SCOTTISH NATURAL HERITAGE

COMMISSIONED REPORT

Commissioned Report No. 103

An assessment of the sensitivity and capacity of the Scottish seascape in relation to windfarms

(ROAME No. F03AA06)

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COMMISSIONED REPORT

Summary

An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms

Commissioned Report No. 103 (ROAME No. F03AA06)
Contractor: Landscape Research Group, University of Newcastle
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Background

A proportion of the Scottish Executives 2020 target for renewable energy is expected to come from marine technologies including offshore windfarms. Scottish Natural Heritage (SNH) supports offshore renewable energy which is compatible with natural heritage interests, as set out in its *Policy on Renewable Energy* (SNH, 2002). Scottish seascapes are renowned and valued for their natural heritage. This study was commissioned to contribute to strategic guidance on areas where the impact of offshore wind energy development on Scottish seascapes are likely to be of least significance.

Main findings

- The study identified 33 Seascape Units at a strategic scale, described their character and assessed their sensitivity to a single development scenario. A visibility assessment was carried out using GIS to produce a comparative scale of visibility for the seascape units. Seascape values were assessed for each Seascape Unit, based on consideration of national and regional designated landscapes and SNH wildland search areas within 10km of the coast.
- An overall capacity index was calculated by combining seascape sensitivities, visibility and landscape values, with an equal weighting being given to each of these factors. Each Seascape Unit was given a rating from lower to higher capacity.
- Main patterns of capacity are low generally along the west coast largely due to higher value scores and seascape sensitivity. There is a higher relative capacity generally present on east mainland coasts, Shetland and North Lewis where seascape sensitivities and visibility ratings are generally lower and fewer designated landscapes are present.
- A review of SNH policy revealed gaps and potential conflicts between strategic consideration of offshore wind energy and current guidance and policy.
- Recommendations include incorporating visibility issues in future policies; considering the discrepancies of scale between onshore and offshore windfarms; balancing the economic needs of remote communities with natural heritage protection; and addressing the potential cumulative impacts.

Limitations

- The study is strategic and should be used at that level. Specific windfarm development proposals will require detailed environmental assessment.
- This is a new and evolving area of work. The assessment methodology was developed specifically for this study, and is not necessarily recommended by SNH.
- Factors such as population, recreation and tourist routes, iconic sites, viewpoints, were beyond the scope of the study.
- One development scenario was used to analyse sensitivity and capacity (100 turbines, 150m high set in an off-set grid layout and covering 25km^2 and 8km from shore).
- Visibility assessment was based on landform, did not take into account the number of viewers and was limited to water depths of 50m or less.
- Visibility, sensitivity and capacity is comparative between seascape units, not absolute.

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John Benson

Professor John Benson, Head of the Landscape Research Group at Newcastle University and lead consultant on this project died suddenly before its completion. The remaining team are indebted to the Steering Group for their support and patience during an immensely difficult time. John will be very fondly remembered for his intellectual rigour, practical approach, constant good humour and for his strong grip on the rudder on this project and on many others in previous years.

Contents

List of figures

List of tables

1 INTRODUCTION

1.1 Background

In response to the Kyoto Protocol, the UK made a commitment to reduce CO_2 emissions by the year 2010. This commitment was further strengthened in the Energy White Paper published in February 2003, where a target of 20% reduction in emissions by 2020 and 60% by 2050 was set out. The Scottish statutory target for the proportion of electricity generated from renewable energy is 18.4%. A new aspirational target of 40% by 2020 has since been agreed by the Scottish Executive.

A 40% target will require a substantial amount of additional installed renewables. The Scottish Executive has indicated its expectation that a proportion of this capacity should be derived from marine renewables technologies. The study, *Scotland's Renewable Resource* (Snodin, 2001) identified a potential 25GW of generation capacity available from offshore wind technology. However, exploitation is currently constrained, primarily by development costs associated with the generally deep waters in Scotland.

The Department of Trade and Industry (DTI), in *Future Offshore – a Strategic Framework for the Offshore Wind Industry* (2002), sets out the potential for offshore windfarms, identifies possible constraints and opportunities and seeks to establish a strategic planning framework, and a legal framework for regulation of proposals outside territorial waters. Based on technological constraints, three areas around the coast of England and Wales have been identified as search areas and a Strategic Environmental Assessment (SEA) (BMT Cordah, 2003) was carried out on these areas prior to a second round of development site leases. The results of Round 2 were announced on 18th December 2003 with permissions to develop proposals for up to 7.2 GW of electricity generation.

Scotland is renowned for the diversity and scenic quality of its landscapes and seascapes. In contrast with land areas, much of the Scottish marine area has seen little in the way of development and consequently remains dominated by natural processes. Scottish Natural Heritage (SNH) supports offshore renewable energy which is compatible with natural heritage interests, as set out in their *Policy on Renewable Energy* (SNH, 2002b). More recent policy focussing on marine renewables states:

> *"SNH encourages exploration of the natural heritage impacts of offshore wave and wind energy developments. Outwith areas of high scenic or marine wildlife value, such impacts may be lower than for land based renewables. SNH supports the strategic identification of appropriate locations and the development of appropriate technologies."* (SNH, 2004)

This work will formulate part of a strategic response which will provide guidance on areas where the impact of offshore wind energy development on the natural heritage will be of least significance.

