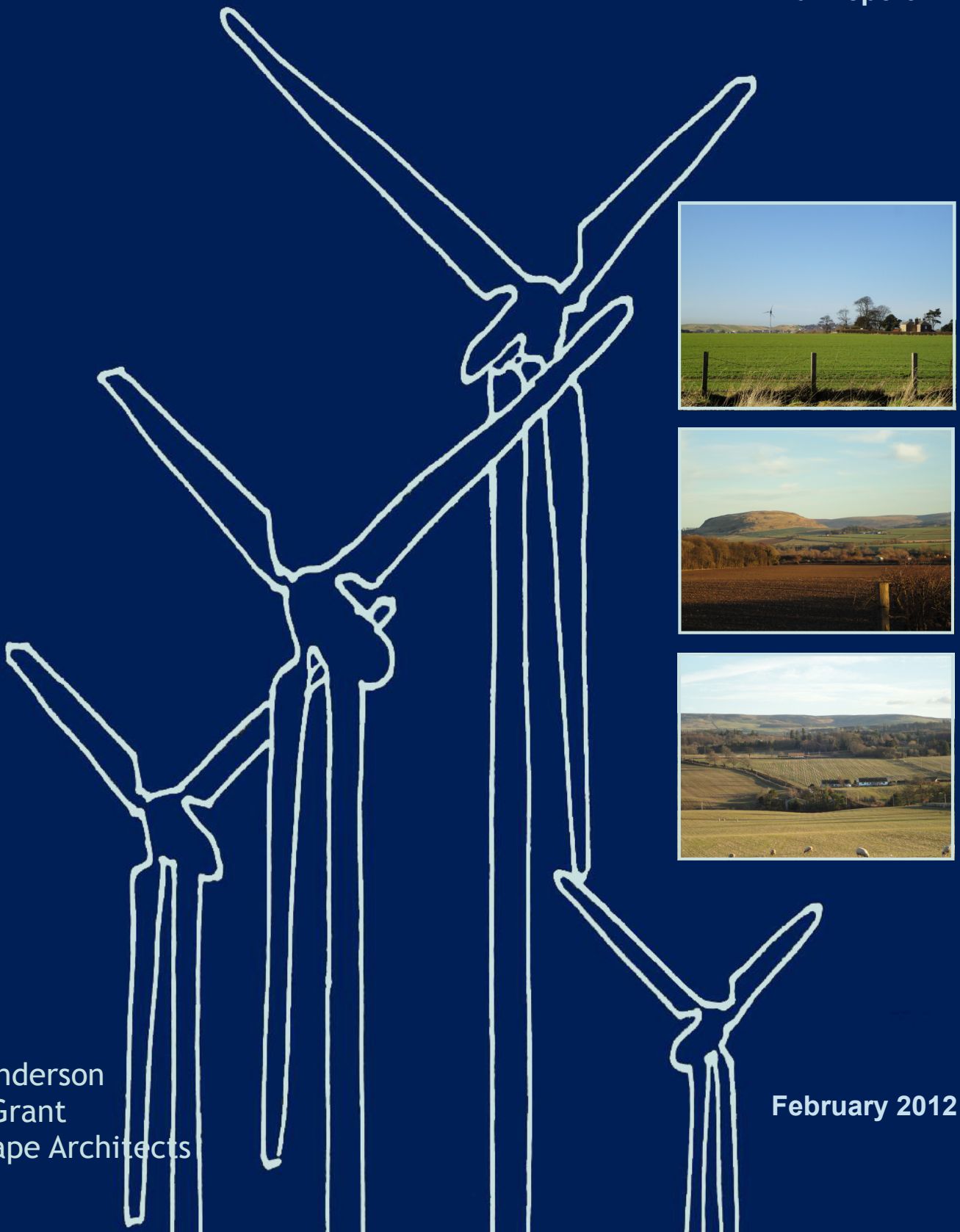
East Lothian Supplementary Landscape Capacity Study for Smaller Wind Turbines

A Report to East Lothian Council
Final Report



Carol Anderson
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Landscape Architects

February 2012

East Lothian Supplementary Landscape Capacity Study for Smaller Wind Turbines : Final Report

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1. Background

Introduction…… 4

The Study Brief…….. 4

2. General approach to the study

Introduction..... 5

Policy and guidance for wind energy development..... 5

Changes to the landscape and visual baseline…… 6

Review of landscape character in relation to smaller turbines..... 7

Development typologies……..... 8

The sensitivity assessment…….. .10

Guidance on the siting of smaller turbines……10

3. Landscape and visual sensitivity assessment

Introduction…… 12

Eastern Coastal Margin..... 14

Northern Coastal Margin..... 17

Musselburgh/Prestonpans Fringe.....19

The Agricultural Plain..... 21

Agricultural Plain : Sub area 1 – East…….. 22

Agricultural Plain : Sub area 2 – North ……. 24

Agricultural Plain : Sub area 3 – South …… 26

Garleton Hills..... 28

Mayfield/Tranent Ridge..... 30

Humbie/Gifford/Whittingehame Valleys..... 32

Eastern Lammermuir Fringe..... 34

North Lammermuir Platform.....37

East Lammermuir Plateau.....39

Plateau Grassland.....41

4. Guidance on the siting of smaller turbines

Introduction..... 43

Small turbines..... 43

Small-medium sized turbines..... 49

Other issues associated with smaller turbines..... 53

5. Summary and conclusions

Introduction..... 54

Summary of landscape and visual sensitivity……. 54

Conclusions..... 54

6. List of Figures

Fig.No 1 Landscape Character areas Used in Study .. after page 8

Fig.No 2 Eastern Coastal Margin .....after page 16

Fig.No 3 Northern Coastal Margin …… after page 17

Fig.No 4 Musselburgh/Prestonpans Fringe …… after page 20

Fig.No 5 Agricultural Plain Sub area 1-East ……. after page 22

Fig.No 6 Agricultural Plain Sub area 2- North……. after page 24

Fig.No 7 Agricultural Plain Sub area 3- South …… after page 26

Fig.No 8 Garleton Hills ……. after page 29

Fig.No 9 Mayfield/ Tranent Ridge ……. after page 31

Fig.No 10 Humbie, Gifford and Whittingehame River Valleys …….. after page 32

Fig.No 11 Eastern Lammermuir Fringe ……. after page 36

Fig.No 12 North Lammermuir Platform ……. after page 38

Fig.No 13 East Lammermuir Plateau ……. after page 40

Fig.No 14 Plateau Grasslands ……. after page 42

Annex A: Guidance on small turbine designs…….. 56

References : …….. 64

1. Background

Introduction

1.1 A landscape capacity study for wind energy development was undertaken for East Lothian in 2005. This study focussed on larger turbines, usually associated with commercial wind farm developments, which were more prevalent at this time. Since the completion of this original study, interest in smaller scale and single turbines has significantly increased with the introduction of the 'Feed in' tariff[1] and this supplementary study has therefore been commissioned by East Lothian Council to address landscape and visual sensitivity to these smaller development typologies.

1.2 The original 2005 capacity study was prepared on behalf of the Council by Carol Anderson and Alison Grant, Landscape architects. The same consultants have also been commissioned to undertake this supplementary study.

The study brief

1.3 The aim of the study is to determine the capacity of the East Lothian lowland landscapes and the Lammermuir fringe to accommodate smaller turbines than those considered in the 2005 capacity study. This work will complement the 2005 study and would provide guidance to Council Officers and developers. It is intended that the key findings and recommendations in the supplementary study would be incorporated into the Council's Planning Policy and Design Guidance.

1.4 The brief states that the supplementary study should be based on the landscape character areas used for the landscape and visual sensitivity assessment in the 2005 study and that it should indicate where different development typologies could be accommodated without having a detrimental effect on landscape character and key views, but also where turbines would not be appropriate in landscape and visual terms. The brief also requires recommendations to be made on wind turbine design and on the visual compatibility of different turbine designs and sizes.

[1] The 'Feed in Tariff' offers a payment per kW produced by specified renewable technologies. The payments vary according to the technology and the amount of electricity generated. Developers who build renewable technologies which generate between 50kW and 5MW of electricity can choose between support through the Renewables Obligation or taking advantage of payments through the Feed in Tariffs.

2. General approach to the study

Introduction

2.1 A similar assessment methodology has been adopted for the supplementary sensitivity assessment to that undertaken for the original 2005 study. A detailed methodological statement is included in the original study and is therefore not repeated here. The study has involved the following key stages and these are briefly described in the following text:

- Review of key changes to policy and guidance since 2005
- Review of key changes to the landscape and visual baseline since 2005
- Review of Landscape character in relation to smaller turbines
- Definition of development typologies
- Landscape and visual sensitivity assessment
- Guidance on siting and design of smaller and single turbines

Policy and guidance for wind energy development

2.2 Since the original capacity study was undertaken in 2005, a number of changes have occurred to policy and guidance relevant to wind energy development. Recent policy and guidance of relevance to this supplementary study is outlined below.

2.3 Scottish Planning Policy (SPP) was issued in 2009. SPP states that developments plans should provide a clear indication of the potential for development of wind farms of all scales. Specific Advice Sheets on onshore wind turbines and the process for preparing spatial frameworks for windfarms have now replaced PAN 45 Renewable Energy Technologies and Annex 2 Spatial Frameworks and Supplementary Planning Guidance for Windfarms. These Advice Sheets will be regularly updated.[2]

2.4 New guidance has been issued by SNH on *Siting and designing wind farms in the landscape, SNH 2008.* This document provides some limited guidance on small/community windfarms. Further guidance will be forthcoming from SNH on smaller turbines with a consultative draft recently issued titled '*Siting and designing single and groups of small turbines in the landscape (2011).*

2.5 East Lothian Council have produced draft Planning Guidance for the Location and Design of Wind Turbines in the Lowland Areas of East Lothian (December 2010) in response to public debate on the potential of such developments on the East Lothian landscape and the suitability of sites which are being proposed. It is aimed at applicants and their agents considering wind turbine proposals and is based primarily on the approved planning policies in the Edinburgh and Lothian Structure Plan 2015, the East Lothian Council Local Plan 2008 and guidance from national agencies. Landscape and visual issues form only a part of this document.

[2] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables

Changes to the landscape and visual baseline

2.6 A number of changes have occurred to the landscape and visual baseline of East Lothian as new development has been constructed. While most of this change is associated with recently constructed wind farm development within the uplands, housing, retail and industrial development has also taken place in parts of East Lothian and has affected landscape character. Significant changes in the landscape and visual baseline are noted in the sensitivity assessment that follows for individual landscape character areas in section 3 of this report.

Existing/consented windfarm developments

2.7 The following existing and consented windfarm developments are assumed to form the baseline for this supplementary study:

Windfarm	***Turbines***	***Height to blade tip***
Crystal Rig + extensions	85	100m/125m
Dun Law + extension	61	62.5m/75m
Fallago Rig	45	125m
Aikengall	16	125m
Pogbie	6	76m

A number of other smaller turbines have also been erected since the original study and these are noted in the sensitivity assessment where relevant. Operational smaller turbines have been noted in the individual sensitivity assessments for each landscape character area.

Potential windfarm developments

2.8 An application for the Aikengall II - Wester Dod windfarm was submitted in July 2009. This proposal comprises 30 turbines of 145m height to blade tip. It is currently the subject of a Public Inquiry. The potential cumulative effects of this development have also been considered in the sensitivity assessment.

2.9 Three potential offshore windfarm sites lie within the Firth of Forth, these comprising 'exclusivity awards' as part of the Round 3 lease sites put forward by the Crown Estate. The closest of these sites to East Lothian are the Neart Na Gaoithe and Forth Array proposals which lie approximately 18-20km offshore.

2.10 In terms of smaller turbine developments, there is an increased interest from farmers, community groups and other landowners for smaller turbines, initiated by the recent 'Feed in Tariff'. Approximately 16 consents for smaller single and small groups of up to 3 turbines have been granted in East Lothian since 2009. The majority of these approvals comprise turbines between 20m and 25m height to blade tip but with a few single turbines of up to 47m height to blade tip.

2.11 Current applications are for turbines which vary considerably in height. The majority are generally between 20m and 40m to blade tip in height, with a lesser number of

proposals for turbines between 47m and 100m to blade tip. Turbine applications are most commonly for single turbines and groups of turbines to a maximum of four[3]. Most applications are for sites within the lowland agricultural areas and the Lammermuir hill fringes.

Other development

2.12 Residential and retail development at Dunbar has incurred the most notable change to landscape character since 2005 and this is referred to in the more detailed sensitivity assessments for that area.

Review of landscape character in relation to smaller turbines

2.13 The assessment undertaken for the original study was largely based on the landscape characterisation set out in the *Lothians Landscape Character Assessment, 1998* published by SNH, but with some reclassification and amendment to landscape character areas to better reflect key sensitivities to windfarm development. We have undertaken further review of landscape character types and also considered more specific sensitivities to the siting and design of smaller turbines for this supplementary study. Following this review, we have identified three sub-areas within the 'Agricultural Plain' landscape character area. These reflect subtle differences in character as described below:

- Area 1 Eastern Agricultural Plain: A more rolling landform with pronounced ridges and occasional landmark features including Traprain and North Berwick Laws. This landscape is relatively well-wooded which increases containment and reduces scale. There is little large scale built development in this area and buildings/settlements often have a strong architectural integrity.
- Area 2 Northern Agricultural Plain: An open, very gently undulating to flat landscape with a relatively expansive scale. There is little woodland and some isolated industrial development and infrastructure.
- Area 3 Southern Agricultural Plain: A gently undulating landscape of long broad ridges and shallow valleys which can have a medium to large scale where more open. Woodlands are often a key feature and are particularly associated with adjacent valley landscapes. There is relatively little large scale built development in this area.

2.14 Some minor amendment has also been made to the northern boundary of the Gifford Valley landscape character area to include the policies of Lennoxlove. All other landscape character areas are those used as the basis for the sensitivity assessment in the 2005 study and are shown on Figure 1.

2.15 This supplementary study focuses the detailed sensitivity assessment on the settled lowland areas and within the parts of the Lammermuir Hills and their fringes where current interest for smaller wind turbines is concentrated. The sparsely settled upland landscape character area of the 'Central Lammermuir Plateau' is not considered in

[3] East Lothian Council Renewable Energy Wind Application Database, 7th March 2011.

the detailed sensitivity assessment within this study. Key landscape and visual sensitivities are summarised in section 5 of the report.

Definition of development typologies

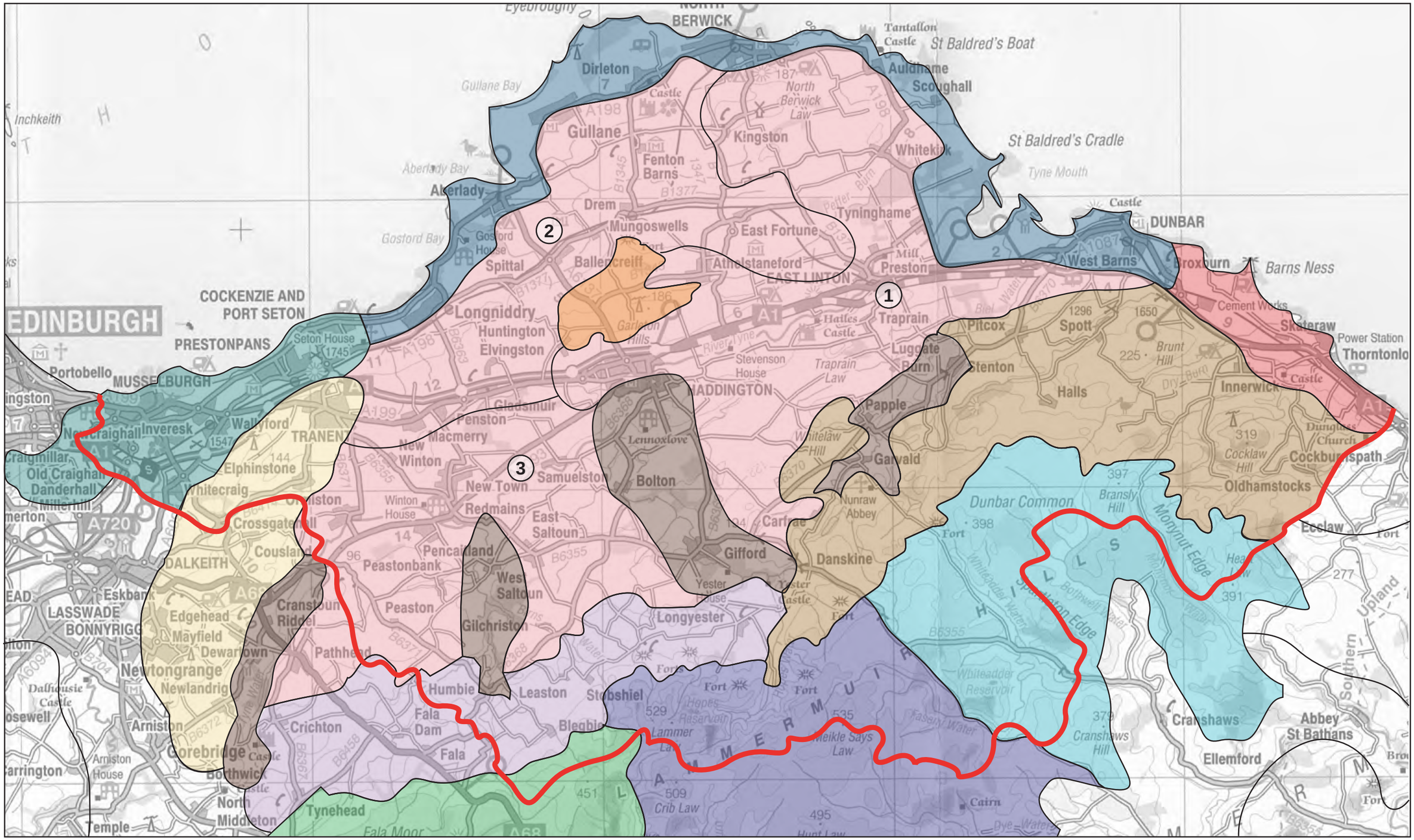
2.16 The original wind capacity study considered the following five different development scenarios:

1. Single turbine development (120m high)
2. Small scale windfarm development (2-5 nr/42m to 65m high turbines)
3. Medium scale windfarm development (6-20 nr/120m high turbines)
4. Large scale windfarm development (21 +nr/120m high turbines)
5. Extensions to existing windfarms

2.17 Smaller turbines were not considered in the original study as these were not commonly available and manufactured in such a range of heights at the time of this assessment in 2005.

2.18 We have reviewed current designs and applications for smaller turbines and defined the key potential landscape and visual issues relating to these. The size of turbines (and rotor arms) relative to other features in the landscape is a key consideration in terms of landscape 'fit' and this has informed the development typologies we have used in the assessment. As this supplementary report primarily seeks to provide landscape and visual advice on potential applications likely to arise from the 'Feed-in' tariff, the development typologies assessed have also been influenced by the 5MW limit set for this incentive scheme.

2.19 The supplementary study does not consider domestic roof/wall mounted wind turbines as these developments are most likely to have impacts on townscapes rather than on more rural landscape which is the focus of the assessment. Freestanding turbines below 12m in height are also not assessed in the study. This is because turbines of this size will generally relate to the size of existing buildings in the landscape, including farm buildings, small telephone masts and tall telegraph poles and they are thus relatively easy to accommodate in a settled landscape if sited to be associated with such a building cluster where they can be visually seen to be part of a group of buildings, or clearly linked to an individual house. Turbines below 12m high could however have cumulative effects and on-going assessment of these will therefore be necessary.



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Landscape Character Areas Assessed in Capacity Study

- Eastern Coastal Margin
- Northern Coastal Margin
- Musselburgh / Prestonpans Fringe
- Agricultural Plain
  Sub areas:
  - 1 East
  - 2 North
  - 3 South
- Garleton Hills
- Mayfield / Tranent Ridge
- Humbie / Gifford / Whittinghame River Valleys
- Eastern Lammermuir Fringe
- North Lammermuir Platform
- Plateau Grassland
- Central Lammermuir Plateau
- East Lammermuir Plateau

0 2 4 6 km

1 : 125,000

Supplementary Capacity Study for Wind Turbine Development 2011

Landscape Character Areas Used in Study

Fig No: 1

2.20 The supplementary landscape sensitivity assessment is based on the following development typologies:

- ***Small wind turbines between 12m and <20m high***. These turbines are about two and a half times the size of a two storey house. While this size of turbine may appear to tower above buildings, 20m is also about the height of a mature forest broadleaved or conifer tree. In fertile lowland landscapes, where trees often achieve a good stature, turbines of this size will not appear as the largest element in the landscape. Other structures which fall into this category height include taller radio masts and small pylons. In coastal areas and more marginal upland landscapes however, tree cover may be sparser and trees may be limited in height by exposure or poor soils. In such areas, a stronger relationship with the scale of the relief of the topography, open expanse of the landscape or specific, more pronounced and higher topographical features may allow the size of the turbine to be readily accommodated. We have considered single and small groups of up to 3 turbines within this category[4].
- ***Turbines between 20m and up to and including 42m high***. These turbines will be higher than most buildings, woodlands and trees but may be similar in height to pylons or relate in scale to lower, but relatively large scale industrial buildings. In the majority of rural landscapes however, turbines of this height are more likely to be accommodated most readily by relating the height of the turbines to the scale of the landform, rather than trying to link them to the size of other structures and trees. We have considered single and small groups of up to 5 turbines within this category.
- ***Turbines between >42m and <65m high***. There is considerable interest in this size of turbine, as evidenced by the East Lothian Council database on wind development applications. Turbines at about 42m will be a similar height to high voltage transmission line towers and roughly twice as tall as mature trees and woodlands. We have considered single turbines only in this category as the original 2005 study assessed groupings of 2-5 turbines of this height band[5].
- ***Turbines between 65m and <120m high*** Turbines around 65m are similar in height to the original Dun Law commercial windfarm turbines while at the upper end of this height band, turbines will be taller than Torness Power Station. We have considered single and groups of up to 6 turbines in this category[6].

2.21 It is not possible within a strategic capacity study to consider every development permutation in terms of turbine height/number. The assessment principally gauges sensitivity in relation to height. Where a greater number of turbines could be accommodated than is indicated in the development typology, this is stated in the assessment.

[4] While it is unlikely that applications for groups of more than 3 turbines within this height band would be forthcoming as it would be more cost effective to install fewer taller turbines there are also landscape and visual reasons why larger groups of smaller turbines should be discouraged and these are discussed further in Annex B.

[5] It is considered unlikely that applications for more than 5 turbines within this height band would be forthcoming for similar economic reasons stated above

[6] A group of 6 turbines towards the lower height band of this typology could be just within the 5MW limit for the 'Feed-in' tariff.

The sensitivity assessment

2.22 The study considers the sensitivity of key landscape and visual characteristics of different landscape character areas within East Lothian to the development typologies outlined above. The descriptions of landscape character used in the 2005 study have been largely replicated in this study although some amendments have been made to reflect changes to the landscape and visual baseline where relevant. There is some 'overlap' in the development typologies considered between the 2005 study and this supplementary study and some of the original conclusions on sensitivity have therefore been reiterated.

2.23 In terms of assessing the potential effects of turbines on key characteristics, judgements were made on turbine height first. Numbers of turbines were considered in relation to the scale of key landscape features and any visual sensitivities. The field assessment was undertaken by two landscape architects using a series of computer generated visualisations showing different heights of turbine to inform the judgements made on landscape and visual sensitivities.

2.24 The assessment identifies key landscape and visual sensitivities, providing further detail to the guidance set out in the Council's *Planning Guidance for the Location and Design of Wind Turbines in the Lowland Areas of East Lothian* on the following issues:

- The setting of towns, villages and important buildings
- Natural landscape features, landmark buildings and structures
- The Edinburgh Green Belt
- Woodlands, trees and field boundaries
- Visibility of development in open countryside
- The coastline
- Cumulative landscape and visual effects
- The historic environment

2.25 In accordance with the 2005 capacity study, the supplementary study does not consider designated landscapes, Areas of Great Landscape Value (AGLV), in the sensitivity assessment although these will be considered by the Council in the appraisal of individual applications where relevant.

