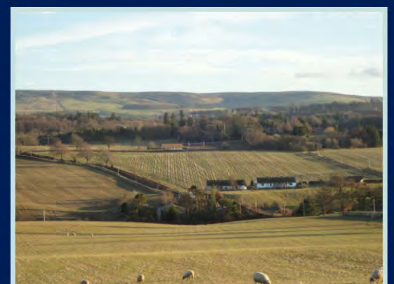
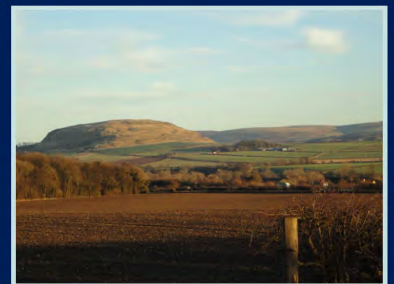


East Lothian Supplementary Landscape Capacity Study for Smaller Wind Turbines



December 2011

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

Prepared for East Lothian Council by :

Carol Anderson and Alison Grant Landscape Architects

Approved with Amendments by East Lothian Council on 13 December 2011

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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' tariff¹ 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 development 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:

<i>Windfarm</i>	<i>Turbines</i>	<i>Height to blade tip</i>
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 four³. 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

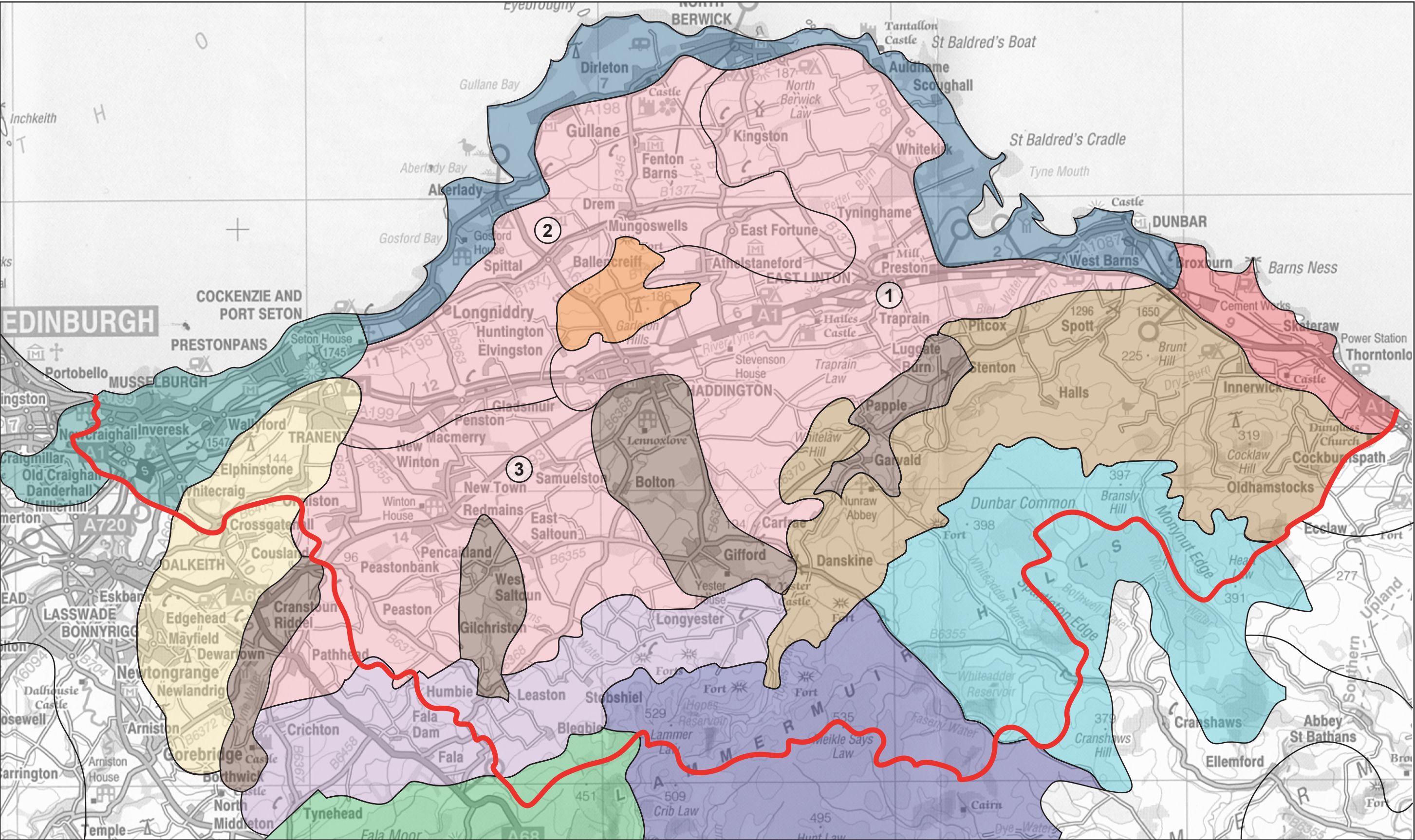
- 2.13 The assessment undertaken for the original study was largely based on the landscape characterisation set out in the *Lothians Landscape Character Assessment, 1998* published by SNH, but with some reclassification and amendment to landscape character areas to better reflect key sensitivities to 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