1.2 The study brief

The purpose of this study is to assess the seascape issues surrounding offshore wind energy developments, in order that the consideration of offshore wind farm development proposals may be better informed.

SNH has produced *Strategic Locational Guidance for Onshore Wind Farms* (SNH, 2002c) which sets out the key natural heritage sensitivities to onshore wind energy developments and makes recommendations on

those areas best suited to such development. This study will extend that work by considering the implications of offshore windfarms on the seascape and visual character of Scottish coastlines.

The key objectives for this study are therefore:

1. To develop, agree and apply a methodology for the strategic assessment of seascape sensitivity to, and capacity for, offshore windfarm development.
2. To relate the findings of the assessment to relevant SNH policies and make recommendations for the seascape dimension of SNH locational guidance for offshore windfarms.

The study brief is contained in Appendix A.

1.3 Current guidance and capacity studies

Recent and revised guidance exists for landscape character assessment (CA-SNH, 2002) and for assessing the impacts of development on the landscape and visual resource of a particular location (LHEMA, 2002). Planning guidance also exists for renewable energy (Scottish Executive, 2001a, 2002). This guidance has been used to inform and contribute to the development of an approach and methods for landscape capacity assessment.

Scottish Natural Heritage (SNH) has done some work on landscape capacity assessment in relation to wind energy (Stanton, 1995; SNH, 2000). Other landscape capacity studies for wind energy development have been done or are in process (eg Land Use Consultants, 2002) but methodologies are still developing. The current study has developed a new methodology specifically for the Scottish seascapes in relation to offshore wind energy development (but drawing heavily on previous studies), which also serves to inform current development and discussion on the subject. A key reference for the assessment of seascapes (although not specifically in relation to wind energy development) is the *Guide to Best Practice in Seascape Assessment* (Hill *et al*, 2001).

These studies and guidance are reviewed in full in Section 2.2 of the report.

1.4 Definitions and terms of reference

1.4.1 Definition of Seascape

In the study brief, SNH has suggested that a working definition of seascape could be:

> '*An area of any extent or scale which includes the sea as a key feature. Seascape has physical and experiential attributes, and encompasses the interrelationship between the sea and the sky, and may include land*'.

Seascape is defined as a series of parameters in Hill *et al.* (2001) that includes:

- Views from land to sea;
- Views from sea to land;
- Views along coastline;
- The effect on landscape of the conjunction of sea and land.

This definition is more strongly focussed on coastal environment viewsheds and the interrelationship between sea and land whereas the SNH definition suggests that a seascape is fundamentally a relationship between sea and sky with land being present or not.

A working definition of seascape for this study is a view from land, sea or air where the sea plays a key role in the composition of the scene. For the purpose of this study, it is assumed that in most situations land will play a significant part in the seascapes we are assessing and it is largely the land element rather than the sea element which will define the basic character of the seascapes. Seascape Units are defined by using visibility analysis in conjunction with character assessment.

1.4.2 Seascape Character

Seascape character is made up of physical characteristics of hinterland, coast and sea plus a range of perceptual responses to the seascape, as well as visual aspects. Seascape character is essentially value free. That is, it involves describing the character(istics) of the seascape but not expressing any value judgements about whether one seascape is of higher quality than another. This study avoids words such as better, worse, inferior, superior, attractive, despoiled, for this reason.

1.4.3 Seascape Sensitivity

Sensitivity is defined here as the measure of how vulnerable or robust seascape character is to change. In this project change relates to offshore wind energy development and any findings on sensitivity are restricted to this (seascapes may have different sensitivities to other forms of change or development). Seascapes which are highly sensitive are at risk of having their key characteristics fundamentally altered by development, leading to a change to a different seascape character ie one with a different set of key characteristics. Sensitivity is assessed by considering the effects on the key physical and perceptual characteristics of seascapes on the basis of recognised effects of offshore wind energy development.

1.4.4 Visibility Assessment

Visibility assessment is defined here as the objective process to determine the potential visibility of a seascape or of windfarm development within a seascape within set parameters. This is achieved using GIS software and is discussed in Section 2.9.

1.4.5 Seascape Values

These represent the quality, worth, merit and benefits attributed to seascapes. They are complex and multi-faceted and are defined and discussed further in Section 2.10.