Guidance on the siting and design of smaller turbines

2.26 Smaller turbines are manufactured to a much more diverse range of designs than larger 'commercial' turbines. Designs range from two-blade to three-bladed styles, on lattice type masts or tubular steel poles, and with different sized rotor blades depending on the generating output and manufacturers designs. This can also result in different blade movement speeds. Given the current incentives, these small turbines may become a frequent and common occurrence in farmed landscapes. Key cumulative issues for small turbines are likely to relate strongly to potential clutter in the landscape. We consider cumulative issues in both the landscape sensitivity assessment and within guidance on turbine design and micro-siting.

2.27 The design of individual turbines in relation to potential cumulative landscape and visual effects is considered in Annex A within this supplementary study. Due to the speed of change occurring in the development and manufacture of smaller turbines, this guidance is not comprehensive and will need to be reviewed periodically. It aims nonetheless to address key design issues with particular reference to the potential cumulative effects of different styles of turbine seen in close proximity.

3 Landscape and visual sensitivity assessment

Introduction

3.1 The sensitivity assessment for onshore development has been undertaken for landscape character areas within the lowlands and the majority of the upland areas of East Lothian. These character areas are shown in Figure 1.

3.2 An introduction to each landscape character area is initially set out in the sensitivity assessments that follow. This briefly describes the location of the character area, the key findings of the 2005 capacity study in relation to larger development typologies and an update of existing and consented wind farm developments, either located within the landscape character area or in the surrounding area (and clearly visible from the character area being assessed).

3.3 Four principal development typologies are considered as follows:

- Typology A: Turbines between 65m and 120m high
- Typology B: Single turbines between >42m and <65m high
- Typology C: Turbines between 20m and up to and including 42m high
- Typology D: Turbines between 12m and <20m high

All turbine heights are to blade tip.

3.4 The sensitivity scores outlined in the summary of sensitivity are made on the basis of a five point scale; High, Medium-high, Medium, Medium-Low and Low. These assessments consider key landscape and visual characteristics and their sensitivity to different types of wind turbine development. Further detail on methodology is contained in the original 2005 capacity study. A summary of the sensitivity assessment is provided in this Main Report with more detailed sensitivity assessment tables contained in a separate Appendix Report.

3.5 Guidance is set out for each landscape character area confirming the appropriate development typologies that could be accommodated and constraints and opportunities in relation to the siting and design of turbines. Where a high sensitivity is accorded, there are judged to be no opportunities to accommodate development due to the significant adverse effects likely to occur on a range of sensitivity criteria. A medium-high sensitivity rating reflects the presence of a number of constraints. Within some landscapes this may result in no capacity being identified or very limited capacity in either a small part of the character area and/or for a very small number of developments. Sensitivity ratings of medium and below indicate increased scope to accommodate turbines, either more extensively across the landscape character area or in terms of the potential numbers of turbines that would be acceptable.

3.6 An indicative map is provided for each landscape character area. The map indicates broad areas of search for potential development of the four typologies A-D considered in the study. The maps take into account key constraints identified in the sensitivity assessment but they do not accurately show constrained areas associated with the protection of key views or the setting of historic and other landmark features, designed landscapes or settlements. Due to the strategic nature of this study,

applications for individual proposals should demonstrate that turbines will not cause significant adverse effect on the sensitivities identified in this assessment. This must be informed by visualisations generated from agreed viewpoints.

3.7 The maps show a blanket indicative search area for Typology D for more populated areas where no major constraints have been identified in the assessment. More specific search areas are indicated in less populated areas and/or in landscapes where there are constraints even to small turbines, for example, where there may be a particular feature such as a ridge line or distinctive hill top, sensitive to all typologies.

3.8 The original 2005 study considered the sensitivity of landscape character areas extending 10km beyond the boundary of East Lothian. The assessment within this supplementary study only focuses on the landscapes lying within East Lothian's boundaries but notes key landscape and visual sensitivities within adjacent authorities where relevant. The maps only show opportunities for different development typologies within East Lothian.

3.9 Multiple larger turbines would quickly dominate the settled lowland landscapes of East Lothian while a greater number of turbines under 20m height would be able to be accommodated, provided they were well sited and designed. The combination of larger turbines and smaller turbines sited within the same character area and clearly inter-visible could also result in cumulative landscape and visual effects while the presence of existing large scale windfarms in the Lammermuir Hills also constrains scope for additional development. On-going monitoring of developments will be essential to ensure cumulative landscape and visual effects are minimised and to define when capacity is close to being reached.

Eastern Coastal Margin

Location

The Eastern Coastal Margin extends east of Dunbar to the boundary with the Scottish Borders near Cockburnspath. It comprises a gently undulating narrow strip of land to the south-east of Dunbar, abutting the North Sea and contained by the foothills of the Lammermuir Hills to the south. This landscape is characterised by large scale industrial features and major transport routes.

Findings of the original study on larger typologies

The original 2005 landscape capacity study concluded that there was moderate capacity for development in the Eastern Coastal Margin with some limited opportunities to locate smaller height turbines (development typology 2 up to 65m high turbines) on the more gently undulating coastal plain away from the coastal edge. The study considered that turbines should be located to avoid the 'spread' of built structures between existing industrial features and that scope for multiple developments were constrained due to the relatively small size of the character area and cumulative effects on views from the A1, where multiple development would be inter-visible with existing industrial development within this character area.

Changes have occurred to the character of this landscape since the field work and assessment was undertaken for the 2005 study and these principally relate to the progression of landfill operations and the visual influence of windfarm development sited in the Lammermuir Hills.

Existing, consented and proposed wind farm development

There is no existing windfarm or smaller turbine development within this character area. The Aikengall windfarm has been constructed since the 2005 study and is visible within approximately 7km from the north-western part of this character area.

Three potential offshore windfarm sites lie within the outer reaches of the Firth of Forth (Exclusivity Awards as part of the 'Round 3' lease sites). The Forth Array proposal is the closest of these sites to this character area, lying approximately 25km distance from shore.

Summary of sensitivity

While turbine development could fit with the generally simple gently undulating landform of this landscape, the narrowness of this coastal margin is a key sensitivity limiting scope for larger and multiple turbine developments. This landscape is perceived as being distinctly man-modified in character due to the presence of large scale industrial development and landfill operations. The large scale turbines of the Aikengall windfarm are also highly visible from this character area. Although the presence of existing large scale structures/buildings reduces sensitivity to a degree, the introduction of larger typologies of wind turbine would exacerbate the fragmentation of the area and the clutter of disparate elements, resulting in the landscape becoming a generally industrial landscape rather than a rural area with some sporadic industrial development. The less modified stretches of coastline, more complex landform, including small scale valleys and headlands found in the south-east, and the high

visibility of this area from major transport routes also increase sensitivity. In terms of the larger turbines considered in this supplementary assessment, there would be ***Medium-high*** sensitivity to Typologies A and B.

The assessment for the smaller turbines considered in this study found that there would be ***Medium*** sensitivity to Typology C and ***Low*** sensitivity to Typology D. This is due to the increased scope for smaller turbines to be sited to minimise cumulative impacts with existing industrial features and reduce visual impact. The less modified coastal edge and areas of more complex landform are still sensitive however, even to smaller turbines.

Constraints

- The narrowness of this coastal margin which limits scope for multiple and larger typologies to be physically accommodated
- More complex rolling landform and small wooded valleys with an intimate scale found in the south-eastern part of this landscape which would be sensitive to all types of wind turbine.
- The large and complex industrial buildings of the cement works and associated disturbed ground/extraction void and landfill operations which increase the potential for visual clutter to occur cumulatively with turbine development
- In contrast, the relatively simple landscape setting to the Torness Nuclear Power station could also be adversely affected by turbine development.
- Potential cumulative visual effects with the operational Aikengall windfarm located in the East Lammermuir Plateau.
- The busy transport routes of the A1 and East Coast railway line where this landscape is highly visible, providing the 'threshold' to East Lothian for travellers from the south.
- Barns Ness lighthouse which forms a focus and the less modified coastal edge of this character area and the promoted Geological Trail.
- The settlement of Dunbar and Broxburn policies in the adjacent 'Northern Coastal Margin'

Opportunities

- The gently undulating landform and relatively simple landcover found within this landscape.
- The containment provided to this character area by the rising ground of the foothills to the Lammermuirs which limits widespread visibility from the more populated lowlands of East Lothian.

Guidance on development

There is no capacity to locate the large turbines within typologies A and B in this character area due to the significant adverse effects that would occur across a range of sensitivity criteria including cumulative landscape and visual impacts with existing large scale windfarm development.

There are some very limited opportunities to locate Typology C in some areas. Turbines should be located to avoid the 'spread' of built structures between existing industrial features and to avoid impacting on sensitive less modified stretches of coastline and the more complex landform of valleys and more intricate coastal edge in the south-east of this

character area. Turbines could draw attention to the artificiality of many man-made landforms if sited on, or close to them. Restoration of these areas to fit with natural landform character should be undertaken prior to consideration of any of these areas for wind energy development.

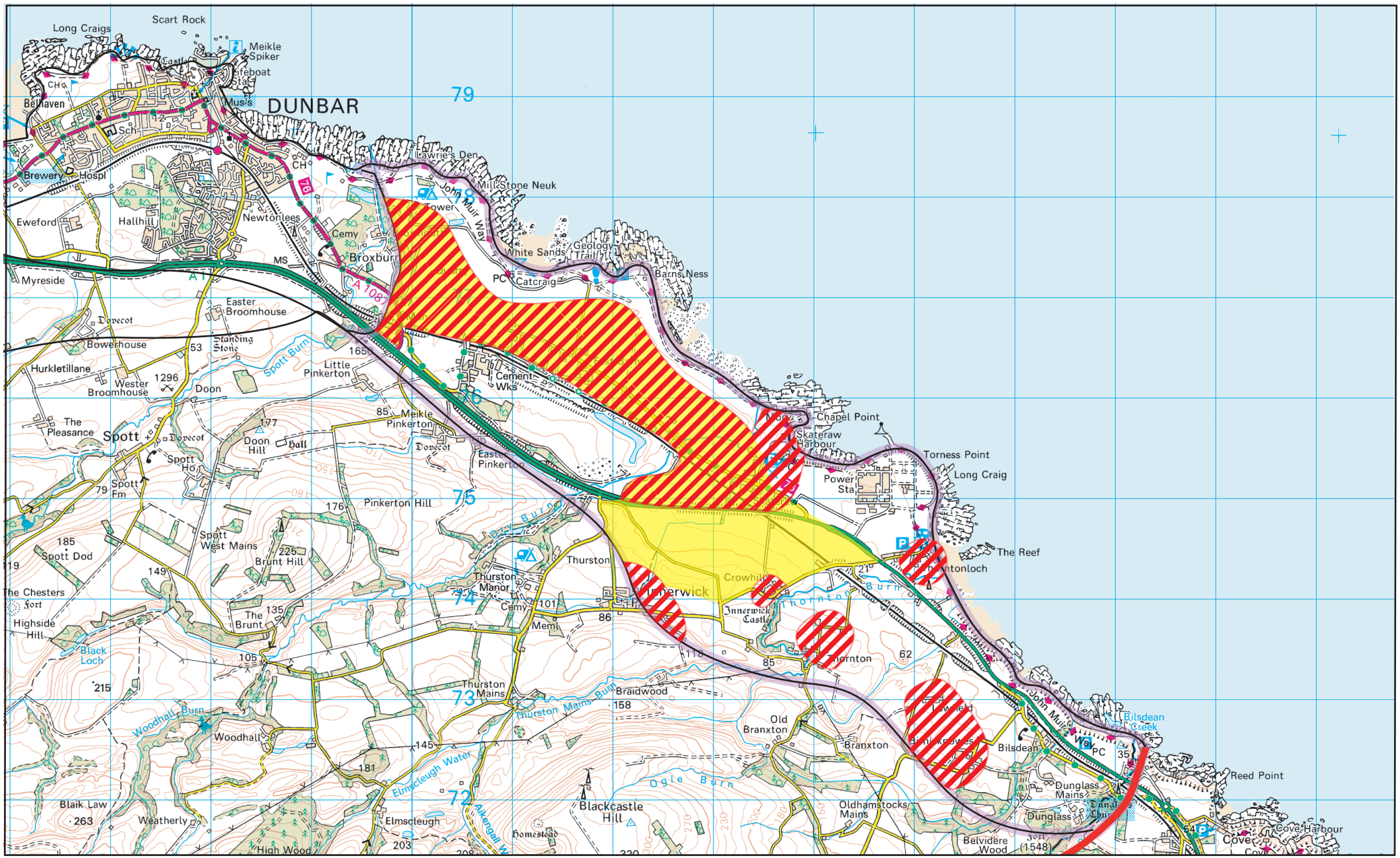
There would be potential problems with siting turbines close to the cement works as this may exacerbate visual clutter with too many discordant forms. A degree of geographic separation should occur if development were to be sited in the north-western part of the character area to avoid these impacts. The landscape setting to Torness Power Station is relatively simple and uncluttered and turbines should avoid compromising this. Access tracks should be simple and grassed over post construction in order to limit interruption of the smoothly rolling landform and electricity connections buried underground to minimise the clutter of elements in this character area.

Opportunities for multiple developments of single and small groups of turbines are very constrained in the Eastern Coastal Margin due to the narrowness of this landscape and the cumulative effects on views from the A1, where multiple developments would be inter-visible with existing industry within this character area. Even smaller turbines have potential to increase the clutter of disparate built structures such as transmission lines, existing windfarms visible in the East Lammermuir Plateau, railway and road infrastructure. It is likely that a very limited number of turbines within typology C would be appropriate in this narrow coastal area with its many landscape and visual constraints.

Small turbines below 20m high should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter in this highly visible coastal landscape. Larger turbines should be sited to relate to landform features such as slight ridges or lower hill slopes.

All turbines should avoid impact on sensitive coastal fringes, where the coast is unaffected by quarrying and landfill, and the more intricate transitional landscapes to the south and south-east where the irregularity and smaller scale of interlocking ridges, coastal features and cleughs and diverse pattern of vegetation and small scale settlement would be compromised by all development scenarios. All turbines should be sited to avoid significant intrusion on key views from the coastal footpath and A1 to the Barns Ness lighthouse and significant cumulative effects with the existing Aikengall windfarm which is visible in relative proximity through the valley of the Dry Burn in the Innerwick area.

The number and design of small turbines should be limited to avoid exacerbating the fragmented character of this landscape. Detailed siting and design should accord with the guidance set out in Section 4 of this report.



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To be read in conjunction with Fig No 1

Fig No 2

Opportunities for Development Typologies

none	A		C Limited opportunities, area of search subject to impact on key views
none	B		D Opportunities to locate if visually associated with farms and buildings

Supplementary Capacity Study for Wind Turbine Development 2011

Eastern Coastal Margin

0 1 2 3 km

Northern Coastal Margin

Location

The Northern Coastal Margin extends west of Seton Mains to the east of Dunbar. It features the least modified and scenic seascapes within East Lothian and is also characterised by extensive policy woodlands and distinctive coastal settlements.

Findings of the original study on larger typologies

The original 2005 study concluded that there was no capacity to accommodate windfarm development in the Northern Coastal Margin landscape character area without significant adverse impacts occurring on both landscape character and on views.

Existing, consented and proposed wind farm development

There is no existing windfarm or smaller turbine development within this character area.

Three potential offshore windfarm sites lie within the outer reaches of the Firth of Forth (exclusivity awards as part of the 'Round 3' lease sites). The closest of these sites to East Lothian are the Neart Na Gaoithe and Forth Array proposals which lie approximately 30-35km from the Northern Coastal Margin.

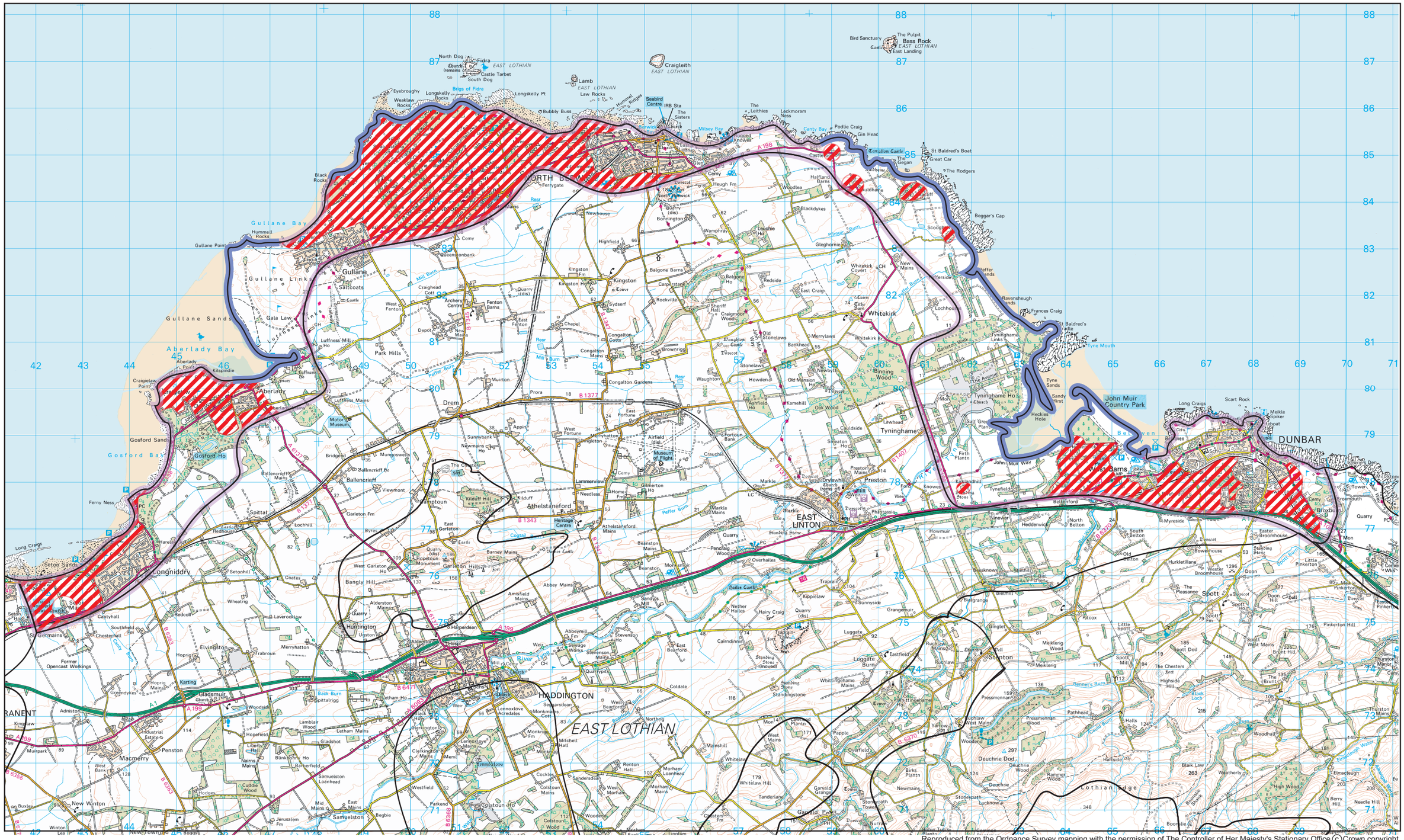
Summary of sensitivity

The integrity of this richly diverse coastal landscape (and wider seascape) with its distinctive pattern of woodlands, settlements and designed landscapes would be compromised by the introduction of development typologies A, B and C. The perceived naturalness and diversity of the coast would be a key limiting factor and the well-settled character of this area and its popularity for recreation additionally increases sensitivity to these larger development typologies. The Firth of Forth and its islands are a key focus of views both from within this character area and from elevated areas of East Lothian and larger turbines would be particularly intrusive in these views. There would be a ***High*** sensitivity to typologies A, B and C which comprise single and small groups of turbines over 20m high.

There would be reduced sensitivity to smaller turbines below 20m height due to their ability to fit with the scale of larger buildings and woodlands. However, the coastal edge is sensitive even to these small turbines where they would affect the characteristic openness, more complex landform and could diminish the sense of naturalness and seclusion experienced. They could also intrude on key views along the more open coastal edge. Overall sensitivity would be ***Medium*** to typology D.

Constraints

- The narrowness of this coastal margin which limits scope for multiple and larger typologies to be physically accommodated
- The relatively unmodified coastal edge which, although well-used for recreation, often has a strong sense of naturalness and can seem secluded away from settlement.
- Designed landscapes such as Gosford, Luffness and Archerfield which include extensive policy woodlands and which could be adversely affected by turbine development.


NORTH BERWICK
EAST LINTON
HADDINGTON
DUNBAR
EAST LOTHIAN
Gullane
Aberlady
Gullane Bay
Aberlady Bay
Gullane Sands
Gosford Bay
Gosford Sands
Longniddry
Kingston
Drem
Whitekirk
Tyninghame
Preston
Athelstaneford
Garleton Hills
Lammermuir Hills
Lothian Edge
John Muir Country Park
Bass Rock
Craigleith
Lamb
Fidra
Castle Tarbet
North Dog
South Dog
Law Rocks
Longskelly Rocks
Eyebroughy
Weaklaw Rocks
Hummel Rocks
Gullane Point
Craigielaw Point
Aberlady Point
Ferny Ness
Seton Sands
Long Craigs
Black Rocks
Bubbly Buss
Milsey Bay
Canty Bay
Seabird Centre
Tantallon Castle
Beggar's Cap
Scoughall
Ravensheugh Sands
Tyne Mouth
Tyne Sands
Heckies Hole
Scart Rock
Meikle Spiker
Broxburn
Pinkerton Hill
Spott
Stenton
Deuchrie Dod
Blak Law
Woodhall
Whittingehame
Luggate Burn
Peffer Burn
Tyne Water
Whittingehame Water
Woodhall Burn
Elmscleugh Water
Bennet's Burn
Black Loch
Mains of Fidra
Fidra
Craigleith
Bass Rock
Tantallon Castle
Seton Castle
Dirleton Castle
Dunbar
Haddington
Gullane
Aberlady
Longniddry
Prestonpans
Musselburgh
Tranent
Macmerry
Gladsmuir
Elvington
Huntington
Garleton Fm
Ballencrieff
Kilduff
Lamington
Spittal
Seton Mains
Gosford Ho
Motor Museum
Museum of Flight
Heritage Centre
Seabird Centre
IRB Sta
Lifeboat Station
Golf Course
Caravan Site
Church
Castle
Cemy
Quarry
Mill
Chapel
Fort
Tower
Monument
Hospital
Sewage Works
Pumping Station
Radio Station
Telecom Tower
Windmill
Wind Turbine
Youth Hostel
Viewpoint
Picnic Site
Car Park
Golf Course
Caravan Site
Museum
Heritage Centre
Motor Museum
Airfield (disi)
Quarry (disi)
Cemy
Ch
Fm
Ho
Mains
Newhouse
Highfield
Kingston Fm
Kingston Ho
Balgone Barns
Balgone Ho
Carpenstane
Redside
Rockville
Sysdserf
Fenton Barns
West Fenton
East Fenton
Archery Centre
Craighead Cott
Queensferrybank
Saltcoats
Gala Law
Luffness Mill
Luffness Mains
Park Hills
Kilspindie
Aberlady Bay Nature Reserve
Muirton
Prora
Congalton Gardens
Congalton Mains
Congalton Cotts
Brownrigg
Waughton
Howden
Old Mansion Ho
Newbyth
Binning Wood
Old Stonelaws
Stonelaws
Merrylaws
Bankhead
Whitekirk Covert
Whitekirk Burn
Craigmoor Wood
Sheriff Hall
Lochhouse
Frances Craig
Tyninghame Ho
Tyninghame Links
Gateleon Wall
Littlerees Wall
Salt 'Gres' Plantn
Firth Plantn
Kirkandhill
Tynefield
Lawhead
Oak Wood
Ashfield Ho
Kamehill
Smeaton Hall
Smeaton Bank
Fortoun Bank
Fortoun Mains
Preston Mains
Dryden Ho
Dryden Bridge
Markle
Markle Mains
Markle Toll
Phantassie
Ford
Knowes
Ninewar
Hedderwick
North Belton
South Belton
Old Belton
Howmuir
Beltonford
Myreside
Bowerhouse
Hurkletillane
Wester Broomhouse
Easter Broomhouse
Standing Stone
Doon
Doon Hill
Doll
Spott Fm
Spott Mains
Spott Dod
Spott Mill
Meiklerig
Meiklerig Wood
The Chesters
Highside Hill
Brunt Hill
Pinkerton Mains
Thurston Mains
Thurston Manor
Broxburn
Quarry
Mon
Towers
Cemy
Broxmouth
Belhaven
Belhaven Bay
Belhaven Ho
Belhaven Hill
Belhaven Links
Belhaven Mains
Belhaven Mill
Belhaven Sands
Belhaven Skerry
Belhaven Tower
Belhaven Wood
Belhaven Burn

- Striking views to the Firth of Forth and the islands of Fidra, Bass Rock and to Fife from the coastal edge, roads and settlements
- Historic features such as Tantallon and Dirleton Castles and the architectural integrity of settlements sited within this character area.
- The landmark feature of North Berwick Law located in the adjacent Agricultural Plain (1) character area where turbines could compete with its prominence in key views.
- The well-settled nature of this character area and its popularity for recreation which increases visual sensitivity to development.