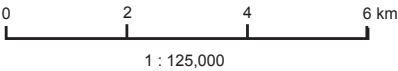
- 2.16 The original wind capacity study considered the following five different development scenarios:
1. Single turbine development (120m high)
 2. Small scale windfarm development (2-5 nr/42m to 65m high turbines)
 3. Medium scale windfarm development (6-20 nr/120m high turbines)
 4. Large scale windfarm 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		Agricultural Plain		Garleton Hills		North Lammermuir Platform
	Northern Coastal Margin		Sub areas:		Mayfield / Tranent Ridge		Plateau Grassland
	Musselburgh / Prestonpans Fringe		East		Humbie / Gifford / Whittinghame River Valleys		Central Lammermuir Plateau
			North		Eastern Lammermuir Fringe		East Lammermuir Plateau
			South				



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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 category⁴.
- **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 band⁵.
- **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 category⁶.

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.

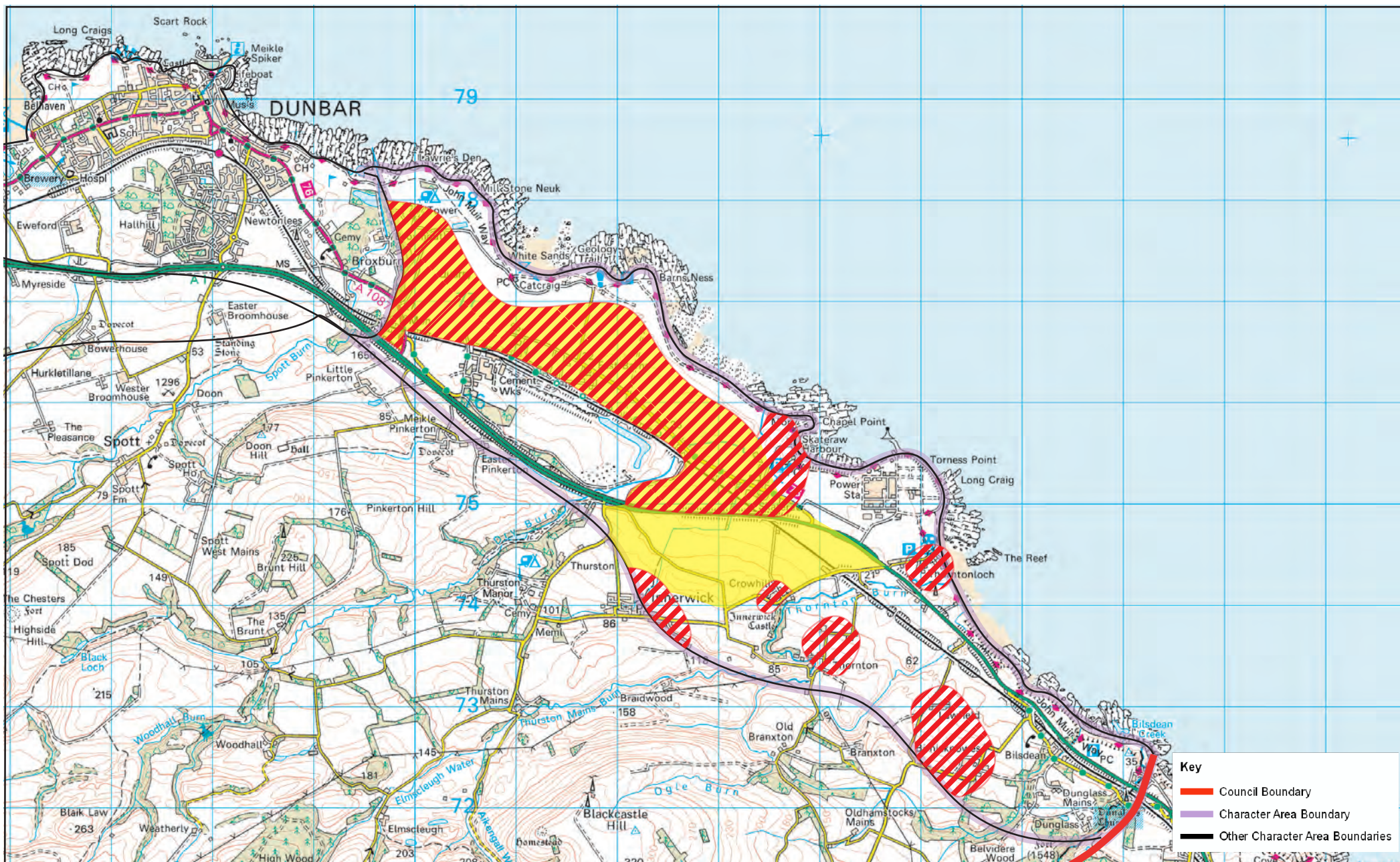
There would be potential problems with siting turbines close to the cement works as this may exacerbate visual clutter with too many discordant forms. A degree of geographic separation should occur if development were to be sited in the north-western part of the character area to avoid these impacts. 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 Lammern 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.



To be read in conjunction with Fig No 1

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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

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Eastern Coastal Margin



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.

- 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.



To be read in conjunction with Fig No 1

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Opportunities for Development Typologies

none	A	none	C
none	B		D Subject to detailed siting and design, avoiding significant intrusion on the coastal edge, key views and the setting of settlements, historic and landmark features.