1.4.6 Seascape Capacity

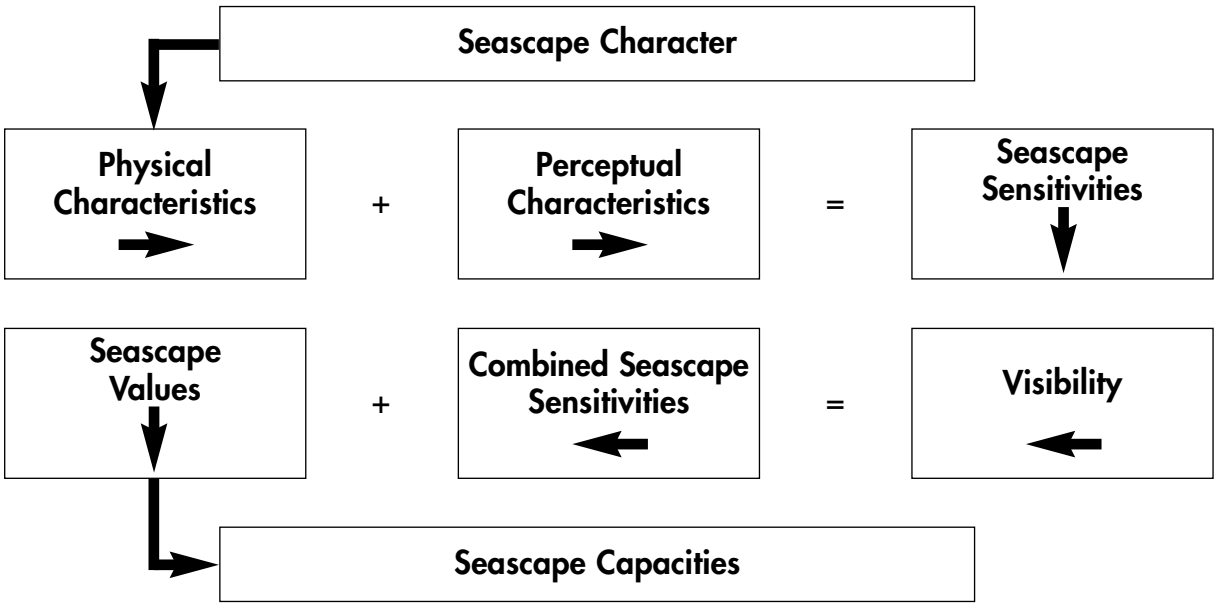
Capacity implies a finite quantity that can be assessed and measured. Here it relates to how much a seascape can absorb or accommodate development without a fundamental change in character. Seascape character and seascape sensitivity are part of this, but capacity in a seascape context also includes visibility assessment and values relating to that seascape, and consideration of the acceptability of change. Therefore a seascape which has high sensitivity would not necessarily have a low capacity and a seascape which has low sensitivity would not necessarily have a high capacity. There are a multitude of factors which

combine to give a measure of capacities and a complicated interplay of factors need to be weighed and evaluated. This is more fully discussed in Section 2.11 of the report.

1.4.7 Capacity assessment model

The overall premises of this study can therefore be summarised as shown in Figure 1. Following seascape characterisation, physical and perceptual characteristics are used to assess sensitivity, and visibility and values are then added to evaluate seascape capacity.