Opportunities

- There are no opportunities for larger typologies within this character area although Typology D could visually relate to farm buildings and the edge of larger settlements with a less strong architectural integrity.

Guidance on development

There is no scope to accommodate turbines above 20m in height within this character area without significant adverse impacts occurring across a wide range of sensitivity criteria.

Small turbines below 20m high should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter in this highly sensitive coastal landscape. They should avoid coastal areas with perceived 'wildland' qualities and more complex dunes and coastal landform features. They should generally be sited away from the coast where they could benefit from a degree of screening by shelterbelts and woodlands inland unless visually associated with a building within a recreational facility or close to a settlement. All turbines should be sited to avoid intrusion on key views from settlements, roads and coastal footpaths and on landmark features such as North Berwick Law, the Firth of Forth islands, Tantallon and Dirleton Castles. The setting of settlements and designed landscapes should also be protected. Special care is needed to ensure that only well-designed turbines are used in this particularly sensitive landscape with limits on the range of designs used in order to minimise cumulative landscape and visual effects. There is limited scope for multiple developments in this landscape character area.

Detailed siting and design should accord with the guidance set out in Section 4 of this report.

Musselburgh/Prestonpans Fringe

General location

A narrow, densely developed coastal fringe at the western extremity of East Lothian. This character area is tightly contained by the Mayfield/Tranent Ridge to the south and features an almost continuous band of built development sited along the coast which appears as an extension to the urban edge of Edinburgh.

Findings of original capacity study on larger typologies

The original 2005 study found that there was moderate capacity for development in the Musselburgh/Prestonpans Fringe. As the scale of turbines would need to fit with the scale of settlement and remaining open space, the lower height band (42m) turbines of development typology (2), was considered to be the only typology appropriate in terms of limiting adverse effects on landscape character and views.

Existing/consented and proposed wind farm development

There is a single small turbine development within this character area.

Although potential offshore windfarm sites lie within the outer reaches of the Firth of Forth there is unlikely to be visibility of these from this character area due to the orientation of the coast.

Summary of sensitivity

The narrowness of this coastal fringe and its densely built up character limits the size and number of developments that can be accommodated. Much of this character area lies within the Edinburgh Green Belt and open space is often important in providing a contrast with, and landscape setting to, settlement. Turbine development in the open spaces north of the A1 would have the effect of extending built development outwards, increasing the present fragmentation of urban edges and affecting the strong coastal settlement pattern. It could also affect views to Edinburgh (with Arthur's Seat forming a key focus), the Firth of Forth and to the historic Inveresk Church from the A1. Larger turbines sited near the Cockenzie Power Station would increase the complexity and clutter of elements characteristic in this area, although the presence of existing large-scale industrial structures and other infrastructure and some large buildings also reduces visual sensitivity in terms of views to and from the area. There would be ***Medium to High*** sensitivity to Typologies A and B and ***Medium*** sensitivity to Typology C.

This landscape would be less sensitive to smaller turbines as these could be associated with existing settlement and would have a limited visual impact within the already complex built-up character. Sensitivity to Typology D would be ***Low***.

Constraints

- The narrowness of this coastal margin which limits scope for multiple and larger typologies to be physically accommodated
- The importance of open space in providing the setting to settlement, recognised by the Edinburgh Green Belt designation which applies to much of this landscape.

- The visibility of this landscape from the busy transport routes of the A1 and East Coast railway line and views to the Firth of Forth and to Edinburgh, Arthur's Seat and the Pentland Hills.
- Cockenzie Power Station and associated large scale transmission lines where turbines could increase visual clutter if located nearby.
- Policy landscapes such as Dalkeith, Carberry and Levenhall and views across the wooded Esk valley and to Inveresk and the focal feature of its church.

Opportunities

- The gently undulating landform and relatively simple landcover found within this landscape.
- The more modified coastal edge away from key views and settlement.

Guidance on development

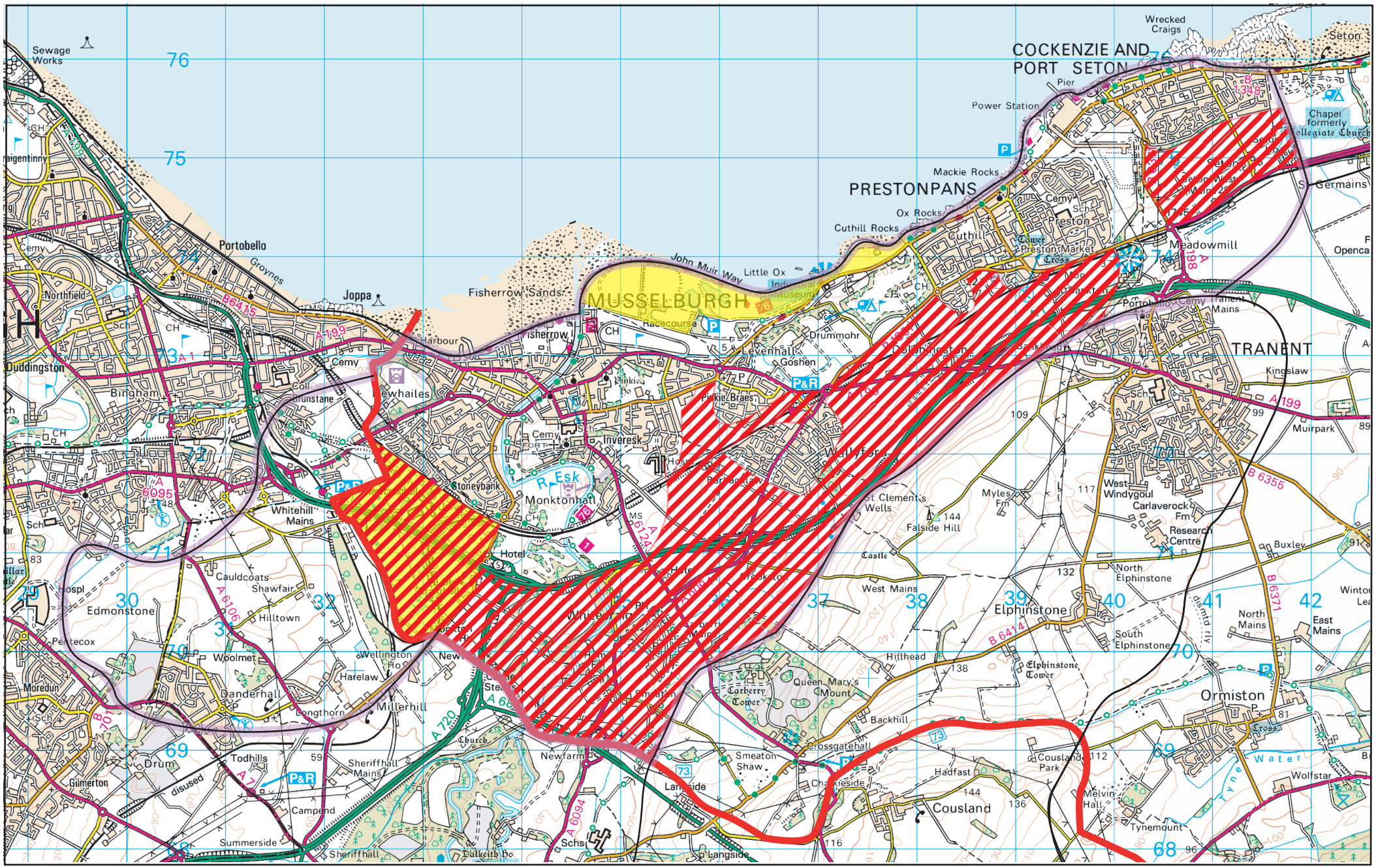
There is no scope to accommodate Typologies A and B within this landscape.

There is some very limited scope to associate Typology C (turbines between 20m and up to and including 42m high) with the simpler modified coastal edge and in areas where open space is less important to the separation and setting of settlements. Development would need to be sited to avoid intrusion on key views of the Firth of Forth and to avoid detracting from views to Arthur's Seat on the approach to Edinburgh from the A1. Turbines should also be sited to avoid intrusion on views to Inveresk Church and should not significantly impact on the integrity and wider setting of designed landscapes. Close proximity to Cockenzie Power station and power lines should also be avoided so as not to accentuate the present visual discord of disparate elements.

Smaller turbines below 20m would have less of a landscape and visual impact providing they were closely associated with existing buildings or urban edges.

There is little opportunity for multiple developments due to the already heavily developed character of this landscape. Care should be taken to limit the variety of turbine scales and designs in this landscape to avoid exacerbating the existing visual clutter of buildings and infrastructure.

Detailed siting and design should follow the guidance set out in Section 4 of this report.


COCKENZIE AND PORT SETON
PRESTONPANS
MUSSELBURGH
TRANENT
Portobello
Joppa
Fisherrow Sands
Inveresk
Monktonhall
Edmonstone
Elphinstone
Ormiston
Cousland
Dalkeith
Gilmerton
Duddingston
Bingham
Whitehill Mains
Cauldcoats
Hilltown
Woolmet
Danderhall
Millerhill
Sheriffhall
Campend
Todhills
Drum
Summerside
Carberry Tower
Queen Mary's Mount
Elphinstone Tower
Crossgatehall
Smeaton Shaw
Hadfast
Backhill
Hillhead
Falside Hill
Levenhall
Goshen
Drummohr
Cuthill
Preston
Meadowmill
Seton
Wrecked Craigs
Mackie Rocks
Ox Rocks
Cuthill Rocks
Little Ox
Fisherrow
Northfield
Cemy
Coll
Brunstane
Lewhailes
Stoneybank
Whitehill Mains
Pinkie Braes
Pinkie Ho
Inveresk
Monktonhall
Hotel
Wellington Ho
Harelaw
Longthorn
Milton
Newfarm
Church
Langside
Dalkeith Ho
Sheriffhall
Summerside
Campend
Todhills
Gilmerton
Drum
Moredun
Pentecox
Edmonstone
Hospl
Sewage Works
Craigentinny
Groynes
Harbour
Racecourse
John Muir Way
Museum
Chapel formerly Collegiate Church
Power Station
Pier
Cemy
Sch
Preston Market
Cross
Trident Mains
Portobello
Kingslaw
Muirpark
West Windygoul
Carlaverock Fm
Research Centre
Buxley
Myles Fm
St Clement's Wells
Castle
West Mains
North Elphinstone
South Elphinstone
North Mains
East Mains
Wintonlea
Cousland Park
Melvin Hall
Tynemount
Wolfstar
Water
Tyne
Germains
Openca
Mains
Hospital
Schs
Ho
Hosp
Ch
Cross
Water
Tyne
R Esk
A1
A199
A6095
A6106
A720
A68
A7
A6124
A6094
A6093
A1198
B6415
B1348
B6355
B6371
B6414
P&R
P
Ch
Sch
Cemy
Hosp
Ho
Schs

The Agricultural Plain

General location and changes to characterisation

The Agricultural Plain extends over much of the lowlands of East Lothian comprising the heartland of the county. This landscape character area has been sub-divided into the following areas for the purposes of this study:

- Area 1 East: A more rolling landform with pronounced ridges and occasional landmark features. This landscape has a relatively high proportion of woodland which increases containment and reduces scale. There is little large scale built development in this area.
- Area 2 North: An open, very gently undulating to flat landscape with a relatively expansive scale. There is relatively little woodland and dispersed industrial development and infrastructure is a feature.
- Area 3 South: A gently undulating landscape of long broad ridges and shallow valleys which can have a medium to large scale where more open. Woodlands are often a key feature and are especially associated with adjacent valley landscapes. There is relatively little large scale built development in this area.

These sub-divisions are shown on Figure 1.

Findings of original study on larger typologies

The original 2005 capacity study found there to be moderate capacity to accommodate windfarm development within the Agricultural Plain landscape character area. Opportunities for limited development of turbines towards the lower height band of 42m height of typology (2) were identified in more open farmed areas and in association with existing industry, largely in the west and central part of the Agricultural Plain. It was concluded that greater numbers of turbines could be accommodated on particularly open areas, up to approximately 7 nr, although this may be limited by proximity to settlement. A key constraint was the need to site development to minimise intrusion on views of North Berwick Law, Traprain Law, the Firth of Forth (and particularly the Tyne Estuary), the Garleton Hills and the dramatic scarp of the Lammermuir Hills which form key foci in views from this and adjacent character areas.

Existing/consented and proposed wind farm development

There are some single and groups of up to two smaller turbines (below 30m) situated in the Fenton Barns area.

Existing windfarm development sited within the Lammermuir Hills is widely visible from this character area with closer views occurring within the eastern and southern parts (sub-areas 1 and 3). Potential offshore windfarm development within the outer reaches of the Firth of Forth may be visible from more elevated ridges and landmark hills within sub-area 1 although it is likely to be very distant.

Agricultural Plain: Sub area 1- East

Summary of sensitivity

The presence of the landmark features of North Berwick and Traprain Laws and the integrity of well-managed farmland and extensive policy woodlands are key constraints to siting larger turbines in this landscape. Larger turbines would also dominate the scale of settlement and have a significant impact on views, particularly seen from the A1. There are few large industrial features in this landscape and this scale of development would be likely to impact on the perception of its rural character. Cumulative landscape and visual effects with existing windfarm development within the Lammermuir Plateau could also be an issue in some parts of this landscape. Overall, there would be a ***High*** sensitivity to Typologies A and B.

While landform can be complex and often rugged in character, broader smoother ridges and gentle hill slopes also occur and these would be less sensitive to smaller turbines. There are greater opportunities to locate these smaller typologies to avoid significant impact on landmark features, settlement and key views. There would be a ***Medium-high*** sensitivity to Typology C and a ***Low*** sensitivity to Typology D, the latter rating reflecting increased scope for smaller turbines to fit with the scale of landscape features, benefit from a degree of screening by landform and woodland and have a reduced effect on key landmark features.

Constraints

- The landmark features of North Berwick and Traprain Laws and their landscape setting which could be affected by all development typologies
- Extensive designed landscapes and wooded policies including those of Biel, Tyninghame, Broxburn, Newbyth and Balgone.
- The high visibility of parts of this landscape from the busy A1 and the East Coast Railway, featuring particularly striking views to the Tyne Estuary and Firth of Forth
- The more complex landform of small, and occasionally craggy, hills at the transition with the Whittingehame Valley and East Lammermuir Fringe.
- The small scale and architectural integrity of many of the smaller settlements within this character area

Opportunities

- More open, broad ridges and gentle slopes away from key landmark features

Guidance on development

There is no scope to locate Typologies A and B due to the significant adverse impacts that would be likely to occur on a range of landscape and visual sensitivities.

There are some very limited opportunities to accommodate Typology C within this character area although turbines should be towards the lower height band of this typology of below 30m to blade tip in order to attain a better scale relationship to small buildings in this well-settled area and minimise effects on views of landmark features. Turbines should be sited to minimise impact on the landscape setting and key views to North Berwick and Traprain Laws and should also avoid the more complex smaller scale rugged landform that occurs at the

To be read in conjunction with Fig No 1

Reproduced from the Ordnance Survey mapping with the permission of The Controller of Her Majesty's Stationary Office ©Crown copyright.

Opportunities for Development Typologies

none	A No scope to locate turbines of this size
none	B No scope to locate turbines of this size
	C Very limited opportunities for turbines **under 30m** subject to key views to landmark features of Traprain and Berwick Law and impacts on designed landscapes
	D Opportunities to locate if visually associated with farms and buildings

Fig No 5

Supplementary Capacity Study for Wind Turbine Development 2011

Agricultural Plain: Sub Area 1- East

0 1 2 3 km

transition with the 'Eastern Lammermuir Fringe'. This height of turbine could exacerbate the spread of development (in combination with existing industrial/commercial buildings) along the key route of the A1 and care should be taken to avoid this as well as impacts on views over the Tyne Basin to the coast in this area. Turbines should be sited on more open, broader ridges and hills (and set down from higher points to reduce prominence). The characteristically small scale settlement of this landscape will be particularly sensitive to taller turbines and they should therefore be sited away from domestic buildings to minimise adverse effects on scale and on the setting of settlements. It is likely that only a very limited number of developments of this size could be accommodated in this landscape without the presently uncluttered and diverse scenic character being significantly and adversely changed.

There are greater opportunities to locate the small turbines of Typology D in this landscape provided these are located so visually associated with farms and other buildings in order to limit the spread of structures. These smaller turbines should also be sited to avoid impacting on distinctive landform features, policy landscapes and on the setting to settlements. Care should be taken in limiting the design of turbines in this landscape given its high landscape and visual sensitivity. Detailed siting and design should accord with the guidance set out in section 4 of this report.

Agricultural Plain - Sub- Area 2, North

Summary of sensitivity

The broad scale of the landscape and the general absence of distinctive landform and land cover features make this character sub-area less sensitive to larger turbine typologies. However, the very tall turbines of Typology A would dominate both the scale of small domestic buildings but also the larger industrial and commercial buildings which feature in this area. They would also be more likely to intrude on key views of the Firth of Forth and the Garleton Hills and could be perceived as contributing to the 'industrialisation' of the landscape. There would be a ***Medium-high*** sensitivity to Typologies A and B.

Smaller turbines would have a better scale relationship with existing settlement and reduce visual intrusion with ***Medium*** sensitivity concluded for Typology C and ***Low*** sensitivity for Typology D.

Constraints

- The Garleton Hills and key views to their rugged and diverse north face
- Designed landscapes, largely situated in adjacent character areas where large turbines could affect their wider setting.
- The high visibility of parts of this landscape from well-used roads, including the A1, the East Coast Railway and from settlements.
- The landscape setting and character of the historic small settlement of Athelstaneford which could be adversely affected by turbine development.

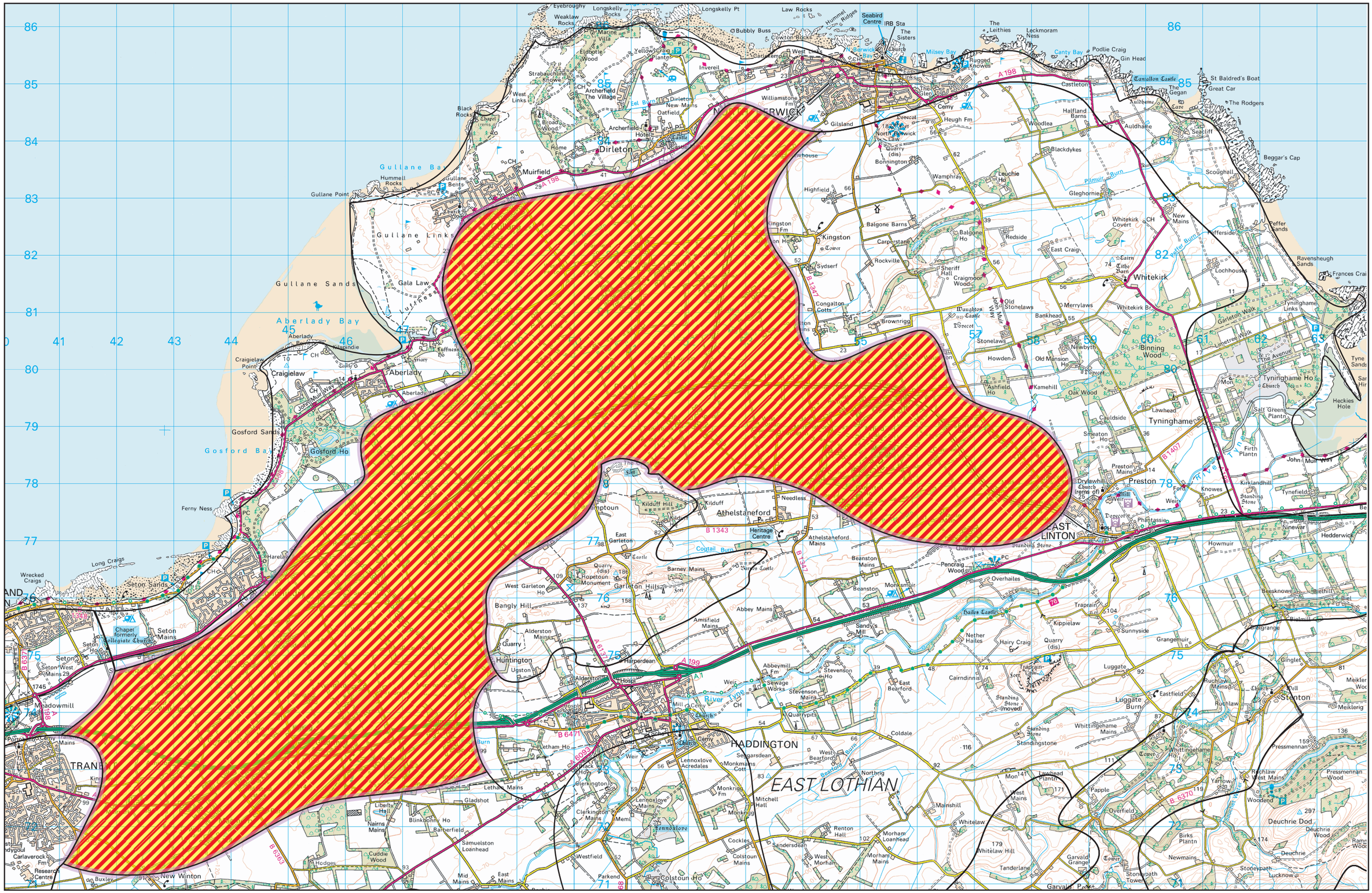
Opportunities

- Larger industrial/commercial buildings which would have a better scale relationship to taller turbines
- The broad gently undulating landform of this character area with its relatively weak field enclosure pattern and sparse woodland giving a medium to large scale able to more easily accommodate turbines.

Guidance on development

There is no scope to locate Typologies A and B due to the significant adverse impacts that would be likely to occur on a range of landscape and visual sensitivities.

Typology C, with its single and small clusters of turbines between 20m and up to and including 42m height, could be more successfully located in this landscape as they would be less likely to dominate existing settlement. They could more comfortably relate to the scale of larger farm buildings and industry/commercial development but could also be sited below low ridge lines to benefit from some back-cloth of rising ground which would reduce prominence and apparent height to some degree. The 2005 capacity study concluded that there would be some limited scope for small groups of turbines within this height band to be sited in this area.