 Highly sensitive coast

Fig No 3

Supplementary Landscape Capacity Study for Wind Turbine Development 2011

Northern Coastal Margin



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

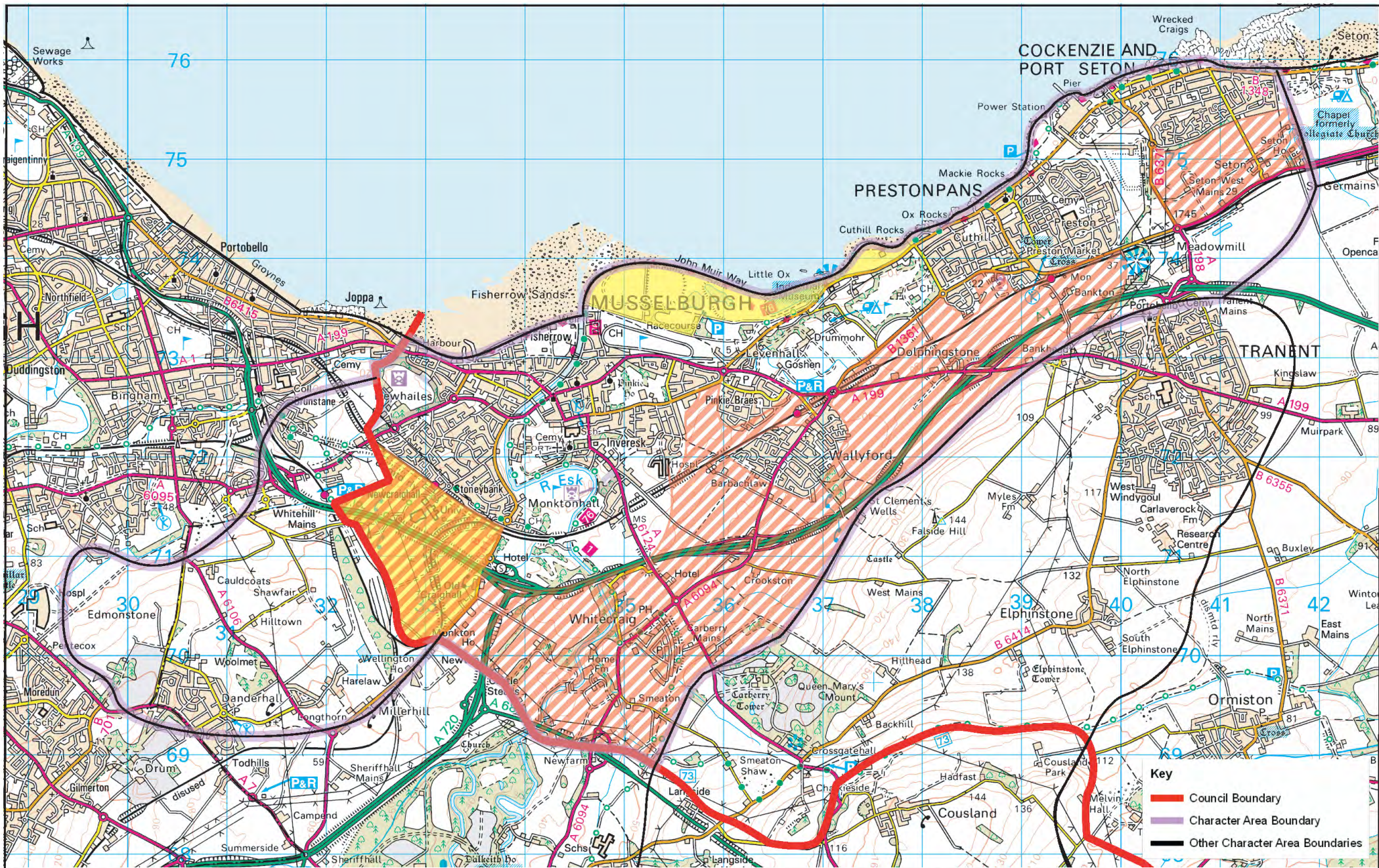
There is no scope to accommodate Typologies A and B within this landscape.

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.



To be read in conjunction with Fig No 1

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Opportunities for Development Typologies

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

Fig No 4 Supplementary Landscape Capacity Study for Wind Turbine Development 2011

Musselburgh / Prestonpans



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, Tynninghame, 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