Figure 1 A basic "model" for capacity assessment



1.5 Limitations of study

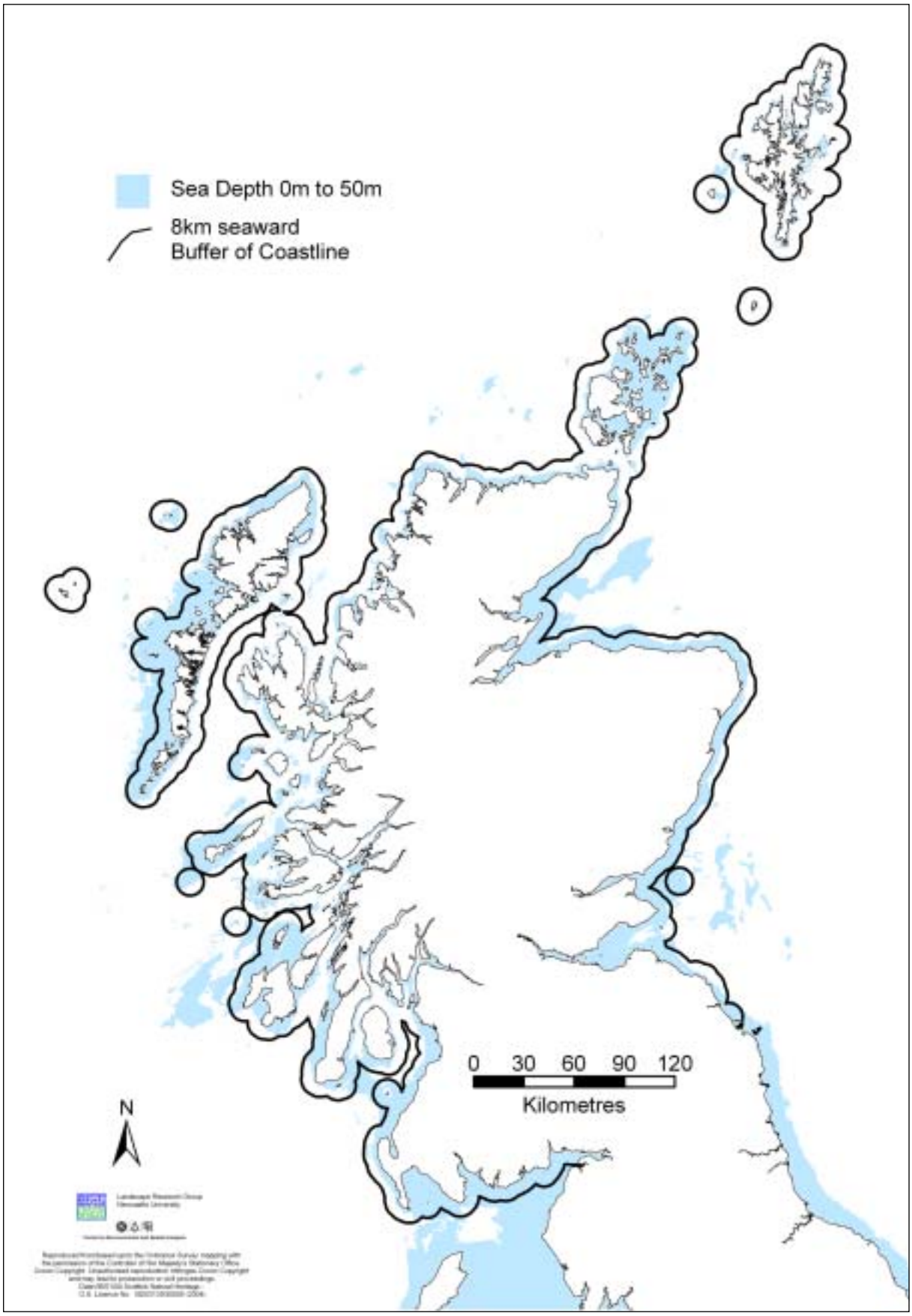
This is a strategic desk based study aimed at presenting an overview of Scottish seascape character and its sensitivity to offshore windfarms. The study team has been closely guided by the steering group, whose members include a cross section of professionals from SNH, Highland Council (on behalf of the Scottish Society of Directors of Planning) and the Scottish Renewables Forum. Parameters for the study were set in agreement with the steering group.

This study has assessed sensitivity to one scenario of development at a set distance from the shore. This development scenario comprises:

- A geographical scope limited to water depths of no greater than 50m and a set distance from shore of 8km. (see Figure 2);
- A development scenario of 100 turbines, 150m high set in an off-set grid layout and covering 25km^2.

The reasoning behind the geographical scope and the adoption of this specific development scenario is outlined in Section 2.4 of the report. No other technical limitations other than water depth, for example, grid connections, were considered in the study. Cumulative effects of more than one offshore windfarm development were not addressed by the study.

Figure 2 Geographical scope of study



All judgements, except where stated otherwise, relate only to this scenario. Different scenarios will create different sensitivities and will need to be assessed on a case by case basis. Some general guidance is provided in Section 4 of the report on the possible interpretation of this study when considering different development scenarios.

Fieldwork was not a significant part of the assessment and judgements are largely based on literature available to the consultants at the time, although the input of SNH advisors and the study team's knowledge of the coastline was also heavily drawn upon. Whilst this study provides strategic baseline data on seascape character to inform case work and policy, it does not replace the need for more detailed seascape assessment on a case by case basis.

In determining the sensitivity of a seascape to development we have assessed change and the nature of change to that area. It is crucial to note that no judgements have been made about whether that change is positive or negative, socially acceptable or unacceptable. Our remit in this study has been to provide assessments of the likely changes that will occur in Scottish seascapes if development occurred.

This study assesses only the seascape and visual effects of offshore wind energy development. It does not assess other equally important issues such as nature conservation interests, social impacts, attitudes of the public to wind energy etc.

Detailed analysis of recreational interests was considered outside the scope and beyond the time and resource constraints of this study. Early discussions on factoring in visibility analysis from long distance footpaths, Munro peaks, coastal roads, important coastal tourist spots, marinas etc soon revealed that such analysis would have to be inclusive and representative of a wide variety of recreational interests and would have been incompatible with the scale and level of detail in other parts of the study. We advise that such studies be undertaken on a case by case basis. However, in the sensitivity analysis of individual seascape units we have taken note of key recreational features in that locale where information has been available to us.

1.6 Report structure

Section 2 of this report initially outlines the approach that has been adopted, providing as background a brief review of guidance that has informed the study methodology. Section 3 presents the results of the study with visibility, seascape character assessment and values considered in turn and with the overall capacity assessment summarised in tabular and map form. The key findings of the study are set out in Section 4. This section includes a summary of the review, undertaken as a requirement of the brief, to inform recommendations for the seascape dimension of future SNH locational guidance for offshore windfarms.