EAST LOTHIAN
HADDINGTON
EAST LINTON
TRANENT
Gullane Bay
Gullane Links
Gullane Sands
Aberlady Bay
Gosford Bay
Muirfield
Dirleton
Gullane
Aberlady
Craigielaw
Gosford Sands
Gosford Ho
Seton Sands
Seton Mains
Seton
Meadowmill
Longniddry
Athelstaneford
Garleton Hills
Hopetoun Monument
Traprain
Traprain Law
Whitekirk
Tyninghame
Preston
Phantassie
Stenton
Whittingehame
Whittingehame Mains
Luggate Burn
Coldale
Coldale Burn
Beanston
Beanston Mains
Monksmuir
Overhailes
Nether Hailes
Hairy Craig
Cairndinnis
Sandys Mill
Stevenson
Stevenson Mains
Sewage Works
Abbeymill Fm
Abbey Mains
Amisfield Mains
Barney Mains
Garleton Castle
Bailes Castle
Standing Stone
Standingstone
Standing Stone (moved)
Quarry (dis)
Quarrypits
Pencraig Wood
Sunnyside
Grangemuir
Kippielaw
Luggate
Eastfield
Ruchlaw
Ruchlaw Mains
Ruchlaw West Mains
Ruchlaw Burn
Whittingehame Burn
Pressmennan
Pressmennan Wood
Deuchrie Dod
Deuchrie Wood
Deuchrie
Howmuir
Ninewar
Hedderwick
Broadwoodside
Bielhill
Braidgrange
Ginglet
Meiklerig
Meikle Wood
Stoneypath
Lucknow
Garvald Grange
Garvald Burn
Tanderlane
Mainshill
Whitelaw
Whitelaw Hill
Morham
Morham Loanhead
Morham Mains
West Morham
Renton Hall
Northrig
Mitchell Hall
Monkrigg
Monkrigg Fm
Monkmains Cott
Seggarsdean
West Beartford
Lennoxlove
Lennoxlove Mains
Lennoxlove Acredales
Clerkington Mains
Clerkington Ho
Letham Mains
Letham Ho
Gladshot
Liberty Hall
Nairns Mains
Blinkbonny Ho
Barberfield
Samuelston
Samuelston Loanhead
Cuddie Wood
Hodges
Westfield
Parkend
Colstoun
Colstoun Mains
Colstoun Ho
Cockles
Sandersdean
Mid Mains
East Mains
Huntington
Huntington Ho
Alderston
Alderston Mains
Harperdean
Bangly Hill
West Garleton Ho
Hopetoun Monument
East Garleton
Kilduff
Kilduff Hill
Needless
Athelstaneford Mains
Heritage Centre
Cogtail Burn
Beanston Burn
Eel Burn
Broad Wood
Strabauchlunn Knowe
Archerfield
Archerfield Hotel
Archerfield The Village
Dirleton New Mains
Oatfield
Yellow Craig Plantn
Invereil Ho
Carlekemp
West Links
Williamstone Fm
Gilsland
Heugh Fm
Camy
Rugged Knowes
Milsey Bay
Canty Bay
Seabird Centre
RNLI Sta
The Sisters
Law Rocks
Longskelly Pt
Longskelly Rocks
Weaklaw Rocks
Eyebroughy
Bubbly Buss
Cowton Rocks
Broad Sands
Hummel Ridges
Hummel Rocks
Black Rocks
Gullane Point
Gullane Bents
Gala Law
Luffness
Luffness Ho
Kilspindie
Craigielaw Point
Ferny Ness
Wrecked Craigs
Long Craigs
Harelaw
Seton West Mains
Seton Ho
Chapel formerly Collegiate Church
Carlaverock Fm
Research Centre
New Winton
Dunbar
Tantallon Castle
The Gegan
Great Car
Great Car Rocks
St Baldred's Boat
The Rodgers
Gin Head
Podlie Craig
The Leithies
Leckmoram Ness
Castleton
Auldhame
Seacliff
Scoughall
Beggar's Cap
Peffer Sands
Ravensheugh Sands
Frances Craig
Tyninghame Links
Tyninghame Ho
Tyninghame Mains
Heckies Hole
Salt Greens Plantn
Lawhead
Cauldside
Smeaton Ho
Preston Mains
Drylawhill
Firth Plantn
Kirklandhill
Tynefield
Knowes
Ford
Weir
Hill
Blackdykes
Woodlea
Halfland Barns
Gleghornie
Pilmuir Burn
Wamphray
Leuchie Ho
Highfield
Whitekirk Covert
New Mains
Pefferside
Whitekirk
Tithe Barn
Lochhouses
Merrylaws
Bankhead
Whitekirk Br
Old Stonelaws
Waughton Castle
Brownrigg
Rockville
Sydserf
Congalton Cotts
Kingston
Kingston Fm
Balgone Barns
Balgone Ho
Carperstane
Redside
East Craig
Sheriff Hall
Craigmoor Wood
Howden
Old Mansion Ho
Newbyth
Binning Wood
Kamehill
Oak Wood
Ashfield Ho
Old Mansion Ho
Bonnington
Quarry (dis)
Bonnington Law
Whouse
Gullane Primary
Muirfield
Dirleton Castle
Dirleton Castle
Dirleton Primary
Scho
Links
Golf Course
Golf Course
Golf Course

There are greater opportunities to locate the small turbines of Typology D in this landscape provided these are located so visually associated with farms and other buildings in order to limit the spread of structures.

All turbines should be sited to avoid significant intrusion on the setting to the Garleton Hills, and particularly the notably rugged north face of these hills, on designed landscape features and on settlement. Capacity is likely to be quickly reached in this very open landscape where inter-visibility between developments (and the well-settled nature of this landscape) increases potential for significant cumulative landscape and visual effects to occur. The use of turbines of different designs and sizes in proximity to each other should be avoided as this could lead to visual confusion and a discordant appearance, particularly given the presence of existing industry and infrastructure which already creates a cluttered character in places.

Detailed siting and design should accord with the guidance set out in Section 4 of this report.

Agricultural Plain Sub-Area 3 South

Summary of sensitivity

Larger scale typologies could relate to the broad scale of the landscape and the general absence of distinctive landform. They would however dominate the scale of small domestic buildings in this well-settled area and could also impact on designed landscapes, in both this and adjacent character areas. Cumulative landscape and visual effects are more likely to occur between these larger typologies and existing wind farms within the Lammermuir Hills. There would be overall ***Medium-high*** sensitivity to Typologies A and B.

Smaller turbines would have a better scale relationship with existing settlement and would be less visually intrusive with ***Medium*** sensitivity concluded for Typology C and ***Low*** sensitivity for Typology D.

Constraints

- Designed landscapes, largely situated in adjacent character areas where large turbines could affect their wider setting.
- Potential cumulative landscape and visual effects with existing and consented windfarm developments in the adjacent Lammermuir Hills.
- The simple, uncluttered character of this rural landscape which would be sensitive to multiple developments of single and small groups of larger turbines.

Opportunities

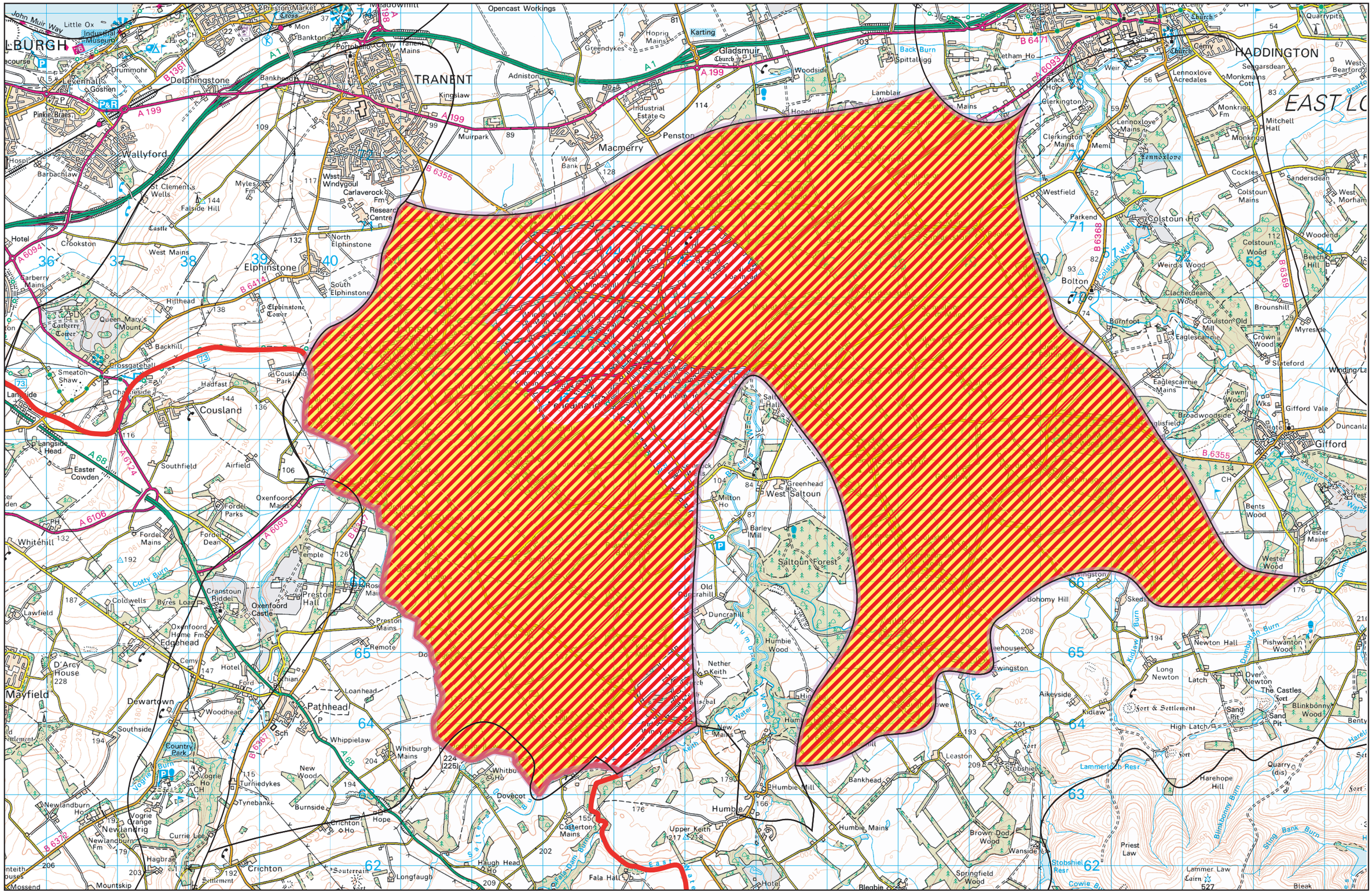
- The broad, gently undulating landform of this character area with its often simple pattern of large fields set back from the more wooded adjacent river valleys.

Guidance on development

While the larger typologies assessed could relate to the broad, simple landform of this character area, it is considered that there is no scope to accommodate turbines of this scale (Typologies A and B) in this landscape due to the likely significant adverse effects on a number of other key characteristics.

There is some limited scope to locate Typology C, with its single and small clusters of turbines between 20m and up to and including 42m height, as turbines of this size would be less likely to dominate existing settlement. Turbines should be sited below small hill tops and ridgelines which would reduce their prominence. Multiple developments of single and small groups of turbines within this typology could however quickly affect the simple, uncluttered character of this landscape and incur significant cumulative landscape and visual effects. There would be increased capacity to accommodate multiple developments of single and small groups of turbines towards the lower height band of this typology (<30m high to blade tip) as these would be less visually prominent.

There are greater opportunities to locate the small turbines of Typology D in this landscape provided these are located so visually associated with farms and other buildings in order to limit the spread of structures in the landscape.


TRANENT
L BURGH
HADDINGTON
EAST LO
Gladsmuir
Macmerry
Penston
Elphinstone
Cousland
Gifford
Bolton
Mayfield
Pathhead
Humbie
Wallyford
Dewartown
Crichton
Saltoun Forest
Opencast Workings
Karting
Industrial Museum
Country Park
Research Centre
Castle
Hotel
Church
Cemy
Sch
Hospl
Fm
Mains
Hill
Wood
Burn
Water
Resr
Quarry
Weir
Golf Course
Caravan Site
Sort & Settlement
Settlement
Tower
Mount
Hall
Ho
Cott
Lodge
Steading
Ruin
Cairn
Spring
Well
Sluice
Pond
Reservoir
Viaduct
Bridge
Footbridge
Ford
Level Crossing
Tunnel
Quarry
Pit
Boundary Stone
Milestone
Milepost
Fingerpost
Telegraph Pole
Electricity Pylon
Electricity Substation
Pylon
Mast
Wind Turbine
Windmill
Windpump
Telephone Kiosk
Post Box
Public Toilets
Public Telephone
Public Footpath
Public Bridleway
Public Byway
Public Path
Footpath
Bridleway
Byway
Track
Road Used as Public Path
Private Road
Road Under Construction
Road Unfenced
Road Liable to Flooding
Gate
Stile
Cattle Grid
Level Crossing
Tunnel
Ferry
Ferry Terminal
Pier
Slipway
Boatyard
Lighthouse
Beacon
Coastguard Station
Lifeboat Station
Radio Station
Radar Station
Weather Station
Observatory
Telescope
Viewpoint
Picnic Site
Camping Site
Caravan Site
Youth Hostel
Bunkhouse
Refuge
Shelter
Toilets
Information
Parking
Park and Ride
Cycle Hire
Cycle Route
Golf Course
Golf Club
Golf Driving Range
Golf Practice Ground
Golf Tee
Golf Green
Golf Bunker
Golf Water Hazard
Golf Rough
Golf Fairway
Golf Clubhouse
Golf Pro Shop
Golf Caddy Shed
Golf Trolley Park
Golf Buggy Park
Golf Buggy Path
Golf Buggy Track
Golf Buggy Hire
Golf Buggy Repair
Golf Buggy Wash
Golf Buggy Charging
Golf Buggy Storage
Golf Buggy Maintenance
Golf Buggy Parking

All turbines should be sited to avoid significant intrusion on the setting of settlements and on designed landscapes. The use of a restricted number of turbine designs will be essential in optimising capacity to accommodate multiple developments.

Detailed siting and design should accord with the guidance contained in section 4 of this report.

The Garleton Hills

General location

The Garleton Hills are a prominent landmark within East Lothian. They form one of the larger igneous intrusions of a broad band of volcanic rocks aligned north-east across the Agricultural Plain and cumulating in North Berwick Law and the Bass Rock.

Findings of original study on larger typologies

The original 2005 study found that there was no capacity for windfarm development in the Garleton Hills as none of the development typologies considered could be accommodated without significant adverse impacts arising on both landscape character and views and visibility.

Existing/consented and proposed wind farm development

A single turbine has recently been erected within this character area.

The existing windfarm developments of Crystal Rig/Aikengall and Dun Law, sited within the Lammermuir Hills, are clearly visible from the Garleton Hills.

Potential offshore windfarm sites within the outer reaches of the Firth of Forth would lie approximately 40km from this character area and would therefore be likely to be barely visible.

Summary of sensitivity

There would be a ***High*** sensitivity to development typologies A, B and C. While Typology A is unlikely to be able to be physically accommodated in this landscape, the larger turbines within both typologies A and B would be highly visible from an extensive area and would significantly diminish the appreciation of the apparent vertical scale of these hills. Although the smaller turbines of typology C would have a less dominant effect on the scale of these hills, turbines over 20m height would still be significantly intrusive if sited on hill tops. These development typologies would visually compete with the focus presently provided by the hills (and the Hopetoun Monument), particularly in views from the north where they have a diverse craggy landform. They would also be likely to intrude on extensive views from popular walking routes and from roads within the hills. All typologies, but particularly larger turbines, would add to the clutter of man-made elements already present on some hill tops and further diminish the integrity of this landscape.

While sensitivity would be reduced for smaller turbines within typology D, it would still be ***Medium-high*** due to the limited scope to avoid the clutter associated with isolated structures in these highly scenic landmark hills.

Constraints

- The high visibility of these landmark hills seen from key transport routes and from settlements and where turbines would detract from their focus
- The rugged north face of the hills and diverse, craggy hill tops and ridges which would be sensitive to all typologies
- The Hopetoun Monument, which could be overwhelmed by larger turbines
- Cumulative effects with existing telecommunication masts on the hills

Opportunities

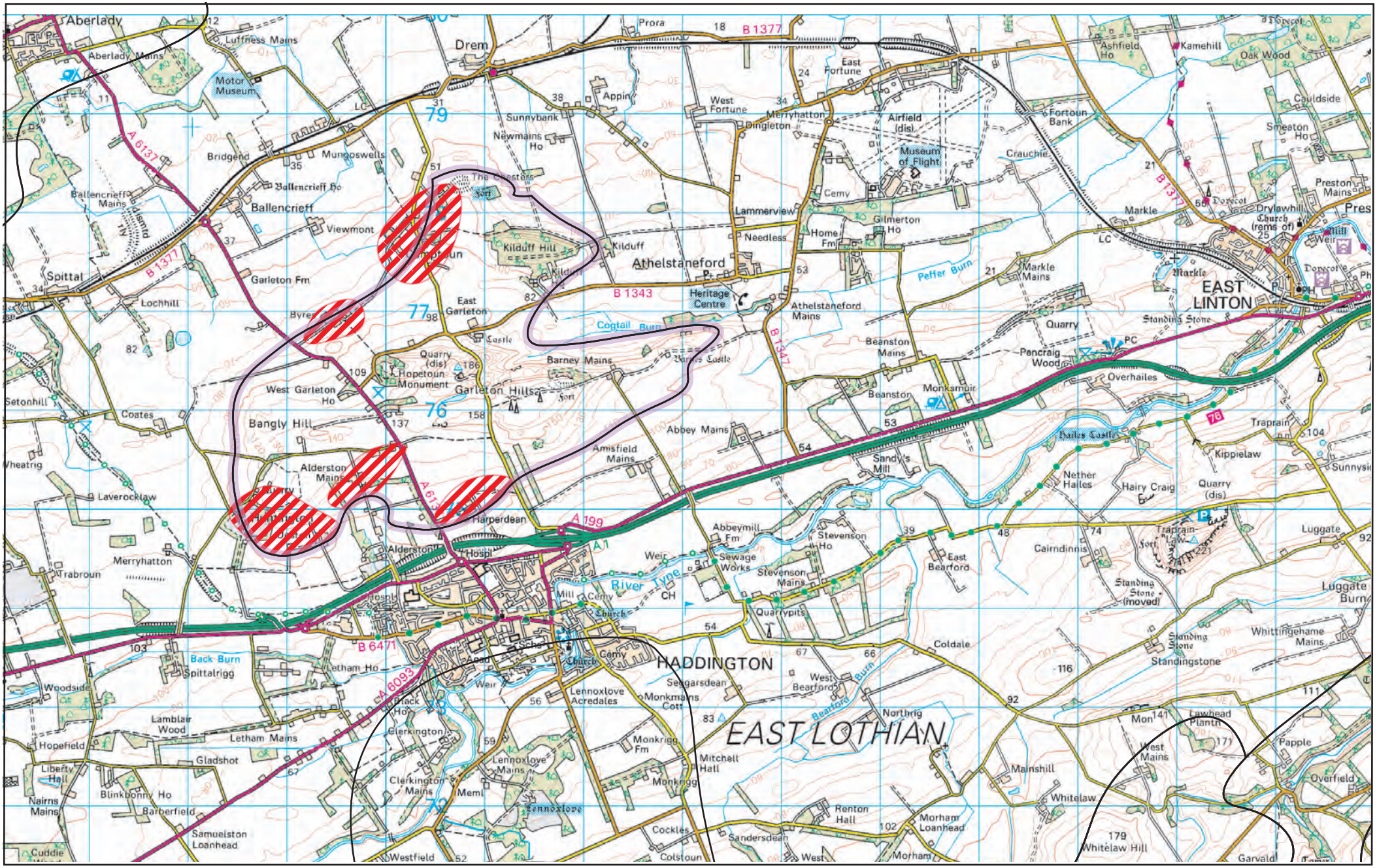
- Lower hill slopes away from sensitive ridges where small turbines could be visually associated with farms and other buildings

Guidance on development

There is no scope to accommodate turbines above 20m in height within this character area without significant adverse impacts occurring across a wide range of sensitivity criteria.

Small turbines below 20m high should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter in these highly sensitive landmark hills. They should avoid sensitive ridges and rugged hill tops and be sited on lower slopes where a backdrop of higher ground would minimise visual impact. Care should be taken to site turbines to avoid impacts on key views of the more rugged northern face of the Garleton Hills, from the B1343 for example, and on the setting of monuments and historic buildings. There is very limited scope for multiple developments of single and small groups of turbines in this small and highly sensitive landscape character area.

Detailed siting and design should follow the guidance set out in Section 4 of this report.



To be read in conjunction with Fig No 1

Opportunities for Development Typologies

none	A	none	C
none	B		D Opportunities to locate if visually associated with farms / buildings

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Fig No 8 **Supplementary Capacity Study for Wind Turbine Development 2011**

Garleton Hills

0 1 2 km

1 : 50,000

Mayfield/Tranent Ridge

General location

The Mayfield/Tranent Ridge is located on the north-eastern edge of East Lothian and extends into neighbouring Midlothian. This character area comprises an elongated north-east/south-west orientated low, undulating ridge forming a backdrop to the well-settled Esk valley.

Findings of original capacity study on larger typologies

The original capacity study concluded that there was overall low capacity for larger turbines within the Mayfield/Tranent Ridge landscape character area, reflecting the very limited scope for development to be sited to avoid impacts on this low ridge which forms a highly visible feature in the wider landscape.

Existing/consented and proposed wind farm development

A single small turbine (15m height to blade tip) has recently been erected near Falside Hill within the part of this character area that lies within East Lothian.

Potential offshore wind farm sites lie within the outer reaches of the Firth of Forth and there may be some visibility from the elevated and more open northern edge of this landscape, although they will be very distant with visual effects unlikely to be significant.

Summary of sensitivity

The larger development typologies sited within this area would diminish the appreciation of the apparent vertical scale of the Mayfield/Tranent Ridge by providing an element of 'scaling' and could affect the presently predominantly rural backdrop which this landscape provides to the wider setting of Edinburgh and the Dalkeith area. Larger turbines would also exacerbate the clutter of tall built structures evident in some parts of the ridge and could detract from the setting and scale of settlement and areas where a more diverse landscape pattern occurs. Larger turbines would also be highly visible, particularly from the wider area due to the visual prominence of this ridge. There would be a ***High*** sensitivity to Typology A and a ***Medium-high*** sensitivity to Typology B.

Sensitivity would be reduced for Typology C to ***Medium***, reflecting the greater scope for turbines of this size to relate to more open areas with a weaker landscape pattern and where they would minimise impact on prominent skylines and interaction with transmission lines and masts. There are greater opportunities to accommodate small turbines to minimise impacts on key sensitivities with an overall ***Low*** sensitivity assessed for Typology D.

Constraints

- The steep north-west facing slopes and ridge top of this landscape which is visually prominent from parts of Edinburgh and other settlements and major transport routes such as the A1
- Designed landscapes, including Carberry and Oxenfoord (the latter sited within the adjacent Scottish Borders) where turbines could impact on their integrity and setting.