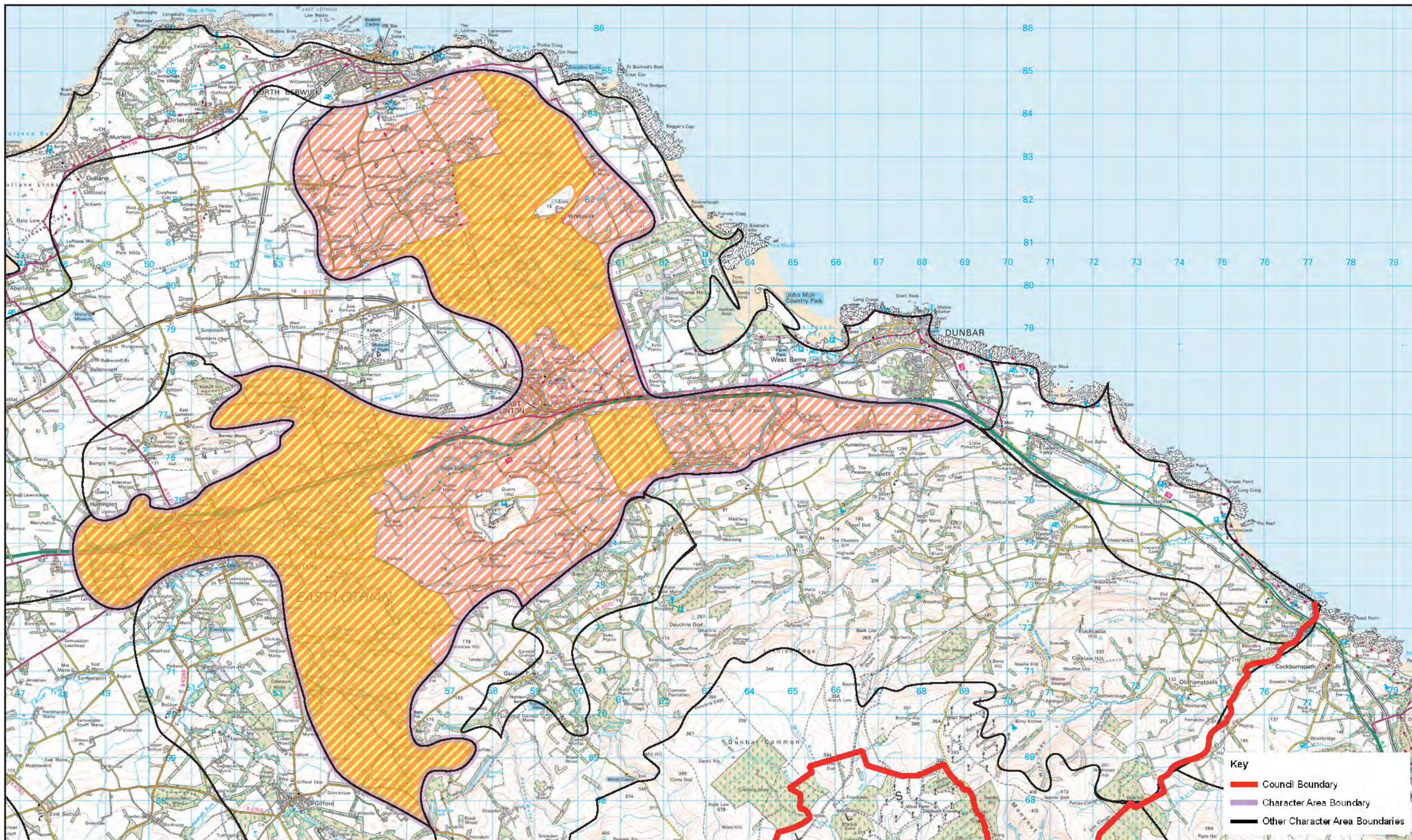
Guidance on development

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

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.



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 Very limited opportunities for turbines under 30m subject to key views to landmark features of Traprain and North Berwick Law and impacts on designed landscapes
- D Opportunities to locate if visually associated with farms and buildings