2 METHODOLOGY

2.1 Introduction

Although various key documents and previous work have informed this study (see Section 2.2), there is no specific guidance for assessing seascape sensitivity/capacity for offshore wind energy. This is an area of work which is new and where methodologies are still developing.

The methodology was required to be:

- robust, repeatable and defensible;
- specific to offshore windfarm development;
- appropriate to the character of Scotland's coastline;
- informed by work undertaken to date in this field;
- on a strategic scale;
- achievable within the constraints of the study.

An overview of the approach is shown in Figure 3. In the round, this is a new methodology. However, this method has been developed partly by adopting and adapting existing approaches to landscape, seascape and windfarm capacity assessment, as described in the next section.

2.2 Review of guidance

2.2.1 Landscape assessment

The latest Countryside Agency and Scottish Natural Heritage guidance (CA-SNH, 2002) and the best practice guidelines contained in LI-IEMA (2002) for landscape assessment have informed our approach to assessing seascape character. Established guidance for impact assessment makes a distinction between landscape effects and visual effects, the latter being considered a specific subset of the former:

> *"Landscape effects derive from changes in the physical landscape which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape. … Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity."* (LI-IEMA, 2002).

In this study we make the same distinction, and incorporate both seascape character assessment and visual assessment into our methodology.

2.2.2 Seascape Assessment

A Guide to Best Practice in Seascape Assessment (Hill *et al.*, 2001) is, to date, the key work on the assessment of seascapes in the UK. The guide advocates the following tiers for seascape classification:

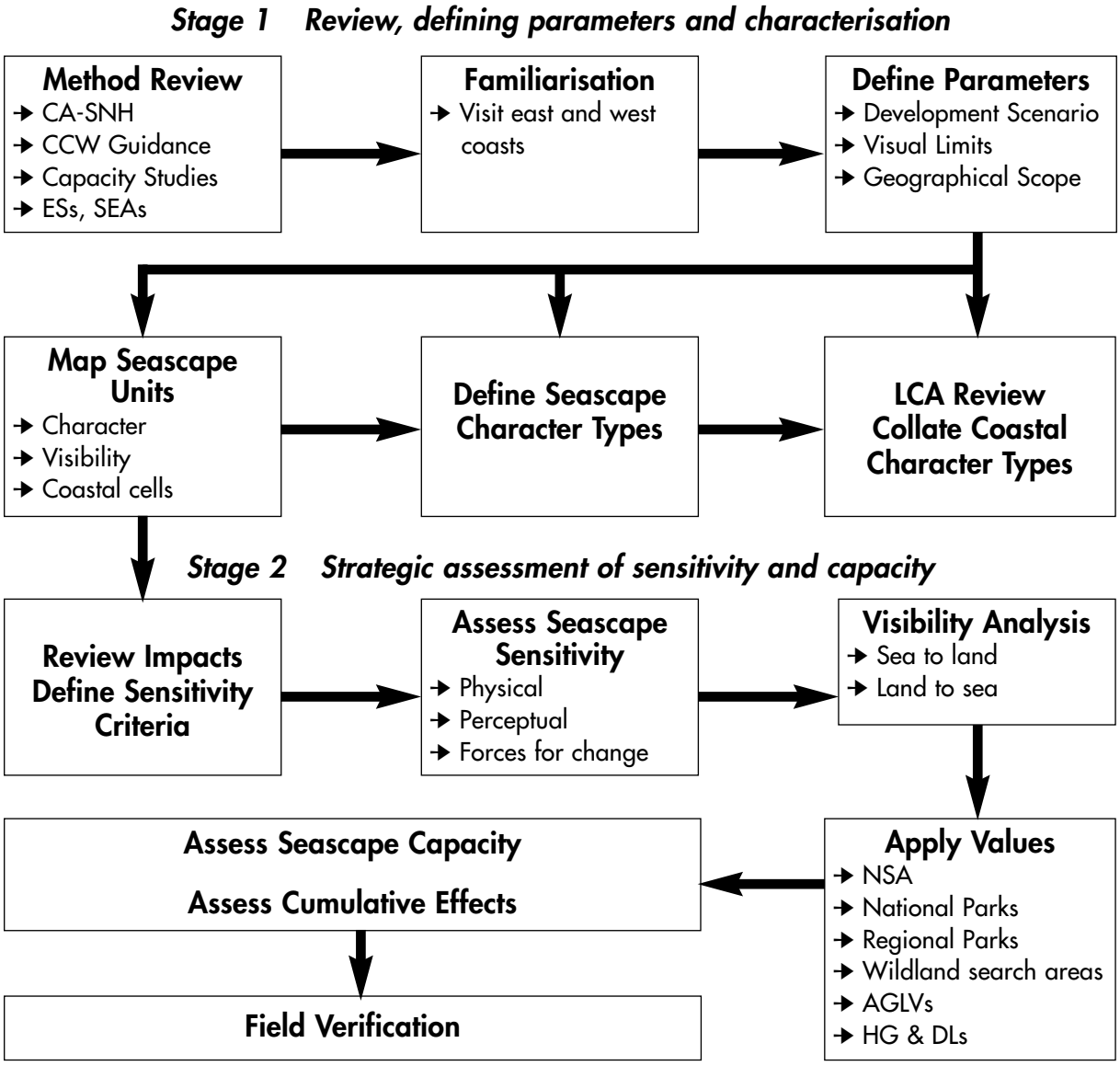
National Seascape Units: *"an extensive section of the coast with an overriding defining characteristic such as coastal orientation or landform defined by major headlands of national significance"*. They can be in