- Cumulative effects with existing transmission lines, particularly in the Tranent/Elphinstone area, where turbines would exacerbate visual clutter.
- The relatively well-settled nature of this landscape where small settlements and houses could be dominated by larger turbines

Opportunities

- Lower south-east facing hill slopes away from sensitive ridges where small turbines could be visually associated with farms and other buildings

Guidance on development

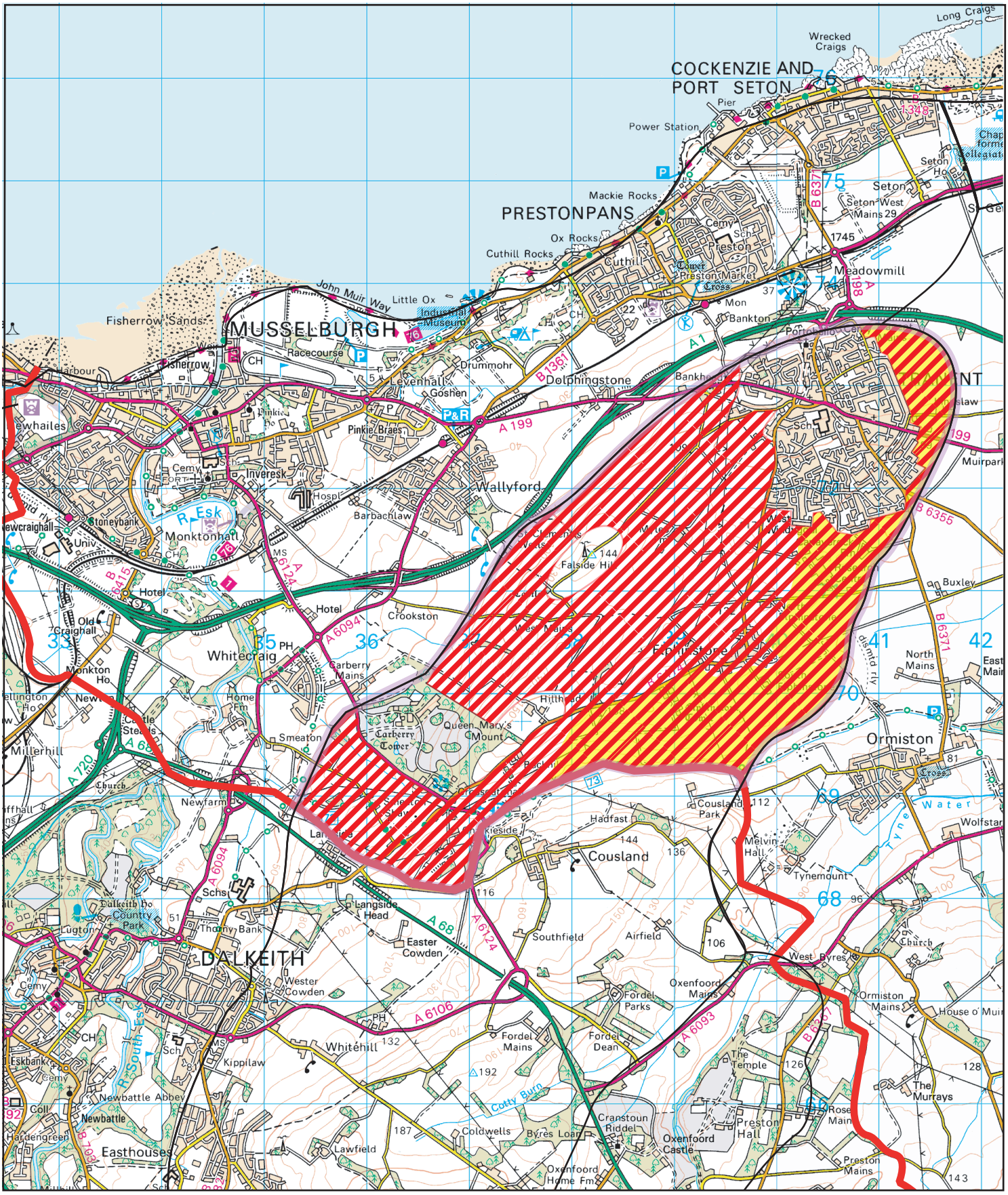
There is no scope to locate Typologies A and B (turbines > 42m) in this landscape due to the significant effects likely to occur across a range of sensitivity criteria.

Typology C, single and small groups of turbines between 20m and up to and including 42m high, could be accommodated in this landscape, although opportunities are very limited within the part of this landscape which lies in East Lothian. Turbines should be sited away from more prominent steep north-west facing slopes and ridges and should avoid exacerbating the visual clutter of existing transmission lines and masts evident in some parts of this character area. They should be associated with broader, gentler hill slopes where a backdrop of rising ground may reduce visual impact (particularly for turbines towards the lower height band of this typology <30m high). Turbines should avoid breaking the skyline of the ridge seen from Edinburgh and other settlements to the north-west. There is limited scope for multiple developments of single and small groups of turbines due to the cumulative effects likely to occur with existing masts and pylons in this landscape.

Small turbines below 20m high should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter. They should avoid prominent ridgelines and be sited on lower slopes where a backdrop of higher ground would minimise visual impact.

All turbines should be sited to avoid intrusion on key views to Edinburgh from the A68 and other elevated routes. They should also avoid impacting on the setting of the designed landscapes and wider policy features of Carberry and Oxenfoord Castle. It is important that the variety of turbine designs is restricted to avoid exacerbating clutter in this landscape.

Detailed siting and design should follow the guidance set out in Section 4 of this report.



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Opportunities for Development Typologies

To be read in conjunction with Fig No 1

none	A No scope to locate turbines of this size
none	B No scope to locate turbines of this size
	C Limited opportunities, Area of Search indicated subject to impact on key views, cumulative impacts with existing masts and transmission lines and on designed landscapes
	D Opportunities to locate small turbines if visually associated with farms / buildings

Fig No 9

Supplementary Capacity Study for Wind Turbine Development 2011

Mayfield / Tranent Ridge

1 : 50,000 0 1 2 km

Humbie, Gifford and Whittingehame River Valleys

General location

The Humbie, Gifford and Whittingehame Waters cut in a generally north/south alignment through the Agricultural Plain. They lie within consistently incised valleys characterised by dense woodland cover and policy landscapes.

The boundary of the Gifford River Valley landscape character area has been extended slightly to the north to include the Lennoxlove policies.

Findings of original capacity study on larger typologies

The original capacity study concluded that there was no capacity to accommodate windfarm development in the River Valleys and that all development typologies would incur significant adverse impacts on both landscape character and views and visibility. The original capacity study only considered turbines above 42m height to blade tip.

Existing/consented and proposed wind farm development

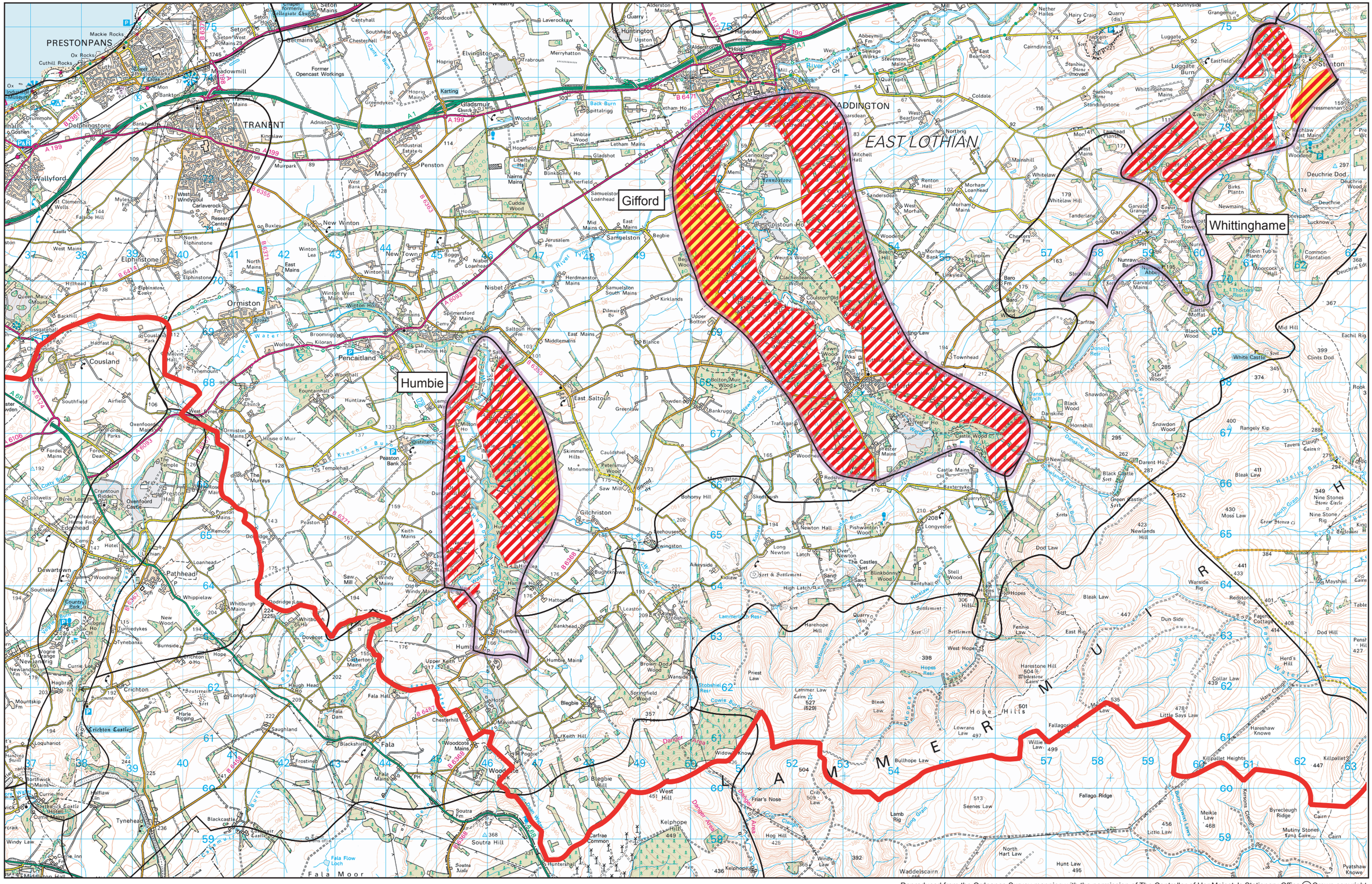
There is no existing windfarm or smaller turbine development within this character area.

Visibility of existing or currently proposed windfarm development in other landscape character areas (and within the approaches to the Firth of Forth) is likely to be very limited due to the incised and often rolling landform of these valleys and their dense woodland.

Summary of sensitivity

There are likely to be physical and technical constraints to accommodating larger development typologies within these valleys. The often complex rolling and incised landform together with the richly intricate pattern of woodlands, designed landscapes and small fields also present a major landscape constraint. These features provide an often highly scenic setting to the small historic settlements and mansion houses that are a key characteristic of these valleys, further increasing sensitivity, particularly to larger typologies. Although views from the River Valleys are restricted by landform and vegetation, larger turbines would extend beyond the visual containment of the incised landform and woodland and would result in intrusion on views from elevated roads and hills within surrounding landscapes. There would be a ***High*** sensitivity to Typologies A and B and a ***Medium to high*** sensitivity to Typology C.

There would be reduced sensitivity to smaller turbines below 20m height due to their ability to fit with the scale of larger buildings and woodlands. However, the complex landform and intricately patterned woodlands and other designed landscape features would still be sensitive even to these small turbines. Overall sensitivity would be ***Medium*** to typology D.



To be read in conjunction with Fig No 1

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Opportunities for Development Typologies

none A No scope to locate turbines of this size

none B No scope to locate turbines of this size

C Limited opportunities to acommodate turbines **below 30m** subject to impact on key views

D Opportunities to locate turbines of this size if visually associated with farms and other buildings and sited to avoid impacts on designed landscapes and key views

Fig No 10

Supplementary Capacity Study for Wind Turbine Development 2011

Humbie, Gifford & Whittingehame River Valleys

0 1 2 3 km

Constraints

- The complex rolling and incised landform of these river valleys and their rich pattern of woodlands and small enclosed pastures which would be sensitive to all development typologies
- The integrity and landscape setting to designed landscapes and small historic settlements located within these river valleys
- Footpaths and other recreational routes within these valley landscapes

Opportunities

- Broader, less rolling slopes with a more open character at the transition with the adjacent Agricultural Plain character area

Guidance on development

There is no capacity to accommodate larger development typologies (turbines over 42m high) within these valleys due to the significant adverse landscape and visual effects likely to occur across a wide range of sensitivity criteria.

There is some very limited scope to locate turbines towards the lower height band of Typology C (below 30m height) away from the intimately scaled valley floor and the complex rolling landform of valley sides. Turbines would need to avoid intrusion on designed landscapes, the setting of settlements and be sited to avoid significant intrusion on key views from adjoining landscape character areas. These constraints are likely to severely restrict opportunities to site this typology within the Whittingehame and Gifford Valleys (which feature extensive policies, and also an intricate interlocking landform in the case of the Gifford Valley) with increased scope associated with the broader and more gently undulating upper slopes of the Humbie Valley which occur at the transition with the 'Agricultural Plain' landscape character area. Turbines should be sited away from the sensitive 'edge' of upper slopes where they may overwhelm the scale of the incised valley and views from footpaths.

There is increased scope to site small turbines below 20m high within these River Valleys. These should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter in these highly sensitive valley landscapes. All turbines should be sited to avoid intrusion on the setting of settlements and impacting on the integrity of designed landscapes. Special care is needed to ensure that only well-designed turbines are used in this particularly sensitive landscape with limits on the range of designs used in order to minimise cumulative landscape and visual effects. There is limited scope for multiple developments of single and small groups of turbines in this landscape character area.

Detailed siting and design should follow the guidance set out in Section 4 of this report.

Eastern Lammermuir Fringe

General location

The Eastern Lammermuir Fringe comprises rolling foothills edging the Lammermuir Plateau and sweeping round to the east to form the backdrop to the Eastern Coastal Margin.

Findings of original capacity study on larger typologies

The original study concluded that there was no capacity to accommodate windfarm development in the East Lammermuir Fringe due to the sensitivities of the rolling and often complex rolling landform, the diverse land cover pattern and scale of this landscape but also the potential for cumulative effects to arise in combination with pylons, masts and windfarm development in adjacent landscape character areas.

Existing/consented and proposed wind farm development

There is a small turbine (15m to blade tip) at Danskine within this character area.

The rolling landform of this character area tends to contain views although the Crystal Rig and Aikengall windfarms, sited within the adjacent Lammermuir Plateau, are visible in close proximity from elevated roads, footpaths and hill tops. The proposed Wester Dod wind farm may be visible from the Oldhamstocks area.

Summary of sensitivity

Larger development typologies would conflict with the often complex rolling landform of small hills and strongly contained narrow valleys found within this character area. The diverse land cover pattern and distinctly rural character of this landscape would also be diminished by larger turbines and they could exacerbate the visual clutter associated with pylons and masts in the eastern part of this area. In some areas, there would be cumulative landscape and visual impacts with existing windfarm development in the adjacent East Lammermuir Plateau character area. While views from this character area are often restricted by landform, extensive and dramatic views from more elevated footpaths, hill tops and also occasionally from elevated roads at the transition with the adjacent East Lammermuir Plateau are a feature and larger turbines would impinge on the foreground of these views. All development typologies would be visually prominent if sited on the broader topped hills adjacent to the Eastern Coastal Margin landscape character area. There would be a ***High*** sensitivity to Typologies A and B and a ***Medium to high*** sensitivity to Typology C.

There would be reduced sensitivity to smaller turbines below 20m height due to their ability to fit with the scale of larger buildings and woodlands. However, the complex landform and intricately patterned woodlands and other designed landscape features found in parts of this character area would be sensitive even to these small turbines. Overall sensitivity would be ***Medium to low*** to typology D.

Constraints

- The complex rolling landform, intimate narrow valleys and the dramatic landform of the steep-sided Lothian Edge and pattern of distinctive knolly hills against the scarp of the Lammermuir Hills
- Visually prominent hill tops seen from key transport routes such as the A1, the East Coast railway and settlements
- Small scale settlements and designed landscapes within the adjacent Whittingehame Valley which would be particularly sensitive to larger turbines
- Cumulative landscape and visual effects with existing windfarm developments within the adjacent Lammermuir Hills and with existing transmission lines within parts of this landscape

Opportunities

- Broader, lower hill slopes with a more open character away from sensitive hill tops

Guidance on development

There is no capacity to accommodate larger development Typologies A and B (turbines over 42m high) within this landscape due to the significant adverse landscape and visual effects likely to occur across a wide range of sensitivity criteria.

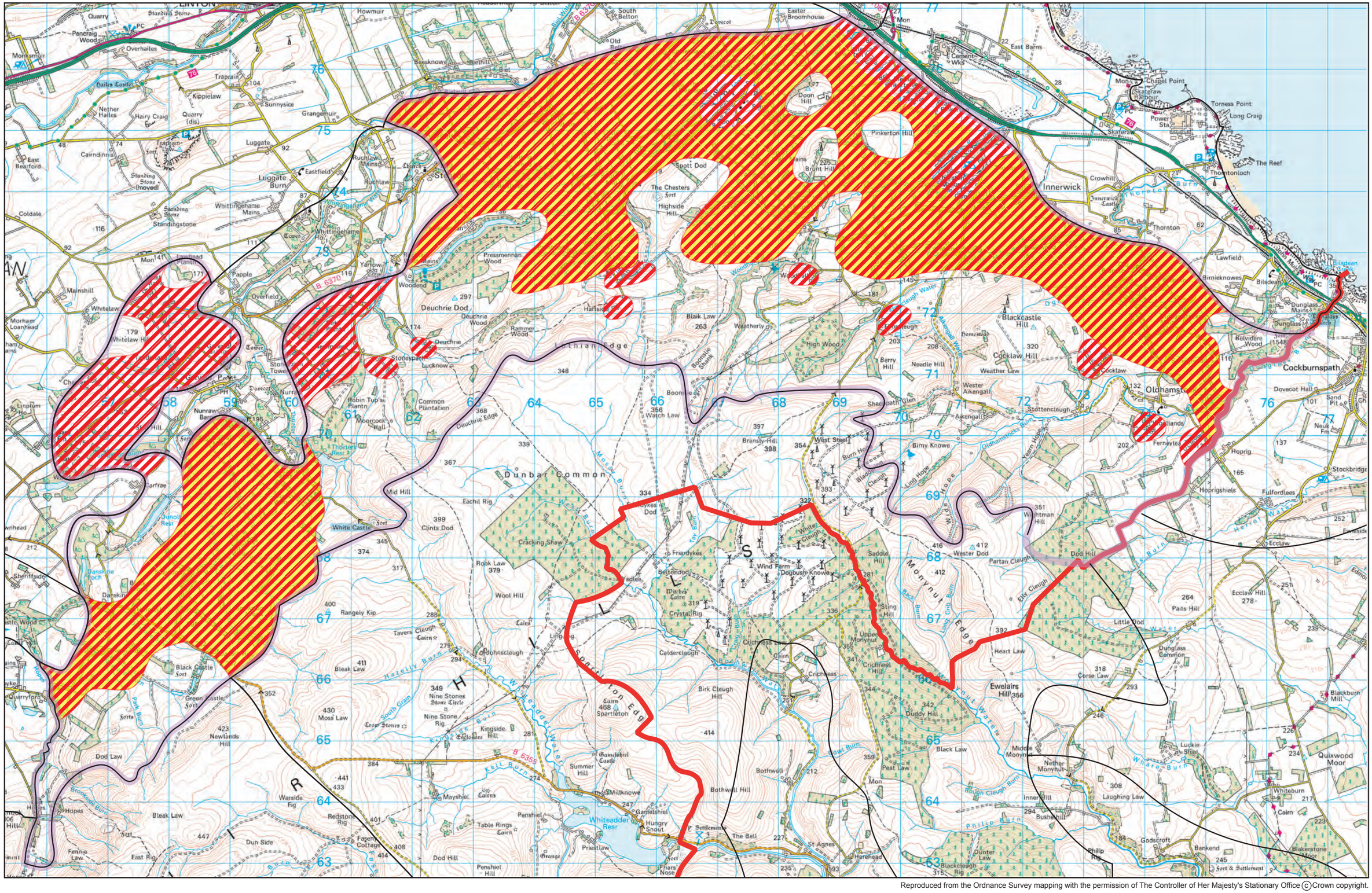
There is some limited scope to locate Typology C (turbines between 20 and up to and including 42m high) within this character area. Turbines should be sited on less complex broader hill slopes away from more complex rolling landform. Turbines should avoid eastern hill tops which are highly visible from the A1 and where they would be likely to incur significant cumulative effects with existing masts, transmission lines and the large turbines of the Crystal Rig windfarm. The distinctive band of small 'foothills' against the edge of the Central Lammermuir Plateau character area (these commonly featuring hill forts of archaeological interest) should also be avoided. Cumulative effects could also potentially arise close to the transition with the East Lammermuir Plateau where the turbines of Crystal Rig are clearly visible and the steep slopes of the Lothian Edge and Monynut Edge should be avoided with turbines instead being located on hill slopes (set down from more prominent hill tops) where a degree of 'back-cloth' from rising slopes would reduce visual impact in views from roads and settlement to the north.

There is increased scope to site small turbines below 20m high within this character area. These should be sited where they can be clearly associated with existing built development, farms or other settlement to minimise visual clutter within this landscape.

All turbines should be sited to avoid significant intrusion on the setting of settlements of Spott, Oldhamstocks and Innerwick and also settlements such as Stenton and Garvald within the adjoining Whittingehame Valley landscape character area. The designed landscapes of Whittingehame and Biel are also highly sensitive to intrusion, particularly from larger turbines located on the steep slopes which provide a backdrop to these richly patterned policies in views from Traprain Law and elevated roads to the north. Small turbines and turbines towards the lower height band of Typology C (below 30m) are likely to minimise impacts on settlements and designed landscapes. Special care is needed to ensure that only well-designed turbines are used in this sensitive landscape with limits on

the range of designs used in order to minimise cumulative landscape and visual effects. There is limited scope for multiple developments in this landscape character area.

Detailed siting and design should follow the guidance set out in section 4 of this report.


Innerwick
Cockburnspath
Oldhamstocks
Dunbar Common
Lothian Edge
Spartleton Edge
Monynut Edge
Whiteadder Reservoir
Whittingehame Water
Whittingehame Burn
Luggate Burn
Thorntonloch Burn
Oldhamstocks Burn
Monynut Water
Whiteadder Water
Blackcastle Hill
Ewelairs Hill
Deuchrie Dod
Blaik Law
Watch Law
Bransly Hill
Pinkerton Hill
Brunt Hill
Spott Dod
Doon Hill
Highside Hill
Bilsdean
Torness Point
Long Craig
The Reef
Chapel Point
Skateraw
Power Sta
Cement Wks
East Barns
Thornton
Crowhill
Lawfield
Dunglass
Belvidere Wood
Cocklaw Hill
Weather Law
Needle Hill
Berry Hill
Weatherly
High Wood
Pressmennan Wood
Woodend
Whittingehame Mains
Whittingehame Ho
Standingstone
Standing Stone (moved)
Luggate
Eastfield
Ruchlaw Mains
Ruchlaw
Yarrow
Overfield
Papple
Whitelaw
Whitelaw Hill
Mainshill
Morham Loanhead
Cairndinnis
East Bearford
Nether Hailes
Hairy Craig
Quarry (dis)
Traprain
Traprain Law
Kippielaw
Sunnyside
Grangemuir
Howmuir
South Belton
Old Belton
Beesknowe
Belhill
Biel
Easter Broomhouse
Dirrycot
Monksmuir
Pencraig Wood
Overhailes
Quarry
Standing Stone
Bailes Castle
Deuchrie Wood
Rammer Wood
Deuchrie
Stoneypath
Lucknow
Harfield
Common Plantation
Robin Tup's Plantn
Moorcock Hall
Deuchrie Edge
Thorter Rest
Nunraw Barns
Nunraw
Linplum Ho
Mid Hill
Eachil Rig
Clints Dod
Cracking Shaw
Rook Law
Wool Hill
Rangely Kip
Tavers Cleugh Cairn
Johnscleugh
Bleak Law
Hazelly Burn
Nine Stones Stone Circle
Nine Stone Rig
Crow Stones
Kingside Hill
Enclosure
Moss Law
Newlands Hill
Dod Law
Park Burn
Green Castle Fort
Black Castle Fort
Quarryford
Danskine Loch
Danskine
Sherriffside
Castle Wood
Hopes
Brookfield Burn
Bleak Law
Fennie Law
East Rig
Dun Side
Fasney Cottage
Redstone Rig
Warside Fig
Mayshiel
Cairns
Kell Burn
B 6355
B 6370
Gamelshiel Castle
Summer Hill
Millknowe
Gamelshiel
Hungry Snout
Table Rings Cairn
Penshiel
Penshiel Hill
Priestlaw
Grange
Dod Hill
Friars Nose
Settlement
The Bell
St Agnes
Harehead
Bothwell
Bothwell Hill
Birk Cleugh Hill
Caldercleugh
Crichness
Crichness Hill
Upper Monynut
Middle Monynut
Nether Monynut
Duddy Hill
Peat Law
Black Law
Heart Law
Sting Hill
Saddle Hill
Wester Dod
Partan Cleugh
Elw Cleugh
Dod Hill
Wind Farm
Dogbush Knowes
Friardykes
Bellendod
Ditched Cairn
Crystal Rig
Long Cairn
Cairn
Spartleton
Cairn
Tod Burn
Long Burn
Back Burn
Lund Crib Burn
Rough Cleugh Burn
Philip Burn
Oldhamstocks Burn
Kern Hope Burn
Bloodie Cleugh
Burn Hope
Ling Hope
Hope Burn
Bimy Knowe
West Steel
Sheepath Glen
Stottencleugh
Aikengall
Aikengall Water
Fernieyeat
Hoprig
Hoprigshiels
Fulfordlees
Stockbridge
Neuk Fm
Dovecot Hall
Sand Pit
Dunglass Mains
Dunglass Burn
Bilsdean Mains
Birnieknowes
Quixwood Moor
Blackburn Mill
Whiteburn
Laughing Law
Corse Law
Little Dod
Paits Hill
Ecclaw Hill
Ecclaw
Dunglass Common
Godscroft
Bankend
Blakerstone Moor
Philip Rig
Dunter Law
Blackcleugh Rig
Wester Aikengall
Inner Hill
Bushehill
Ewelairs Hill
Quarry
Pencraig Wood
Overhailes
Monksmuir
Traprain
Kippielaw
Sunnyside
Grangemuir
Nether Hailes
Hairy Craig
Quarry (dis)
Luggate
Eastfield
Ruchlaw Mains
Ruchlaw
Yarrow
Overfield
Papple
Whitelaw
Whitelaw Hill
Mainshill
Morham Loanhead
Cairndinnis
East Bearford
Standing Stone (moved)
Standingstone
Whittingehame Mains
Whittingehame Ho
Pressmennan Wood
Woodend
Deuchrie Dod
Deuchrie Wood
Rammer Wood
Deuchrie
Stoneypath
Lucknow
Harfield
Blaik Law
Weatherly
High Wood
Berry Hill
Needle Hill
Weather Law
Cocklaw
Cocklaw Hill
Blackcastle Hill
Wester Aikengall
Aikengall
Stottencleugh
Fernieyeat
Oldhamstocks
Dovecot Hall
Sand Pit
Neuk Fm
Hoprig
Hoprigshiels
Fulfordlees
Stockbridge
Dunglass Mains
Dunglass Burn
Bilsdean Mains
Birnieknowes
Quixwood Moor
Blackburn Mill
Whiteburn
Laughing Law
Corse Law
Little Dod
Paits Hill
Ecclaw Hill
Ecclaw
Dunglass Common
Godscroft
Bankend
Blakerstone Moor
Philip Rig
Dunter Law
Blackcleugh Rig
Wester Aikengall
Inner Hill
Bushehill
Ewelairs Hill
Middle Monynut
Nether Monynut
Duddy Hill
Peat Law
Black Law
Heart Law
Sting Hill
Saddle Hill
Wester Dod
Partan Cleugh
Elw Cleugh
Dod Hill
Wind Farm
Dogbush Knowes
Friardykes
Bellendod
Ditched Cairn
Crystal Rig
Long Cairn
Cairn
Spartleton
Cairn
Tod Burn
Long Burn
Back Burn
Lund Crib Burn
Rough Cleugh Burn
Philip Burn
Oldhamstocks Burn
Kern Hope Burn
Bloodie Cleugh
Burn Hope
Ling Hope
Hope Burn
Bimy Knowe
West Steel
Sheepath Glen
Stottencleugh
Aikengall
Aikengall Water
Fernieyeat
Hoprig
Hoprigshiels
Fulfordlees
Stockbridge
Neuk Fm
Dovecot Hall
Sand Pit

North Lammermuir Platform

General location

The North Lammermuir Platform forms a long band of undulating farmland and small foothills fringing the northern edge of the Lammermuir Hills. This character area extends west into Midlothian.