Fig No 5

Supplementary Landscape Capacity Study for Wind Turbine Development 2011

Agricultural Plain: Sub Area 1- East

0 1 2 3 km

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

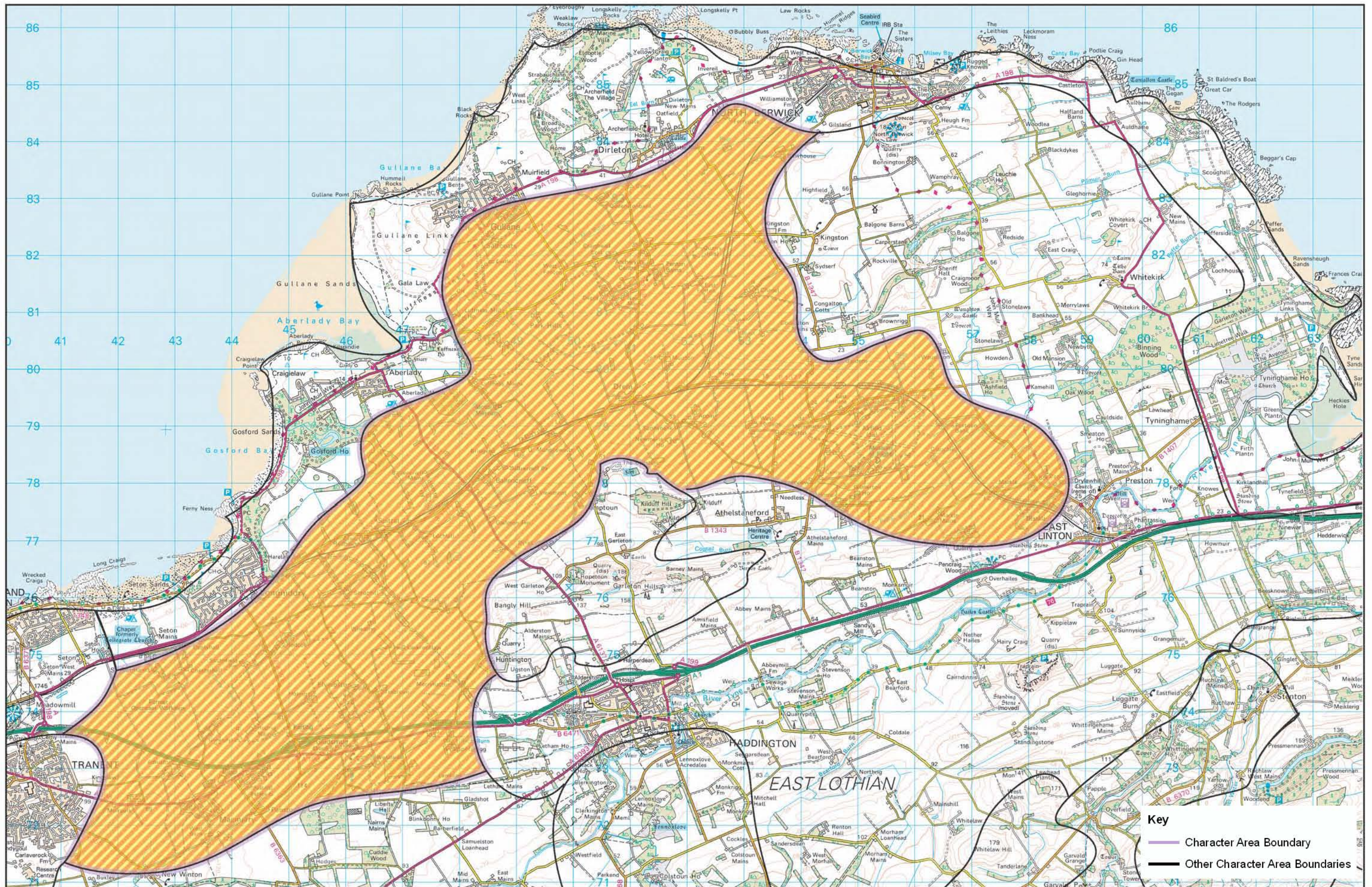
There is no scope to locate Typologies A and B due to the significant adverse impacts that would be likely to occur on a range of landscape and visual sensitivities.

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.

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.

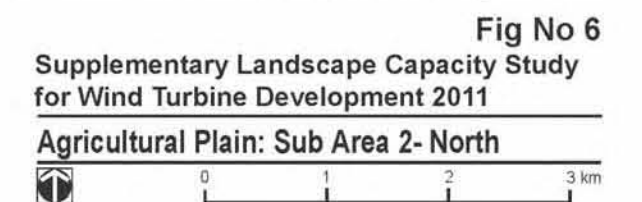


To be read in conjunction with Fig No 1

Opportunities for Development Typologies

none	A No scope to locate turbines of this size	yellow	C Some opportunities subject to impact on key views
none	B No scope to locate turbines of this size	orange hatched	D Opportunities to locate small turbines if visually associated with farms and buildings

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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