excess of 100km and will extend to 24km offshore and therefore viewsheds and intervisibility are not appropriate criteria for defining the boundaries of these units. These national units were based on major sediment cells for England and Ireland with which there was a clear relationship. Criteria for assessment at this scale include Zone of Visual Influence (ZVI), rare landscape features, major access points to the coast, recreation, cultural and historic associations, landscape designations.

Regional Seascape Units: subdivisions of National Units defined by regional headlands, islands, or coastal features where the determining factor is intervisibility based on GIS analysis. These regional seascape units can extend 15km offshore with a maximum length of 30km of coastline (ignoring indentations) and have a landward buffer of 10km. This is the most appropriate scale for strategic sub regional planning and for offshore wind energy developments. It is therefore this level of assessment that this current study focuses on. Seascape character assessment is based on coastline, hinterland and maritime elements.

Local Seascape Units: much smaller divisions (extending 2–3km offshore) and not usually appropriate for assessing large developments like offshore wind.

Figure 3 Overview of methodology for assessing seascape capacity



2.2.3 Classification of seascape units around the Scottish coast

The Hill *et al.* (2001) study provides a well considered and organised methodology for classification of seascapes and was largely adopted but with some important modifications for the seascapes of Scotland. While that study was developed from assessments of the Welsh and eastern Irish seascapes, the coastline and maritime component of Scotland's seascapes are considerably more complex, particularly in the north and west. In the Hill *et al.* study coastal management units (the basis for Shoreline Management Plans) were the basis for the national units and these are fairly well spaced throughout the Welsh coastline (and England and Ireland) and therefore made sensible national divisions.

However, similar coastal management units do not exist in Scotland and the coastal sedimentation cells for Scotland are very different in size. For example, the east coast which tends to have a much simpler coastline in seascape character terms is divided to a fine grain into cells and sub cells for sedimentation patterns, whereas the west coast which has a more diverse seascape character, has a much simpler sedimentation pattern and therefore one main cell covers much of the west coast (HR Wallingford, 1997).

A decision was therefore made to form seascape divisions in this current study on the basis of a combination of factors including seascape character, viewsheds, coastal geometry, orientation and sedimentation units (where these correlated to a reasonable grain of unit). A single tier of classification was therefore adopted which was at a strategic scale but still enabled distinct sections of coastline to be recognised. Visibility analysis which could provide information about viewsheds was considered to be useful in determining units. Therefore, our study largely accords with the strategic scale of the National Units identified in the Hill *et al.* guidance, but has some aspects of regional seascape assessment.

2.2.4 Future offshore

The DTI study, *Offshore Wind Energy Generation: Phase 1 Proposals and Environmental Report* (BMT Cordah, 2003) was a strategic environmental assessment carried out in respect of offshore wind energy developments. The seascape assessment was carried out only on the three strategic areas already identified through technological constraints (wind speed, water depth etc). These areas are the Wash, Liverpool Bay and the Thames Estuary. National and regional units were applied according to the Hill *et al.* guidance and regional units were applied on the basis of view sheds, coastal geometry and orientation. Sensitivity was determined by looking at four key elements, scale, land use, recreation and quality. Formal landscape designations were factored in at an early stage. In this current study the character of seascapes plays a crucial part in the sensitivity assessment process but values are treated as a separate layer, applied in the later stages.

2.2.5 Burbo[1] offshore windfarm landscape and visual assessment

The landscape and visual assessment contained within the *Burbo Offshore Windfarm Environmental Statement* (Casella Stanger, 2002) also largely adopts the approach outlined in the Hill *et al.* guidance and demonstrates the usefulness of the approach in organising the complex factors which determine seascape. It classifies seascape into both national and regional units and this appears to work quite well, but understandably, it focuses on a relatively small section of seascape limited by the zone of visibility associated with a proposed windfarm.

[1]Burbo offshore windfarm is located in the Irish Sea off Merseyside.

Although both the studies quoted above considered regional units as well as national ones, the current study covers a much larger area and is even more strategic in nature. It was beyond the resources and remit of this study to consider regional rather then national units.

Additional notes to SNH provided by John Briggs, one of the authors of the Hill *et al.* guidance, reveal an interest in developing the seascape assessment methodology further in relation to seascape character. In recognising the importance of the character of the landscape in views and relationships between land and sea he specifically references the approach to landscape characterisation made in the *Skye and Lochalsh Landscape Character Assessment* (Stanton, 1996) where this relationship was considered.