Findings of original capacity study on larger typologies

The original 2005 capacity study concluded that there was low capacity to accommodate larger single and wind farm development typologies within the North Lammermuir Platform character area. Some limited scope was however identified for turbines towards the lower height band of typology (2) considered in the study (65m-42m turbine height).

Existing/consented and proposed wind farm development

There is no existing wind farm development within this character area although a few single small turbines are present in the Gifford area. Existing and consented wind farms located within the Lammermuir plateau are visible from parts of this character area.

Summary of sensitivity

A number of key constraints limit scope for accommodating larger turbines in this area. These principally relate to the effect of tall turbines on the scale and pattern of dispersed settlement and field and woodland pattern. Occasional distinctive landform features would be highly sensitive to development. These include the dramatically steep and rugged scarp slopes of the Lammermuir Hills which form the backdrop to this character area and also the series of pronounced small hills lying at the foot of this scarp which commonly feature hill forts of archaeological interest. This character area provides the foreground to extensive views to and from the Lammermuir Plateau and larger turbines could intrude on these views, particularly where sensitivity to development is thus increased. Cumulative landscape and visual effects are more likely to occur between larger typologies and existing wind farms within the Lammermuir Hills. There would be a ***High*** sensitivity to Typology A and a ***Medium-high*** sensitivity to Typology B.

Sensitivity would be reduced to ***Medium*** for Typology C due to the increased scope to associate smaller turbines with broader hill slopes, away from more sensitive complex landform which tends to occur close to the scarp edge of the Lammermuir Hills. There would be ***Low*** sensitivity to Typology D due to the ability of these small turbines to fit with the scale of landscape features and to be visually contained by woodlands and landform.

Constraints

- Distinctive knolly hills lying at the foot of the Lammermuir Hills which also commonly feature hill forts of archaeological interest
- The dramatic steep scarp of the Lammermuir Hills which provides a backdrop to this character area and key views to it from the B6368
- The strong and distinctive pattern of policy woodlands, field trees and hedgerows characteristic of the western part of this landscape

- Small scale settlements and designed landscapes within this and the adjacent Humbie Valley which would be particularly sensitive to larger turbines
- Cumulative landscape and visual effects with existing windfarm developments within the adjacent Lammermuir Hills

Opportunities

- Broader, gentle hill slopes away from prominent hill tops

Guidance on development

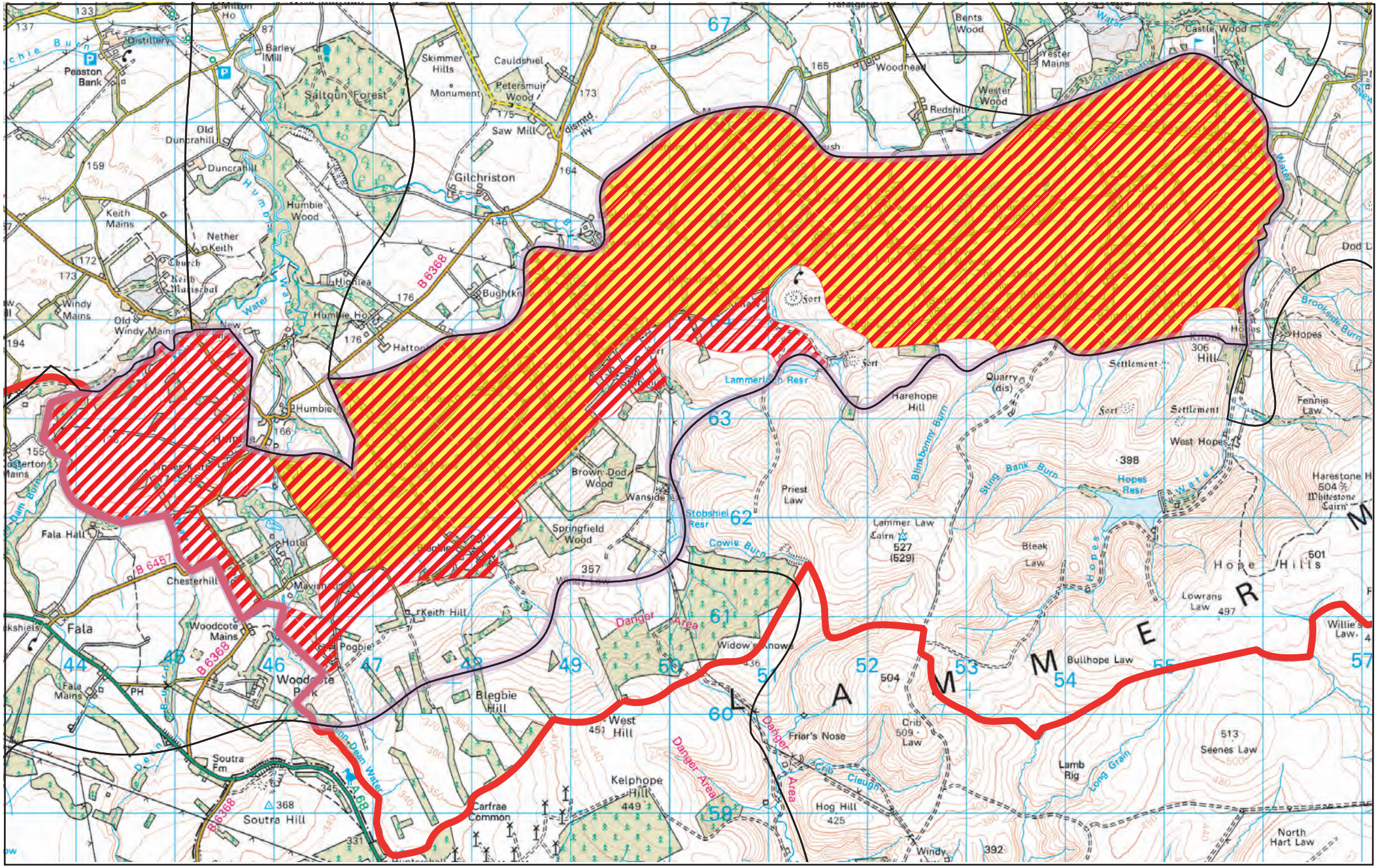
There is no scope to accommodate the larger turbines of Typologies A and B within this character area due to the significant adverse effects likely to occur across a number of key characteristics.

There is some scope to locate Typology C, with its single and small clusters of turbines between 20m and up to and including 42m height, although cumulative effects with the consented windfarm of Pogbie may be a constraint particularly in the western part of this character area. Turbines should be located on more gently undulating areas at the transition with the Agricultural Plain avoiding the more pronounced small, knolly hills lying at the foot of the Lammermuir Plateau. They should be sited on broader, gentle hill slopes, set down from prominent hill tops where visibility could be minimised by a backdrop of rising ground. Multiple developments of this typology could quickly dominate the strong, coalescing pattern of woodlands and field trees and uncluttered character of this landscape and on-going review of cumulative landscape and visual effects will be essential. There is likely to be increased capacity to accommodate multiple developments of turbines towards the lower height band of this typology (<30m high) as these would be less visually prominent and be likely to have less of a cumulative impact with existing/consented windfarm development.

There are greater opportunities to locate the small turbines of Typology D in this landscape provided these are located so visually associated with farms and other buildings in order to limit the spread of built structures in the landscape.

All turbines should be sited to avoid significant intrusion on the setting of settlements such as Humbie, on designed landscapes in this and adjoining character areas, and on key views to the dramatic scarp face of the Central Lammermuir Plateau, for example from the B6368 and on the setting of hill forts. The use of a restricted number of turbine designs will be essential in optimising capacity to accommodate multiple developments.

Detailed siting and design should follow the guidance set out in section 4 and Annex A.



To be read in conjunction with Fig No 1

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Opportunities for Development Typologies

none A No scope to locate turbines of this size

none B No scope to locate turbines of this size

C Limited opportunities, Area of Search subject to impact on key views to Lammermuir scarp, effects on distinctive pattern of woodland, hedges and field trees and cumulative effects with other windfarm development

D Opportunities to locate smaller turbines if visually associated with farms and buildings

Fig No 12 Supplementary Capacity Study for Wind Turbine Development 2011

North Lammermuir Platform

1 : 50,000 0 1 2 km

East Lammermuir Plateau

General location

The eastern part of the Lammermuir Hills comprises an undulating plateau cut by the Whiteadder Valley. This upland area forms a backdrop to the eastern coastal plain and foothills of East Lothian and to the sparsely populated farmed valleys of the Borders to the south.

Findings of original capacity study on larger typologies

The original 2005 capacity study concluded that there was low capacity to accommodate larger single and wind farm development typologies within the East Lammermuir Plateau. This was because although some key characteristics of this upland landscape could relate to larger scale turbines, the presence of existing and consented wind farm development increased sensitivity due to potential cumulative landscape and visual effects.

Existing/consented and proposed wind farm development

The existing large scale wind farm of Crystal Rig 1, 1a, 2 and 2a (85 turbines, 125m max height) and the Aikengall wind farm (16 turbines, 125m height) are sited in this character area. The proposed Wester Dod wind farm (30 turbines, 145m height) is also located within this character area.

The consented Fallago Rig wind farm is located in the adjacent Central Lammermuir Plateau character area but will be visible across much of this character area and seen cumulatively with the existing Crystal Rig and Aikengall wind farms.

Summary of sensitivity

There would be a ***High*** sensitivity to Typologies A and B within this character area due to the cumulative landscape and visual effects likely to occur in association with existing and consented wind farm developments in this and adjacent upland character areas. The sheer-sided dramatic landform features of the Spartleton and Monynut Edges are now dominated by wind farm development and remaining open and distinct hill tops, such as Spartleton, Penshiel and Priestlaw Hills, and the contained Whiteadder valley and reservoir are important features providing visual relief. Larger wind turbine development would diminish the unity and integrity of remaining open hill tops and valleys with a less fragmented landscape pattern and the proportion of open sweeping hills to 'developed' skyline within this character area.

While there would be a reduced sensitivity to Typology C with ***Medium-high*** sensitivity due to some very limited opportunities for turbines towards the lower height band of this typology (<30m high) to be sited so less visually prominent, cumulative landscape and visual impacts remain key limiting factors. Although the smaller turbines of Typology D (below 20m to blade tip) have greater potential to provide a clear scale differential with larger turbines within surrounding wind farm developments, sensitivity would be ***Medium***, reflecting the potential for even small turbines to appear out of scale within these more extensive uplands and to incur cumulative landscape and visual impacts if not closely associated with existing buildings within this sparsely settled area.

Constraints

- Cumulative landscape and visual effects likely to occur in association with existing and consented wind farm developments in this and adjacent upland character areas.
- Remaining open and distinct hill tops, such as Spartleton, Penshiel and Priestlaw Hills, and the Whiteadder valley and reservoir which are important features providing visual relief from existing/consented windfarm development.

Opportunities

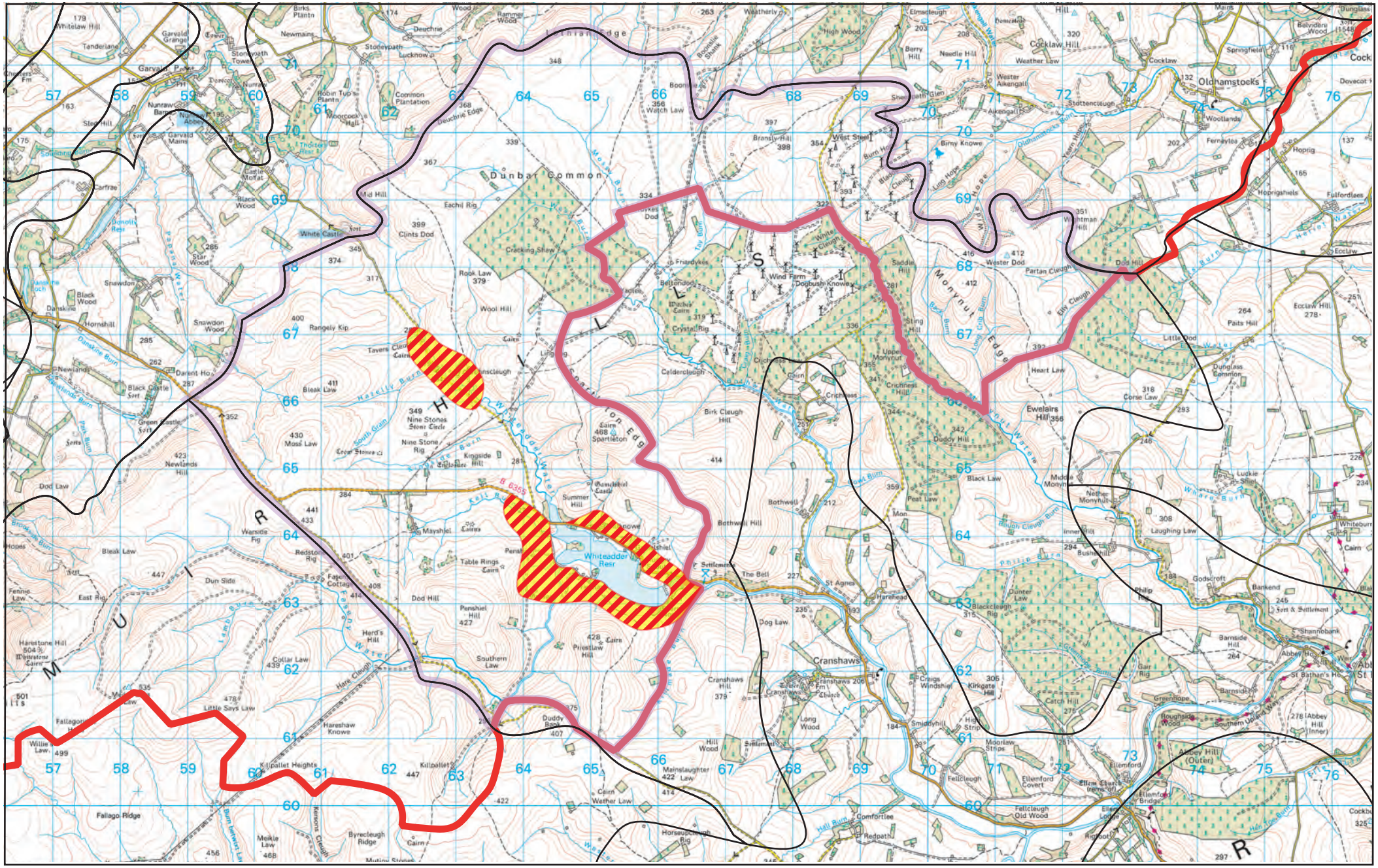
- Lower hill slopes visually associated with existing settlement within the Whiteadder valley

Guidance on development

There is no scope for the larger development Typologies A and B to be accommodated within this character area. This is because capacity is considered to have been reached in terms of the degree of large scale wind farm development which already characterises this landscape and the significant cumulative effects that would be associated with any further development of larger turbines.

There is some very limited scope for smaller turbines, towards the lower height band of Typology C (below 30m height in order to achieve a clear differential with existing windfarm development) and Typology D to be accommodated. Turbines should be associated with existing buildings such as farms which are set within the Whiteadder Valley or on gentler slopes or low hills where they could be back-dropped by rising ground. They should be sited away from sensitive scarp edges and prominent open hill tops which are important landscape features, separating existing windfarm developments and providing the setting to settled valleys and the adjacent Eastern Lammermuir Fringe. Development should avoid the more intricate edges of the Whiteadder Reservoir.

Detailed siting and design should follow the guidance set out in Section 4 of this report.


Dunbar Common
Cockburn Law
Dunbar
Oldhamstocks
Cockburnspath
Cockburn Edge
Monynut Edge
Dunglass Common
Cranshaws
Whiteadder Reservoir
Fallago Ridge
Killapallet Heights
Mainslaughter Law
Ellemford
Abbey Hill (Outer)
Abbey Hill (Inner)
Ellemford Bridge
Ellemford Covert
Felliecleugh
Felliecleugh Old Wood
Comfortlee
Redpath
Cranshaws Hill
Dod Hill
Penshiel Hill
Southern Law
Collar Law
Harestone Hill
Little Says Law
Willie Law
Meikle Law
Byrecleugh Ridge
Horsepoolrigh Rig
Wether Law
Hareshaw Knowe
Duddy Bank
Long Wood
Hill Wood
Smiddyhill
Moorlaw Strips
Catch Hill
Greenhope
Roughside Wood
Barnside
Barnside Hill
Shannobank
Godscroft
Bankend
Laughing Law
Dunter Law
Blackcleugh Rig
Gair Rig
Kirkgate Hill
Craigs Windshiel
Dog Law
Bothwell
Bothwell Hill
Peat Law
Black Law
Ewelairs Hill
Heart Law
Corse Law
Paits Hill
Little Dod
Ecclaw Hill
Ecclaw
Hoprigshiels
Hoprig
Fernaylea
Woollands
Springfield
Cocklaw Hill
Cocklaw
Weather Law
Wester Aikengall
Stottencleugh
Needle Hill
Berry Hill
High Wood
Elmscleugh
Weatherly
Deuchrie
Deuchrie Edge
Stoneypath
Lucknowie
Newmains
Garvald Grange
Garvald Park
Garvald Mains
Nunraw Barns
Nunraw Abbey
Robin Tup's Plantn
Moorcock Hall
Common Plantation
Thorter Rest
Castle Moffat
Black Wood
Star Wood
Eachil Rig
Mid Hill
Clints Dod
White Castle
Cracking Shaw
Rook Law
Wool Hill
Rangely Kip
Tavers Cleuch Cairn
Snawdon
Snawdon Wood
Hornshill
Danskine
Danskine Loch
Newlands
Newlands Hill
Black Castle Sort
Green Castle Sort
Darent Ho
Bleak Law
Moss Law
Nine Stones Stone Circle
Nine Stone Rig
Crow Stones
Kingside Hill
Enclosure
Warside Fig
Redston Rig
Fagend Cottage
Table Rings Cairn
Dun Side
East Rig
Fenrae Law
Herd's Hill
Dod Law
Bleak Law
Hopes
Brockie Burn
Pease Burn
Dunglass Burn
Whiteadder Water
Dowlaw Burn
Lamb Burn
Have Cleugh
Hell Burn
Kell Burn
Hatelly Burn
Pease Burn
Monynut Burn
Long Crib Burn
Whiteadder Burn
Philip Burn
Dowlaw Burn
Ellemford Burn
Hen Moss Burn
Burn between Law and Meikle Law
Kennons Cleugh
Mutiny Stones
Cairn
Summer Hill
Spartleton
Priestlaw Hill
Mayshiel
Whitchester
Chesterlee
Friardykes
Bellendood
Ditchy Cairn
Crystal Rig
Wind Farm
Dogbush Knowe
Saddle Hill
Sting Hill
Upper Monynut
Nether Monynut
Middle Monynut
Crichness
Crichness Hill
Celdercleugh
Birk Cleugh Hill
Duddy Hill
Inner Hill
Bushnell
Philip Burn
Whiteburn
Cairn
Settlement
Harehead
The Bell
St Agnes
Cranshaws Fm
Cranshaws Church
Cranshaws Hill
Long Wood
Hareshaw Knowe
Killapallet
Mainslaughter Law
Wether Law
Comfortlee
Redpath
Horsepoolrigh Rig
Byrecleugh Ridge
Fallago Ridge
Meikle Law
Little Says Law
Willie Law
Collar Law
Harestone Hill
Dun Side
East Rig
Fenrae Law
Herd's Hill
Penshiel Hill
Southern Law
Dod Hill
Table Rings Cairn
Mayshiel
Whitchester
Chesterlee
Summer Hill
Spartleton
Priestlaw Hill

Plateau Grassland

General location

The Plateau Grassland character area covers the western part of the Lammermuir Hills and comprises an upland plateau of smooth, gently undulating hills covered by rough grassland and coniferous woodland. Only a small part of the Plateau Grassland falls within East Lothian and the assessment which follows only considers sensitivity within the small part of the Plateau Grassland which lies within East Lothian.

Findings of original capacity study on larger typologies

The original 2005 capacity study concluded that there was moderate to high capacity for development within the Plateau Grassland character area with an extension to existing windfarm development considered to be the optimum typology in terms of minimising landscape and visual impacts. This assessment considered sensitivity across the whole of the Plateau Grassland character area lying in East Lothian, Midlothian and Scottish Borders. The Dun Law windfarm extension was proposed, but not consented, at the time of the 2005 study and this has now been constructed. The Pogbie windfarm was also consented in 2009 and would be located on the northern edge of this character area within East Lothian This scheme comprises 6 turbines, 76m high. These windfarms did not form part of the landscape and visual baseline assumed for the original sensitivity assessment and the conclusions on sensitivity have therefore been substantially reviewed within this current supplementary assessment.

Existing/consented and proposed wind farm development

The existing large scale wind farm of Dun Law I and II is located in this character area (within Scottish Borders) and comprises a total of 61 turbines between 62.5m and 75m high. The Pogbie windfarm was also consented in 2009 and is located on the northern edge of this character area within East Lothian. This scheme comprises 6 turbines, 76m high.