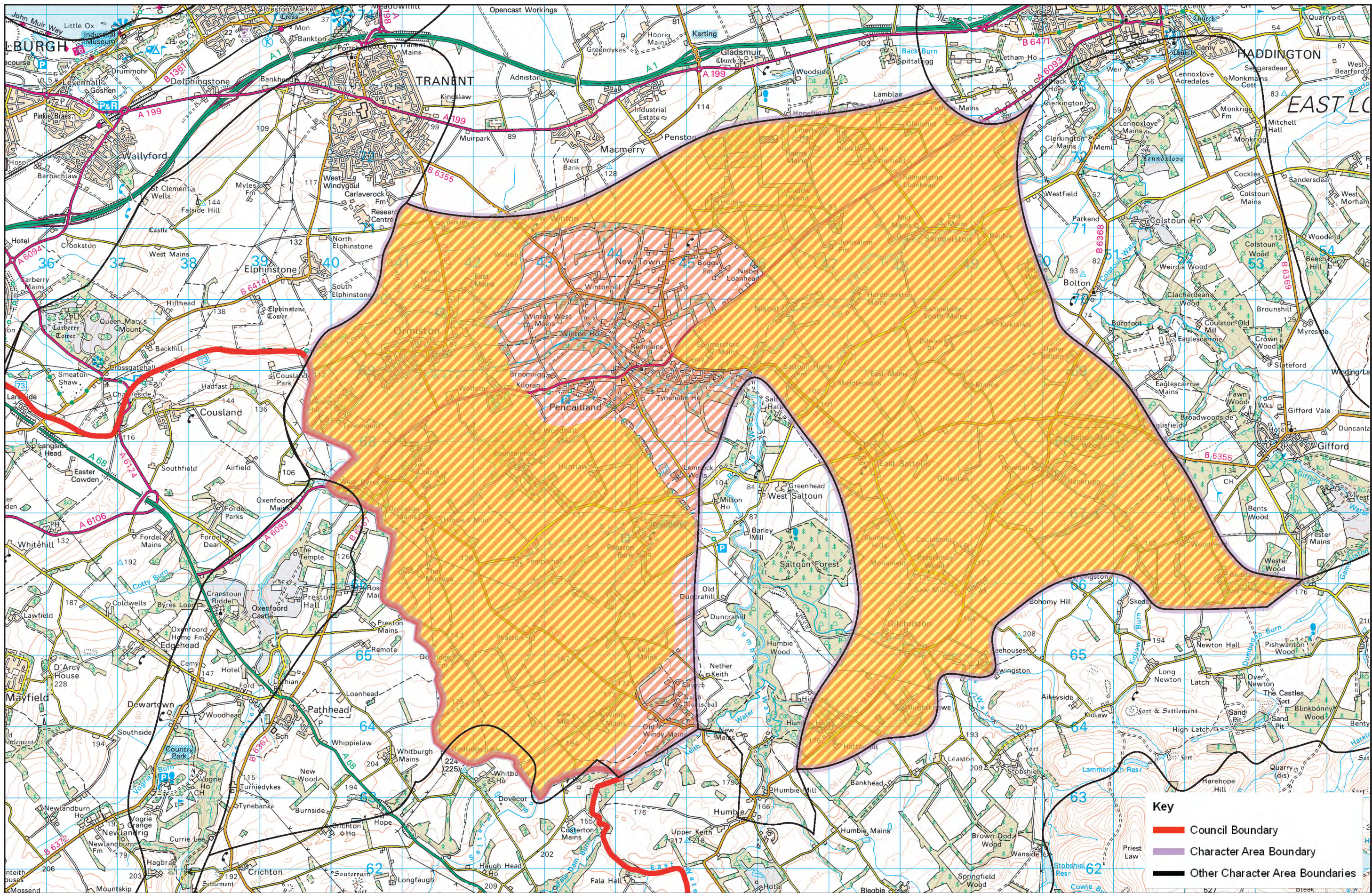
While the larger typologies assessed could relate to the broad, simple landform of this character area, it is considered that there is no scope to accommodate turbines of this scale (Typologies A and B) in this landscape due to the likely significant adverse effects on a number of other key characteristics.

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.

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.