2.2.6 Landscape sensitivity/capacity studies

The Argyll (LUC, 2002), East Highland and Moray (MLURI & ECA, 2003), Western Isles (Benson *et al.*, 2004) and North East of England (Benson *et al.*, 2003) studies are all regional sensitivity/capacity studies for onshore wind energy. They are all heavily influenced in their approach by the sensitivity criteria developed by SNH for onshore windfarms through assessing attributes of landscape character. However each assessment applies these criteria in very different ways and this illustrates the innovative and developmental nature of this work. These methodologies are of most value in this review for the discussion of sensitivity and capacity criteria and have informed the current study regarding what will work for a strategic, desk based, offshore study. The Argyll study was focussed on finding sites for wind farms which we are not intending to do in this study. The East Highland and Moray study concentrated heavily on GIS for applying criteria such as landscape complexity, scale etc, whereas the current team approached both the Western Isles and the Government Office North East studies in a qualitative, descriptive way by looking at the character of the area. It is this latter approach that has been similarly adopted for this seascape capacity study, albeit modified to relate to the particular characteristics of seascape.

2.3 Familiarisation

Assessing the sensitivity of seascapes to offshore wind farms as a desk based, strategic study is a challenge. Although the team was already generally familiar with the broad character of much of the Scottish seascape, either from various specific studies or personal experience, it was beneficial to view actual seascapes in the context of assessing sensitivity to offshore windfarms. Two familiarisation visits were made, one to the west coast (Argyll, Islay and Jura) and one to the east coast (Berwick Upon Tweed – Firth of Forth). These have been important in the initial formulation of ideas and approach.

The west coast of Scotland poses particular challenges due to the intricate arrangement of islands and mainland and the interchange of views between them. The visit here was very beneficial as it helped to clarify particular issues which the Hill *et al.* study does not address due to the very different nature of the seascapes involved in Wales. In particular the distances quoted for significance may be an underestimate when applied to Scotland where the visibility is generally higher (see Section 2.4.2).

Views from ferries are also very important in Scotland particularly on the west coast and due to the number of islands and intricacy of coastline one ferry journey can provide many varied and changing views and compositions. The complexity of island seascapes or of having very complex coastlines, firths and sealochs where headland to headland geometry and orientation may not be easily applicable was a factor that had

to be resolved in determining seascape units. There is a marked difference between the areas between mainland and islands (inner island area) and the areas on the west where islands look out into the Atlantic (outer island area). The division of seascape units has taken this into account.

The stretch of coastline from Berwick upon Tweed to the Firth of Forth provided a contrast in scale, form, pattern, experience and perceptions. This contrast was useful as assessing sensitivity is a relative and comparative exercise. Consideration of two contrasting seascapes aided early discussions on consistency of approach and a relative strategic national scale of assessment from which to work. Differences between the east and west coast in terms of the actual and perceived remoteness and naturalness were noted and provided a basis for the relevant part of the seascape sensitivity assessment.

2.4 Parameters of study

2.4.1 Geographical scope

The study area includes the whole of the Scottish coastline and encompasses all proposed offshore wind energy development which will have an impact on Scottish waters. However, geographical scope was also determined by water depth. Figures for technically or economically feasible water depths currently quoted by the industry range from "up to 30m" to "up to 50m" (BMT Cordah, 2003). Analysis of current proposed development sites shows that the majority are in much shallower water than this. However, a proposed development in the Moray Firth is in water of 40m depth. SRF has advised that the industry regards any depth of more than 30m at the moment as unfeasible. However there may be technological advances in the near future which mean that siting in deeper waters is an option. Water depths of more than 50m were considered to be beyond the short/medium term prospect of commercial viability and therefore this factor was used to limit the study area in terms of the visibility assessment.

For the development of the scenario we used a distance of 8km offshore which is the minimum exclusion zone recommended in the DTI SEA (BMT Cordah 2003). This distance is based on research into distances of visual significance carried out by CCW (Briggs, 2003) and extrapolated for large offshore development.

Snodin in *Scotland's Renewable Resource* (2001) has produced an analysis of feasible areas for offshore wind based on water depth, wind speeds and cost. These areas have not been used in order to limit the area of study as technologies are developing rapidly and therefore cost efficiencies will change accordingly.

2.4.2 Visual limits

There were two main issues to be considered when exploring the issue of visual limits. The first was the issue of visibility which is largely an objective measurement and includes maximum potential visual range and actual visibility (subject to screening factors and atmospheric and meteorological factors) and the second was the issue of the significance of visibility which is subjective. The former issue influences judgements about the latter. Judgements made about significant distances affect decisions made regarding the outer limits set for ZTV (zone of theoretical visibility) analyses for example.

Further detail on factors affecting visibility is contained in Appendix B.