Summary of sensitivity

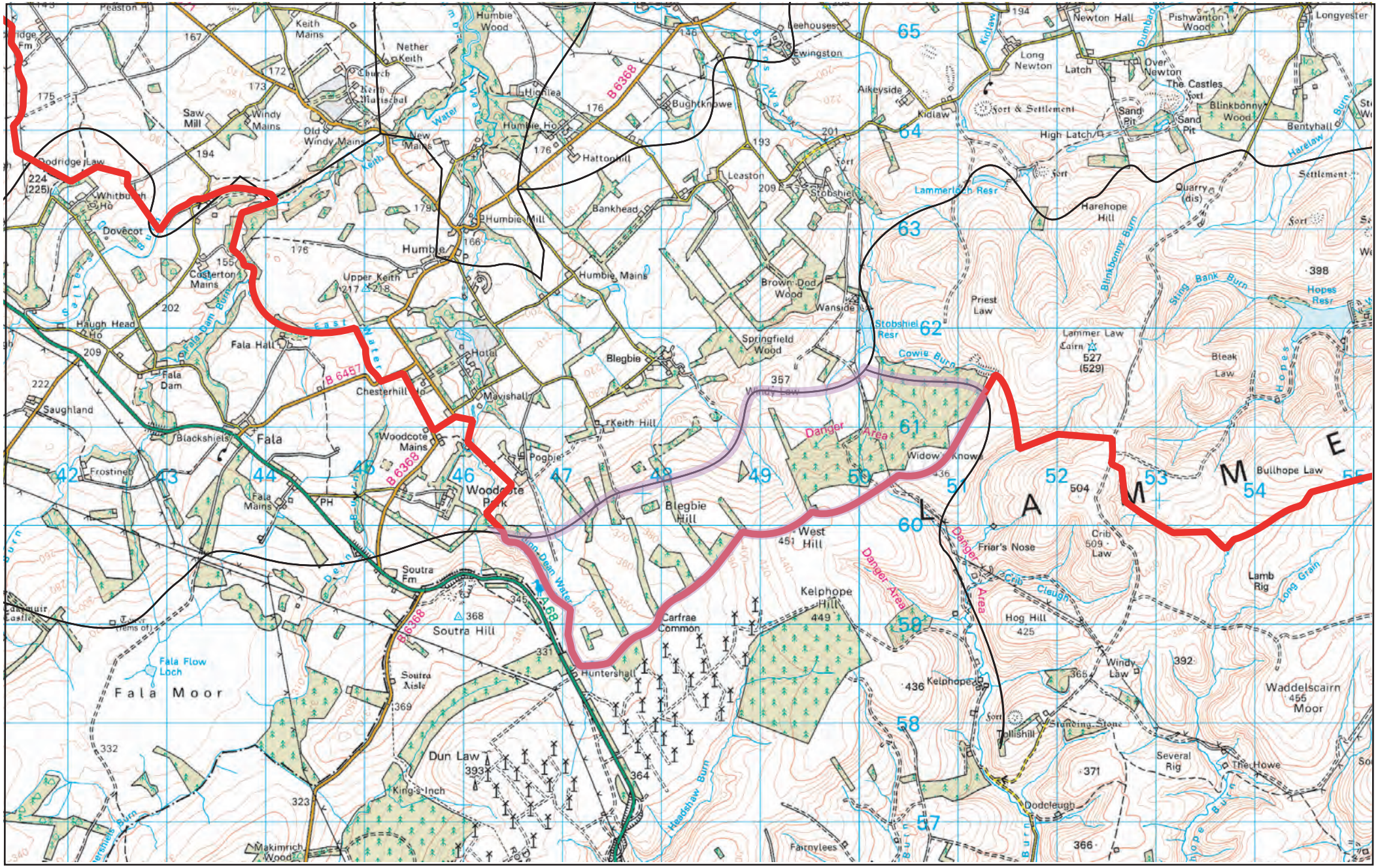
Existing and consented windfarm development is a key characteristic of the wider Plateau Grassland landscape character area. The part of this character area which lies within East Lothian comprises the steep scarp slopes of the Lammermuir Hills. These scarp slopes are sensitive to all development typologies in that they form a highly visible backdrop to the adjacent 'North Lammermuir Platform' and the western part of the 'Agricultural Plain' character areas. Blegbie Hill and West Hill are also important in forming a rim of higher ground which visually contains the expansive upland basin of the plateau to the south where the existing Dun Law windfarm is located and thus limits close views of this development from the 'North Lammermuir Platform'. Significant cumulative effects would be likely to occur on views from the A68 and from longer views from the north if any of the development typologies considered in this study were sited on these largely open scarp slopes as they would be seen in conjunction with the existing and consented windfarms of Dun Law and Pogbie. There would be a ***High*** sensitivity to all typologies within this character area.

Constraints

- Cumulative landscape and visual effects likely to occur in association with existing and consented wind farm developments in this character area
- The highly visible steep scarp slopes of the Lammermuir Hills and the rim of slightly higher ground formed by Blegbie Hill and West Hill which is important in providing the setting to the existing windfarm of Dun Law and allowing dramatic views from the A68 across East Lothian

Guidance on development

There is no scope for any further development to be accommodated within the part of this character area which falls within East Lothian.



To be read in conjunction with Fig No 1

Opportunities for Development Typologies

none A No scope to locate this size of turbine

none B No scope to locate this size of turbine

none C No scope within East Lothian due to cumulative constraints

none D No scope within East Lothian due to absence of existing buildings

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Fig No 14 **Supplementary Capacity Study for Wind Turbine Development 2011**

Plateau Grassland

1 : 50,000 0 1 2 km

4. Guidance on the siting of smaller turbines

Introduction

The height of turbines relative to other structures in the landscape is a key consideration in terms of landscape 'fit'. With this in mind, three heights of 'small' turbines were considered when developing the guidance for this supplementary assessment. These are:

	Height	Approximate kW output
Micro wind	Freestanding < 12m	Up to 1.5kW
Small wind turbine	12m to <20m	1.5 kW – 15kW
Small – medium wind turbine	20m to <42m	15kW – 50kW

Micro wind developments

Domestic roof/wall mounted systems are most likely to have an impact on townscape and add to cumulative effects in urban areas. They have not been included in this landscape capacity assessment, as it is difficult to identify a robust list of sensitivities for this size of development which can be properly assessed at the strategic scale required for this locational guidance.

Freestanding <12m high turbines would generally relate well to the size of existing buildings in the landscape, including farm buildings. They are just over twice the height of a single storey house, while a two storey house is about 9m high to roof pitch. This height of turbine is also similar to small telephone masts and tall telegraph poles[7].

A single turbine of this height is most likely to be used to contribute to the energy needs of a house, farm or other rural based small business. The size means that it is relatively easy to accommodate in a settled landscape, if sited to be associated with a building cluster. Therefore, while it is recognised that the free standing turbines of up to 12m may have cumulative effects on the landscape, they have been excluded from the landscape sensitivity assessments.

Small turbines (12m – <20m in height)

This size of turbine has been included as a development typology in the landscape sensitivity assessments carried out in this supplementary study. The sensitivity assessment has assumed that single turbines and small groups of up to 3 turbines are most likely to be associated with this typology. Proposals for 'wind clusters' of small turbines over 3 in number are likely to have adverse impacts as the speed of blade movement seen on mass would be visually confusing and distracting.

Within the East Lothian landscape, the following issues have been identified as being particularly influential in terms of detailed siting of turbines of this size within character types and units identified as being appropriate for this typology:

- *Turbine height in relation to the scale of the landscape*
- *Landform and landscape shape*
- *Settlement and land use pattern and features*
- *Visibility*

[7] Telegraph poles are available in heights from 6m to 25m, although based on site observations most appear to be 10m or less in height.

- *Cumulative issues*

Turbine height in relation to the scale of the landscape

Landscape scale is made up of two factors, the scale of the landform and the scale of the pattern of land use. Assessing the scale of the landform involves assessing the perceived vertical height and horizontal expanse of the topography, as well as the degree of openness and containment created by topographical relief. The pattern of land use can create an additional layer of possible enclosure, for example where woodland and hedges provide containment, or conversely can reinforce openness, for example where moorland dominates. In addition, while we often assess sense of scale relative to ourselves within the landscape, individual elements, from trees to pylons, can offer reference points against which the scale of the landscape or the size of other elements is perceived and understood.

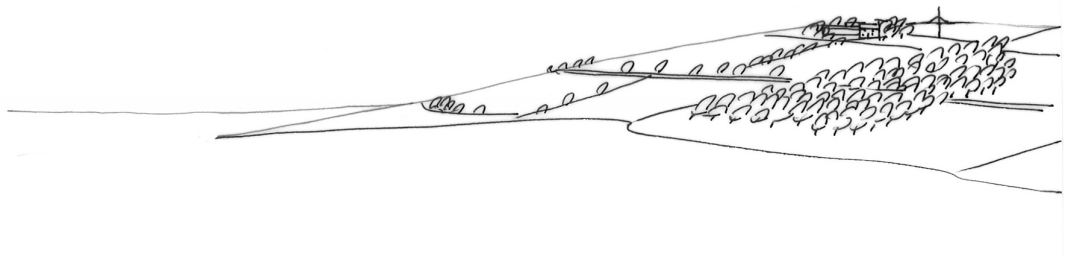
Small wind turbines from 12m to <20m, will appear as being up to about two and a half times the size of a two storey house. While this size of turbine is therefore likely to be prominent and may appear to tower above the buildings, a mature woodland, broadleaved or conifer tree is also about 15-20m in height. In the fertile lowland landscapes of East Lothian, where trees often achieve a good stature, turbines of this size may therefore relate well to the size of mature broadleaved or conifer trees in the landscape. Other structures of a similar height include taller telecom masts and small pylons.



Turbine size in relation to other landscape features: A turbine which is 2 times the height of the house, or a taller turbine located behind the ridge to reduce overall height from this view. The turbine is well scaled in relation to the size of other individual features. It is also located on the side of the hill, rather than the hill top, where it can be 'read' in conjunction with the farm buildings. This forms a 'cluster' of development, which reduces landscape and visual impact.

In some coastal areas, trees are more limited in height due to wind pruning and exposure and buildings may be low, or tucked away in sheltered locations. In such areas, the relationship between the turbines and landscape features is likely to be more sensitive, as turbines could easily dominate the scale of these individual elements which are key characteristics of these landscapes.

Care should be taken to site turbines where they do not dominate individual features. Turbines should avoid the immediate coastal edge and their size should be closely associated with the size of the features – which may be smaller than in more sheltered areas.



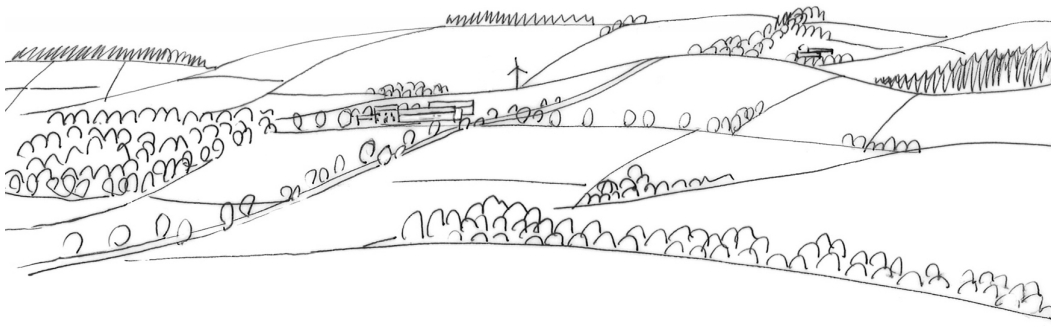
Coastal scenario: This turbine (Approx 1.5 times the height of the house) is located where it can relate to the farm steading cluster and the larger trees which are associated with these better soils. Note that the turbine is not located right on the skyline, where it would appear higher and more dominant. The smaller size fits in with the lower growing 'wind pruned' trees which are a feature of these coastal areas.

In the upland fringes, settlement is more dispersed. Trees, if present, may also be slow growing or short due to increased exposure. The size of the turbines should be closely associated with the size of these few features – which, like on the coast, may be smaller than in more sheltered areas. In these upland areas, however, there is also the opportunity to site turbines where they can be associated with the larger upland landform. Turbines can relate to the scale of the relief, foothills and ridges, or be back-dropped against higher land.

Landform shape

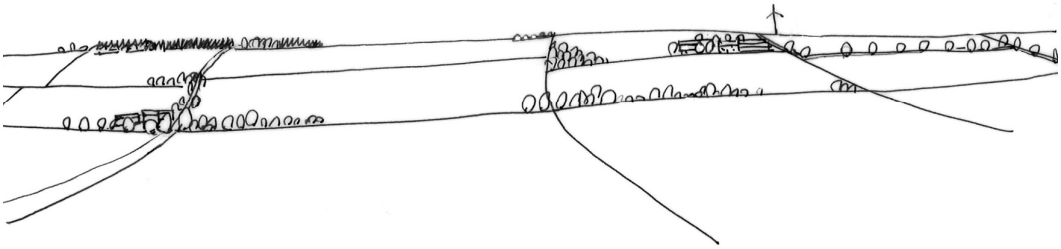
It was noted in site work that many of the lowland landscape character types are generally either more complex lower hill slopes (fringing the Lammermuirs), long ridges or wider, gently undulating plains.

Lower hill slopes are characterised by relatively complex, interlocking, rounded hill forms. They often have terraces, narrow ledges, folds and subtle hollows or distinct changes in gradient associated with rising slopes or dips which have the potential to create natural platforms for siting wind turbines.



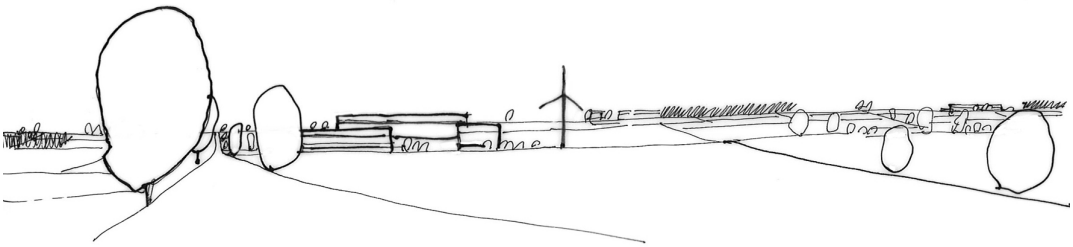
Landform shape – Lower hill slopes: This turbine, an indicative 2.5 times the size of the house, is clearly located on a flatter terrace below sloping ground. This interim ridge is back-dropped by more distant hills. The turbine is also close to the farm, creating a 'development cluster'.

Long ridges, which are a common feature of the East Lothian lowlands, tend to have low relief, with regular-shaped fields and woodlands extending up over the horizon. They have simple topography, with often gentle, evenly graded side slopes – and they do not rise very high. Turbines should be located where there are subtle changes of gradient in the topography, or clear breaks in slope. Aim to avoid the highest stretches of the ridgelines.



Landform shape – Long ridges: This indicative small turbine is located on the edge of the ridge, not on its highest point, which makes it less visually dominated than if it was located on the highest section of the ridge. The turbine is sited close to the farm, so that it creates a visual 'cluster'.

Wide valleys and plains are expansive and often relatively open landscapes. Large, regular fields and occasional woodlands extend across the gently undulating broad plains. Turbines should be located near to groups of buildings as far as possible, to limit visual clutter. In the absence of distinct folds in the landform or other topographical details, turbines should aim to be located at the field edges, so that they are linked to the landscape pattern.



Landscape shape – Wide valleys and plains: *This turbine, approximately 2x the height of the large sheds, is located at the edge of a field, reflecting the pattern of the landscape which has open fields edged with occasional individual field trees along the fencelines.*

Settlement and land use pattern and features

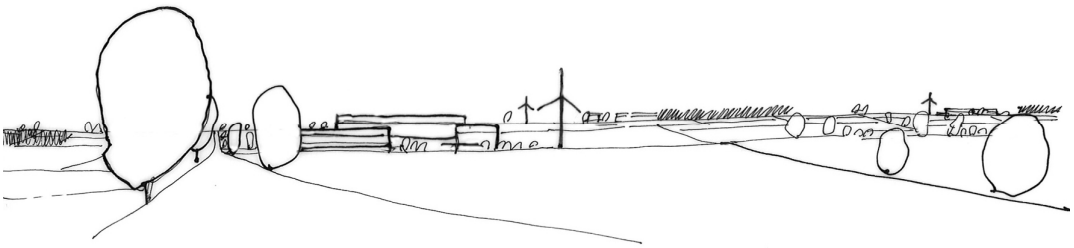
Small turbines are most easily accommodated in areas where there is settlement and other existing infrastructure. In such areas, the distribution of existing built development can form a recognisable pattern to which wind turbines can be visually and physically linked.

In East Lothian, lowland and foothill landscape character types are well settled, with farms, small villages and larger towns dispersed across a relatively cultivated and managed

landscape. Farms vary in size, and in more prosperous low-lying plains and shallow valleys, the steadings can be large. There are also warehouses, former aircraft hangars and industrial units and retail outlets which form clusters of large sheds in more low lying landscapes, and occasionally very large buildings such as the cement works at Dunbar. Smaller farms and lower buildings are associated with the more upland areas and villages are often nestled in folds in the landscape.

While small turbines are likely to be larger than most buildings, it is still appropriate to establish a visual relationship between a turbine and a farm or other group of buildings – especially the clusters of large sheds and farm steadings – in all these lowland or foothill landscapes. Turbines may also appear frequently enough in a settled or farmed landscape to create a helpful 'sub-pattern' of consistent association with farms or small clusters of buildings if the turbines are located close enough to the buildings.

Larger farm steadings and groups of industrial buildings are generally associated with more fertile low-lying plains and some of the ridges, where there are also larger fields, open landscapes with occasional trees or woodlands and more infrastructure, including wider roads, more frequent overhead lines and settlement. Turbines in these areas are best sited where they avoid prominent hilltops or landmark features such as clumps of trees, as well as the setting of villages and small buildings. Close association with farms or industrial buildings will limit visual clutter across these developed landscapes.



Settlement pattern - Wide valleys and plains: These turbines are all of a similar size in relation to each other and the buildings. They are all arranged so that they are in relatively close proximity to the farms, creating a 'sub-pattern' which is consistent across the landscape.

Smaller farms**,** designed landscapes and small villages nestled into the folds of the landscape tend to be found in more intimate areas of more complex landform. The small scale of the topography is reinforced by smaller fields and often more woodland, which may range from field trees to policy and commercial woods. In these landscapes, turbines should be located where they relate to the pattern and rhythm of the farm buildings and avoid hill top features or the edge of steep sided valleys.

Visibility

Unsurprisingly, small turbines are likely to be less visible than the larger ones over a wider area. Turbines which are 20m or less in height are more likely to be able to be screened or hidden within a wooded landscape, or by relatively low landforms and buildings. This is because they are about the same size as mature trees and, especially from lower viewpoints, have the potential to be hidden by other elements in the landscape. This is particularly the case in more complex, undulating landscapes.

Built features can often be seen from a great distance on the more open landscape and broader, more sweeping topography of the low-lying plain. In these landscapes, however, small turbines may be difficult to see from a distance, simply because they will not be prominent in such a large space.

As applicants may own farms or larger land holdings, there may be the potential to screen turbines from viewpoints if required, for example to reduce cumulative visual impacts, by establishing trees adjacent to the viewpoint (for quicker, maximum screening affect).

Cumulative issues

Given the current incentives, these small turbines may become a frequent and common occurrence in farmed landscapes. Key cumulative issues for small turbines are likely to relate strongly to potential clutter in the landscape. Issues may include:

- *Several individual, or small groups of turbines, could begin to dominate local character; The landscape could appear 'cluttered' if single or groups of turbines were associated with the majority of land holdings;*
- *Clusters, frequent single turbines or several groups of small turbines could begin to dominate local character;*
- *While one turbine breaching a skyline may be a focal point, a number of diverse structures, all spinning at different speeds – or even several groups of the same type of turbine – strung along a prominent or important skyline may become a visual distraction from other landscape features or from perceived visual amenity, especially from key viewpoints;*
- *The variety of potential different types of wind turbines within the landscape could lead to clutter with different styles, sizes of structures and speeds of blade movement dotted across a landscape;*
- *Lack of a clear siting strategy could lead to fragmentation of an existing robust, recognisable, consistent and characteristic pattern of development, especially if turbines do not relate well to existing buildings and point features in the landscape;*
- *There may be the added complication of increased visual clutter created by a wide range of different heights of turbine within a farmed landscape with micro-, small and small/medium sized turbines;*
- *Potential clutter may also be exacerbated if there are other masts, such as telecoms masts, overhead wires and pylons within the same vicinity*

Small – medium size turbines (20m – <42m in height)

This size of turbine has been included as a development typology in the landscape sensitivity assessments carried out for this supplementary study. The sensitivity assessment has assumed that single turbines and small groups of up to 5 turbines are most likely to be associated with this typology. In some landscapes, where topography is more complex, characterised by low relief or where vegetation pattern is more diverse, then groups of up to 3 turbines might be a more appropriate maximum number. Such decisions need to be made when considering the scale of the immediate setting of a proposal.

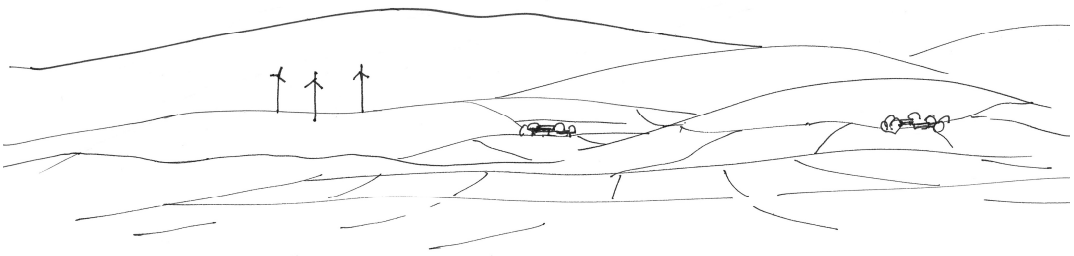
In general within the East Lothian landscape, the following issues have been identified as being particularly influential in terms of detailed siting of this typology within character types and units identified as being appropriate for this typology:

- *Turbine height in relation to the scale of the landscape*
- *Landform and landscape shape*
- *Settlement and landscape pattern and features*
- *Visibility*
- *Cumulative issues*

Turbine height in relation to the scale of the landscape

Turbines of between 20m and 42m are going to be one of the tallest structures in any landscape. They are going to be taller than most buildings and most trees. They are still, however, similar in height to some pylons.

Turbines of this height can be accommodated most readily by relating the height of the turbines to the scale of the landform, rather than trying to link them to the size of other structures and trees. If well sited, turbines of this size, even in small groups of up to three turbines, may be able to take advantage of the degree of relief created by medium scaled landforms.

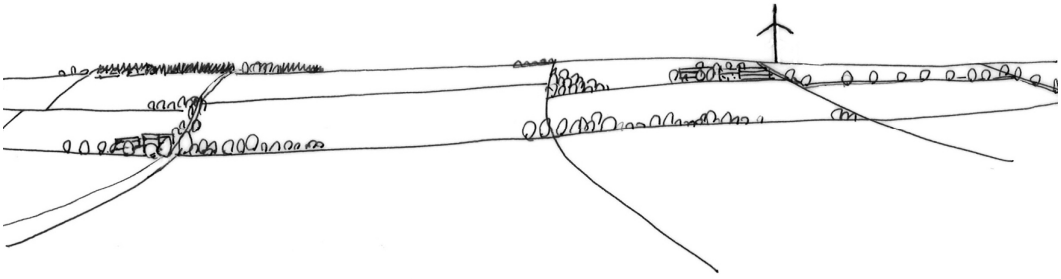


*<u>Foothills – Landscape scale</u>**:** Indicative turbines of about 6 times house height located on a ridgeline where there are few features in immediate proximity against which to judge the scale. They are also located at a slight dip in the ridge, and back-dropped in this view by higher ground. Note that even so, they are large in this landscape, especially when referenced against fields and nearby buildings – they would be difficult to accommodate any closer to the valley without dominating the scale of the smaller features.*

Turbines of this size are likely to be difficult to accommodate in landscapes of intimate or complex topography, on low ridges or hills where there is low relief, within narrow river valleys or along the upper edges or rims of smaller valleys. This size of turbine will also be difficult to accommodate where the landscape scale is relatively small. Small scale

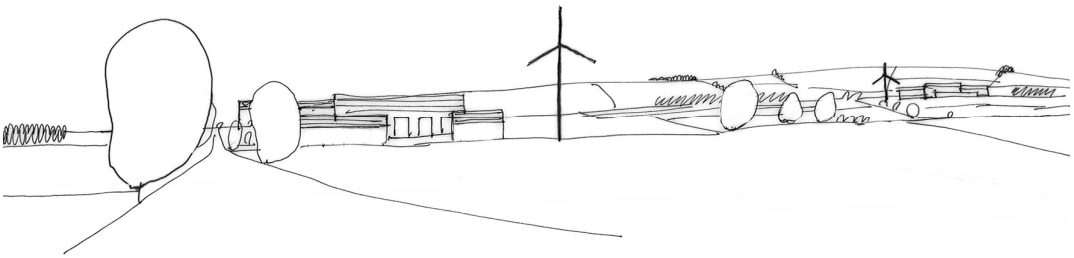
landscapes are characterised by complex land form, small fields and diverse land use and pattern. These turbines may also be difficult to site close to settlements and houses which act as reference points against which size can be easily perceived.