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To be read in conjunction with Fig No 1

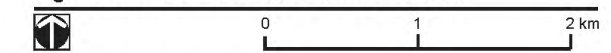
Opportunities for Development Typologies

none	A No scope to locate turbines of this size		C Limited opportunities, area of search subject to impact on key views
none	B No scope to locate turbines of this size		D Opportunities to locate small turbines if visually associated with farms and buildings

Fig No 7

Supplementary Landscape Capacity Study
for Wind Turbine Development 2011

Agricultural Plain: Sub Area 3- South



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

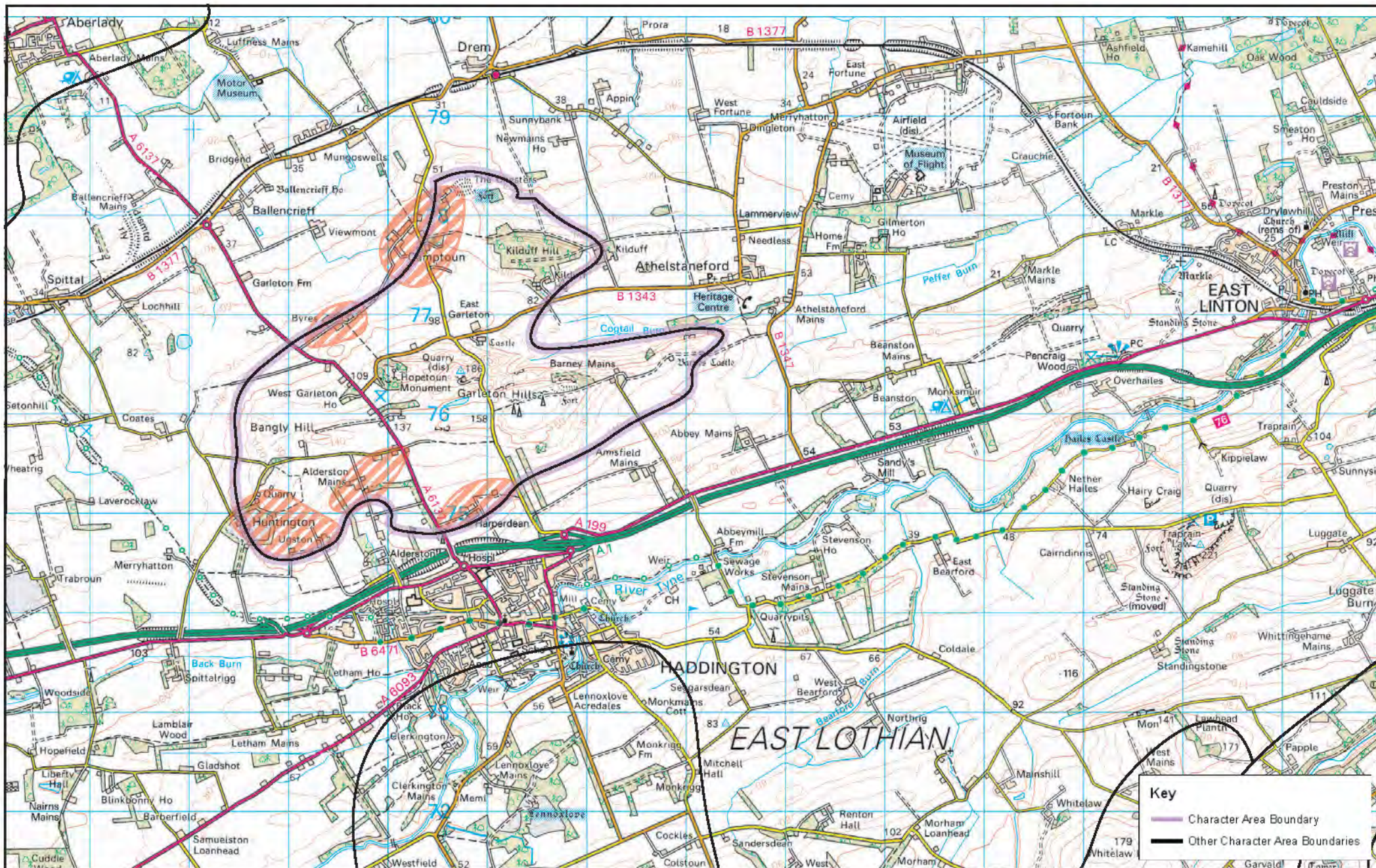
- Lower hill slopes away from sensitive ridges where small turbines could be visually associated with farms and other buildings

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 Figs No 1 & 2
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 Landscape Capacity Study for Wind Turbine Development 2011

Garleton Hills



0 1 2 km