Outcrops of low hills and low ridges are likely to be sensitive to this size of turbine, which will diminish the perceived scale of the low relief. The size of these turbines may be more easily accommodated surrounded by the broad, sweeping scale of the low-lying plains, on the higher ridgelines and more extensive hilly areas, or areas back-dropped by more sweeping, larger scale uplands.

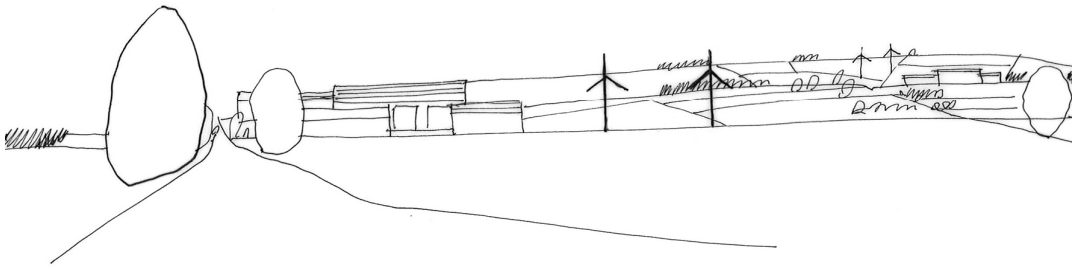


<u>Long ridges – Landscape scale:</u> This turbine, about 4.5x the height of the house, dominates the farm and buildings – although it relates well to the height of the ridge, and is also much less dominant than a turbine placed on the highest point of the ridge.

Where the size of a turbine is going to impact negatively on landscape scale, developers should be encouraged to consider the suitability of two or three small turbines instead of one large turbine, which may be easier to accommodate in the landscape.



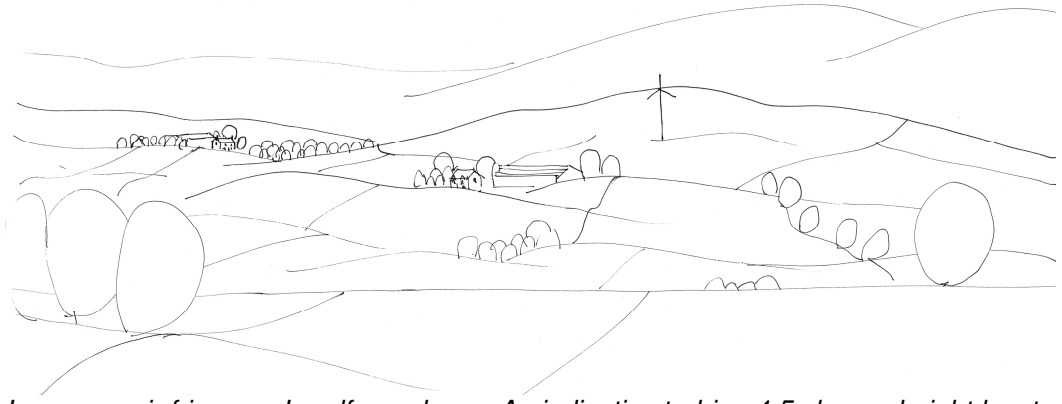
<u>Landscape scale</u> – single small-medium sized turbines can be difficult to accommodate without dominating the size of other features in the landscape, even when the landform scale is broad and sweeping and fields are large.



<u>Landscape scale</u> – two smaller turbines replace the one large turbine, and these are more in scale with the buildings and trees in this landscape.

Landform shape

Distinct changes in gradient associated with a break in slope, well defined dips within undulations, broad terraces or more expansive concave landforms and interim hills along the lower edges of the foothills, as well as the edges of more expansive plateaux all provide potential opportunities for micro-siting turbines of this size.



*<u>Lammermuir fringes – Landform shape</u>**:** An indicative turbine 4.5x house height located on the side of a hill, sited where there is a distinct fold or dip in the landform. The turbine has been located on a hillside where there are no other nearby features – like trees or houses – against which to gauge its height.*

Settlement and land use pattern and features

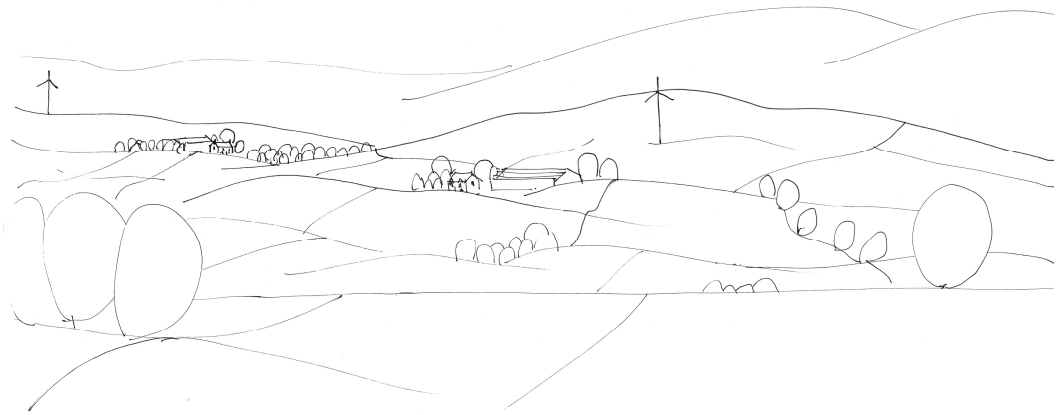
These turbines are larger than most buildings found in rural areas. They therefore should be sited where they can more readily be accommodated by landform scale, and avoid overshadowing or dominating smaller elements in the landscape, including small and complex landforms, small fields and intricate patterns of settlement.

It is more likely that this size of turbine will be located at a distance from farms or settlements. Care should therefore be taken not to disrupt the pattern and prominence of small clumps of trees on top of rounded hills or features of designed landscapes. If they can be accommodated in the sweeping scale of broader low-lying landscapes, they should be

sited along field boundaries or other linear elements in the landscape, or close to large buildings and industrial sites.

The alignment of tracks and location of supporting infrastructure, as well as the turbines themselves, should reflect the pattern of existing infrastructure.

Developing a recognisable pattern of development – for example, locating turbines at a similar elevation, and/or on similar topographical features across a landscape type will help create a pattern of development which will appear less cluttered and will also develop a distinctive and consistent landscape characteristic over time.



Landscape pattern*: These two turbines are located on similar, low lying hills, carefully sited to relate to a break in slope or fold in the landscape. They are also loosely associated with the farms. This similarity in size, location and elevation helps to maintain the unity of the landscape pattern.*

Visibility

Turbines which are more than 20m in height are more difficult to screen than small turbines. They are taller than most trees and large farm buildings, and are therefore likely to have wider visibility than those turbines less than 20m in height.

In East Lothian there are often long views across low-lying land. Recognised and valued views to local points such as outcrop hills, the Laws and historic landmarks will be particularly sensitive in this landscape.

Cumulative issues

Given the current incentives, these small-medium sized turbines may become a frequent and common occurrence, especially in farmed landscapes. Key cumulative issues are likely to relate strongly to potential clutter in the landscape and the visual relationship with other wind farms. Issues are similar to those identified in the analysis of small wind turbines, but because of the larger size of these turbines the issues are likely to occur more quickly and may include:

- *Several individual, or small groups of turbines, could begin to dominate local character;*
- *Diverse designs of turbine, all spinning at different speeds – or even several turbines of the same type – strung along a*

prominent or important skyline could become a visual distraction from other landscape features or from perceived visual amenity, especially from key viewpoints;

- *The larger the turbine, the harder it is likely to be to accommodate a number of them in a single view or recognisable tract of landscape without them becoming the dominant feature. It is also harder to accommodate the turbines in a sequence of views experienced, for example, when travelling along a road;*
- *The variety of potential different types of wind turbines within the landscape could lead to clutter with different styles, sizes of structures and speeds of blade movement dotted across a landscape;*
- *Lack of a clear siting strategy could lead to fragmentation of an existing robust and recognisable landscape pattern – where possible, it is important to site turbines on similar landforms, at similar elevations and with a similar relationship to the existing settlement pattern;*
- *Potential clutter may also be easily created if there are other masts, such as telecoms masts, overhead wires and pylons within the same vicinity – this is likely to be a bigger problem with this typology than with much larger turbines;*
- *There may be the added complication of increased visual clutter created by a wide range of different heights of turbine within a farmed landscape with micro-, small and small/medium sized turbines;*
- *Other complications may be the visual inter-relationship with larger wind farms of large and medium sized turbines, especially within the upland areas of the East Lammermuir Plateau and Plateau Grassland character areas but also in adjoining character areas which fringe the Lammermuirs.*

Other issues associated with smaller typologies

The construction of new access tracks should be minimised by careful siting of turbines to utilise existing tracks and to avoid more difficult terrain. Care should also be taken in the alignment and design of any access tracks to ensure that sensitive landform and vegetation is not adversely affected and that intrusion on key views is avoided. Electricity cables should be undergrounded to avoid a clutter of disparate built elements in the landscape.

5 Summary and conclusions

Introduction

5.1 This supplementary study has considered landscape and visual sensitivity to the following development typologies:

- Typology A: Turbines between 65m and 120m high
- Typology B: Single turbines between >42m to <65m high
- Typology C: Turbines between 20m and up to and including 42m high
- Typology D: Turbines between 12m and <20m high

All turbine heights are to blade tip.

Summary of landscape and visual sensitivity

5.2 Sensitivity is summarised against each of the landscape character areas in table 5.1 below:

Table 5.1: Summary of sensitivity to development scenarios

Landscape Character Area	**A**	**B**	**C**	**D**
Eastern Coastal Margin	MH	MH	M	L
Northern Coastal Margin	H	H	H	M
Musselburgh/Prestonpans Fringe	MH	MH	M	L
Agricultural Plain sub-type 1 East	H	H	MH	L
Agricultural Plain sub-type 2 North	MH	MH	M	L
Agricultural Plain sub-type 3 South	MH	MH	M	L
Garleton Hills	H	H	H	MH
Mayfield/Tranent Ridge	H	MH	M	L
River Valleys	H	H	MH	M
Eastern Lammermuir Fringe	H	H	MH	ML
North Lammermuir Platform	H	MH	M	L
East Lammermuir Plateau	H	H	MH	M
Plateau Grassland	H	H	H	H

Conclusions

5.3 The study concludes that there is no capacity for Typologies A and B, turbines above 42m and to 120m high within any of the landscape character areas considered in the sensitivity assessment.

5.4 Landscapes with a 'High' sensitivity score will present major landscape and visual constraints to the specific development typology assessed, with significant adverse impacts likely to occur in relation to the majority of key sensitivity criteria. A 'Medium-high' combined sensitivity indicates a landscape where the constraints are such that

there would be unavoidable significant adverse impacts on some key criteria despite other criteria being potentially less sensitive to the development typology. A 'Medium-high' sensitivity will generally preclude capacity for the development typology under consideration although in some landscape character areas there may be some very limited scope in a small area for a restricted number of developments of typologies C and D.

5.5 A landscape accorded 'Medium' sensitivity would have increased opportunities for wind turbine development, although there would still be some constraints which would be likely to restrict scope for multiple developments. 'Medium-low' and 'low' sensitivity landscapes would have fewer constraints and therefore present greater scope for accommodating multiple developments, although careful siting and design would still be necessary to mitigate impacts on more sensitive landscape features or limit visual intrusion in some instances.

5.6 There are greater opportunities to accommodate Typology C although the Northern Coastal Margin, the Garleton Hills and the Plateau Grassland would be highly sensitive to this development typology. Capacity would also be severely limited for turbines of this size to be accommodated within the Agricultural Plain 1, the River Valleys, the Eastern Lammermuir Fringe and the East Lammermuir Plateau with turbines towards the lower height band of this typology, <30m high, only likely to be able to be sensitively accommodated in the majority of these character areas and within very restricted locations.

5.7 There are greater opportunities to accommodate the smaller turbines of Typology D because of the ability of these smaller turbines to relate to the scale of woodlands and buildings in the landscape and to minimise visibility by being screened by intervening landform and vegetation. All of the landscape character areas considered in the study would be able to accommodate this small typology except the part of the Plateau Grassland character area lying within East Lothian.

5.8 The assessment identifies constraints in analysis and at a strategic scale and developers would need to demonstrate how they have dealt with potential effects on the constraints identified in the sensitivity assessment at a more detailed level.

Annex A: Guidance on design of smaller turbines

Introduction

The 'Feed-in Tariff' has generated substantially increased interest in smaller wind turbines. Current applications within East Lothian are for turbines which vary considerably in height. The majority are generally between 20m and 40m to blade tip in height, with a lesser number of proposals for turbines between 47m and 100m to blade tip. It is likely that the Feed in Tariff, which varies payments according to kW output, will influence the popularity of specific sizes or even styles of small turbines, depending on payback over the lifetime of individual turbines.

The study brief required advice on the design of small wind turbines. This design guidance annex principally considers the design of free-standing turbines below 80m height (these being the scale of turbine most commonly proposed in current applications to East Lothian and some other Scottish local authorities). This guidance does not consider roof mounted wind devices.

The guidance has been informed by our observations in the field of a number of smaller turbines including the Gaia model (seen at Drem, East Lothian), the Proven models (sited extensively across Scotland) and the Northwind model (Girvan community hospital). We have also attended a Small Wind Energy conference and exhibition and have been able to view a wide variety of turbine models and discuss specification with manufacturers and agents. Consultation has also been undertaken with RenewableUK, the advisory body for wind and marine energy.

The research on available models is not exhaustive within the limited scope of this supplementary study. Smaller turbines are rapidly evolving with many designs and sizes currently on the market. These are likely to develop further in future in terms of enhanced efficiency. Future update of this guidance will therefore be necessary.

Size and output of turbines

There is not always a direct correlation between the size of turbine and its power output. This can be seen when comparing the tower heights, blade diameters and power outputs for small turbines set out in Table A.1 which lists current models.

Key design issues

Variations in the design of smaller turbines principally relate to the following:

- The size of the turbine
- The type of turbine – whether vertical axis or horizontal axis
- Number of blades – whether two or three – and the rotation speed
- The proportion of the turbine in relation to the tower height/blade diameter
- The materials used for the tower (whether lattice or tubular) and blades including colour finishes

Key design issues in relation to these characteristics are discussed below.

Turbine size

The size of turbine in relation to the scale of the landscape is discussed in more detail within the sensitivity assessment for each landscape character area and also in the guidance on

micro-siting of smaller turbines in section 4 of this supplementary study. Table A.1 lists current turbine models and overall heights to blade tip. Taller turbines will generally be more visible than lower turbines particularly in relation to other features in the landscape such as trees, woodland and buildings

Type of turbine
Horizontal axis turbines are more common than vertical axis turbines. Vertical axis turbines tend to be quieter but are less efficient than horizontal axis models. Some vertical axis models currently on the market, for example the Quiet Revolution turbine shown in photograph 2, have a sleek, well-designed appearance. Vertical axis turbines tend to be more popular in urban areas where noise is a key consideration.

Proportion
There are significant differences in the proportion of turbine height to blade diameter in the products currently available. Taller towers with smaller diameter rotors are generally used in lowland areas to capture more available wind. They can have a different proportion and perceived visual balance to larger rotors mounted on similar height towers. Large blades on short towers will appear 'top heavy' and disproportionate.

Blade rotation speed
Smaller blade diameter turbines turn round more quickly than turbines with larger blades. In strong winds, the small blades whiz round and catch the light. This may also be accompanied by an increase in noise which could adversely affect the sense of tranquillity associated with some less developed landscapes. The rotation movement of twin blade turbines is maintained at a regular pace, regardless of wind speed by the gearing system and they tend to have a regular but uneven rhythm (tipping down relatively quickly in relation to the slower rise of the blade).

Quickly rotating blades are more common with smaller turbines and can be less restful on the eye, possibly heightened by the relatively slow movement of other features in the rural landscape. This effect could be amplified by multiple turbines creating a less tranquil landscape experience when seen together.

Materials and colour
There is considerable variation in the design of small turbines. Towers can be metal lattice or tubular with either a painted or galvanised steel finish. The Gaia turbine, shown in photograph 10, features a lattice tower and white painted blades. From our observations during field work we have noted that the lattice tower tends to merge very successfully into the backdrop of land and sky but the blades of this turbine then appear dislocated, 'floating' above a less visible tower which can produce a disconcerting visual effect. Solid tubular towers are therefore preferable and guidance should aim to encourage consistency.

Turbine colour also varies and it is possible to customise colour according to location, although this is usually a more expensive option. We note that while the black UPVC 'hood' and blades of the Proven models (photograph 5) can reduce visibility where they are back-dropped by land, overall this turbine appears bulky and inelegant due to its large, relatively 'clunky' components. This type of design seems to be more appropriate when seen in conjunction with industrial type buildings.

The more successful models in terms of design appear as 'mini' versions of large turbines commonly found in commercial wind farm developments where there is little variation in the finish used for tower and blades and a more streamlined appearance is attained. The white painted models generally provide a clean and uncluttered image although they can stand out more where they are seen against a darker backdrop of land or woodland.

Some turbines feature manufacturers branding and this can be quite prominently displayed.

Other issues
A small boxed fencing surround at the base of some turbines is shown in some manufacturer's promotional material. Some smaller turbines may also require guying. Access tracks may be required for construction and this may be an issue in some landscapes. The electricity connection to smaller turbines usually comprises underground cabling. Overhead wires and any additional fencing or other structures should be discouraged, as they simply introduce additional visual 'clutter' to the landscape.

Cumulative landscape and visual impacts
Cumulative landscape and visual impacts will be dependent on the number of small turbines, their size and also their design.

Occasional turbines widely dispersed across the landscape may be perceived as a novel and incidental feature. Increased numbers of turbines more closely spaced may appear ubiquitous (in the same way as lighting columns or electricity transmission towers) or possibly even dominant features depending on their height and density. It is considered that there is no capacity for turbines over 42m high to be accommodated in the lowland landscapes of East Lothian due to key landscape and visual constraints. Multiple turbines of this size would quickly dominate the scale of the landscape and would be likely to detract from the characteristic landform, land-cover and settlement pattern.

While the number of small turbines will be a key factor in determining perceived impact, variations in design could also significantly exacerbate adverse impact. This can be demonstrated by other tall structural elements in the landscape such as telecommunications masts which can vary considerably in their design and scale (although, unlike turbine blades there are no visibly moving parts). Transmission line towers tend to feature a common lattice tower design, although variations to the norm are easily spotted, for example the line between Bogg Holdings and Macmerry in East Lothian.

Cumulative impacts are likely to occur where a large number and wide variety of turbine designs are seen, either in one view or in quick succession when travelling through the landscape. They are also likely to occur where different sized turbines are inter-visibility in close proximity and this is considered in section 4 of the study report.

Detailed guidance

Turbine design
We recommend that the range of turbine designs should be limited in order to minimise cumulative impacts. The following guidance should be adhered to:

- Groups of smaller turbines below 20m high to blade tip should be limited to no more than 3 in order to reduce the visual impact of tightly spaced turbines with quick rotor speeds being seen on mass.

- A simple turbine design is essential, avoiding the juxtaposition of different materials and favouring turbines which have a more streamlined appearance with little contrast between tower/blade.

- Tubular tower design is generally likely to be neater and less obtrusive (in terms of the contrast between tower and blades) than lattice towers.

- Turbine colour should relate to the predominant backdrop to the development. Where the main background is sky then an off white colour would be more appropriate and where the turbine is principally back-dropped by rising ground in key views, then a darker colour will reduce visibility.

- Corporate branding should be discreet and brightly coloured/contrasting details used for hubs and to highlight blade tips should be avoided.

- Potential cumulative impacts of proposed wind turbine development with larger commercial wind farms in the Lammermuir Hills should be considered. Design compatibility between differently scale turbines may help minimise landscape and visual impacts so there is a consistency between structures which avoids a clutter of disparate built elements in rural locations.

- Design compatibility should also be carefully considered where existing small turbines have already been erected. Although to date, existing small turbines within East Lothian primarily comprise two models, where a number of these have been approved in one area then it would be better to restrict new turbines to a similar design particularly where they would be seen in close proximity or be inter-visible from key roads and settlement.

Where turbines are sited within or close to settlements, particular care should be taken to ensure that only well-designed models are used. This is because turbines would be seen in close proximity from properties and roads, where the poor quality of design and components would be obvious and would contrast with the often high architectural integrity of buildings within East Lothian.

Ancillary features
Formally constructed access tracks should be avoided to reduce impacts where open and elevated views are possible. Removable matting could be used during construction and simple reinforced grass tracks, aligned close to the edge of field boundaries, installed where necessary post construction. Fencing should be avoided around the base of turbines in order to minimise clutter in the landscape.

All grid connections should be buried underground to reduce the accumulation of overhead wires and present a simple uncluttered setting to turbines.

Table A.1: List of current small turbine specifications

Model	***Pylon Height (m)***	***Rotor Diameter (m)***	***Height to Blade Tip (m)***	***Output (KW)***
Evoco 10	12	9.7	16.85	10
	15		19.85	
	18		22.85	
Airsurfer	12	3.2	15.2	1.5
Evance R9000	10	5.5	12.75	5
	12		14.75	
	15		17.75	
	18		20.75	
Quietrevolution	3.4	3.1	4.95	4.2
	6		7.55	
	15		16.55	
Xzeres 110	No Data	3.6	3.6+	2.5
Xzeres 442SR	12	7.2	15.6	10
	15		18.6	
	18		21.6	
Gaia Wind 133	18	13	31	11
Ampair 300	12	1.7	13.7	0.3
Ampair 6000	15	5.5	20.5	6
Fortis Wind Turbines Passatt	12	3.12	13.56	1.4
	18		19.56	
Skystream 3.7	No Data	3.72	3.72+	2.4
Proven 7	6.5	3.5	8.25	2.5
	11		12.75	
Proven 11	9	5.5	11.75	5.2
	11.6		14.35	
	15		17.75	
Proven 35-2	15	8.5	19.25	12.1
	20		24.25	
Swift	No data	2.08	2.08+	1.5
Northern Power Northwind 100	30	21	40.5	100
	37		47.5	

Endurance Wind Power E3120	25	19.2	34.6	50
Endurance Wind Power S-343	27.5	6.37	30.685	5.2
	31.1		34.285	
	36.6		39.785	
Endurance Wind Power G-3120	30.5	19.2	40.1	35
	36.5		46.1	
	42.7		52.3	
Fortis Wind Alize	18	7	21.5	10
	36		39.5	
Fortis Wind Montana	12	5	14.5	5
	24		26.5	
Enercon E44	45	44	67	900
	55		77	
Enercon E33	44	33.4	60.7	330
	50		66.7	



1: Evance R9000



2: Quiet Revolution



3: Xzeres 442SR



4: Evoco 10



5: Proven 11



6: Skystream 3.7



7: Northwind 100



8: Endurance E3120



9: Endurance Wind Power G-3120



10: Gaia 133 11kW Lattice



11: Enercon E33



12: Fortis Montana

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