2.4.2.1 Visual range

An Introduction to Visibility (Malm, 1999), defines visual range in landscape terms as being *'the greatest distance at which an observer can just see a black object viewed against the horizon sky'*. Factors which affect visual range are:

- air clarity;
- meteorological effects;
- illumination of the overall scene by the sun including scattered (reflected) sunlight;
- object characteristics including colour, contrast, texture, form and size;
- acuity of the human eye;
- psychophysical responses.

The visual range in the atmosphere is reduced mainly by the presence of aerosol particles. These can be water droplets (rain, fog, clouds) or solid particles (eg smoke, dust, pollen, sea spray containing sea salt particles). In the absence of these particles where air clarity is exceptionally high the visual range of natural gaseous atmosphere would be over 200km. Studies in western US have recorded clean air visual ranges of up to 193km (Malm, 1999). In these conditions visibility is limited only by the curvature of the earth (see Appendix B) and acuity of the human eye.

A global visibility study (Husar & Husar, 1998) showed that visual range for Scotland is significantly higher than that for England and Wales and visual range on the north west coast of Scotland is consistently high. However, this study discounted the affects of weather and measured only air clarity. Although we have attempted to interpret some visibility distances from this study (see Appendix B) our conclusions remain very general but have affected our thinking in terms of the limits of visual significance (see below).

2.4.2.2 Actual visibility

In this study visibility of seascapes is objectively assessed through GIS analysis (see Section 2.9 for full discussion of method). This uses a 'worst case scenario' in that it maps visibility patterns using a basic digital elevation model (DEM) which represents screening by landform but cannot represent local screening factors such as buildings and vegetation.

Weather conditions in Scotland affect visibility for a significant proportion of the time and this is discussed more fully in Sections 2.9 and 3.3. Due to the seasonal, regional and local variations and the unpredictability of weather generally, we cannot interpret this information into anything other than discursive comment on general trends.

The size of an object is also important. For example, at a distance of 1km in good visibility a pole of 1m height will become difficult to see and at 2km a pole of 2m height will be difficult to see etc. (Hill *et al.*, 2001). This of course also depends on other factors mentioned such as colour, contrast and viewing time.

The towers of 5MW turbines are likely to be 5m diameter (from information supplied by James Glennie at BWEA). If we take 5m as an example then a viewer could theoretically see the tower at a distance of 50km. However, in certain viewing positions rows of turbines may coalesce theoretically creating visibility over longer distances (see Figure 4).

2.4.2.3 Distances of visual significance

In assessing the distances of visual significance which could then be applied to seascape units, different issues come into play. The crucial issue here is at what distance does visibility of turbines become insignificant?

The main guidance is contained in Hill *et al.* (2001), with further intelligence offered by the CCW (notes by John Briggs, May 2003). For the Hill *et al.*, study the consultant worked out limits of visual significance by assessing the grain of detail that could be seen from a boat looking back at the Pembrokeshire coast at different distances. They concluded that:

- up to 2km away we can see people, individual buildings, cars, individual trees etc;
- up to 10km we can see field patterns, clusters of buildings, woodlands, cliffs etc;
- up to 24km we can see broad colours and textures representing towns, uplands, forests etc. and out of the ordinary man made structures such as power stations and turbines;
- above 24km we struggle to see any recognisable detail on land.

Subsequently (and recognising that visibility of an offshore wind energy development out to sea is different from looking back at the landscape features of a coastline) a suite of visual significance limits was proposed by CCW to particularly apply to offshore wind farms. These distances were adopted in the DTI SEA report (BMT Cordah, 2003). They are:

0–8km – high visual impact

8–13km – moderate visual impact

13–24km – low visual impact

>24km – not significant

In comparison, during a familiarisation trip for this project to Islay and Jura in September, notes were taken on what could be seen from the Kennacraig to Port Ellen ferry and the Port Askaig to Jura ferry. These are not maximum distances of visibility but merely what the distances happened to be from the ferry route. These distances are guidelines only as it was not possible to accurately fix the position along the ferry route although landmarks and turning points along the journey provided useful references. The conditions were clear and sunny in the late afternoon with direction of view generally west and north west where the angle of sun and aspect combined to give a clarity of front/side lit views which highlighted landform detail.

- at a distance of around 15km settlement and field patterns along the coastline of Kintyre were clearly visible;
- at a distance of around 25km houses along the Jura coastline could be made out, however these were white and provided a high contrast with their background. It was the colour rather than the shape which was discernible;

- at a distance of around 30km the scree patterns and colours on the Paps of Jura and the light and shadow patterns on the hills (which highlighted landform) were clearly visible. The views of the Paps at this distance could still be described as dramatic because a sufficient amount of landform detail, colour and contrast could be appreciated;
- the hills of Scarba (50km) and Ben More on Mull (65km) appeared pale blue without any landform definition.

The key question arising from this is that if levels of visibility are higher in Scotland (or certain places in Scotland) should the limits of visual significance be increased? If offshore turbines can be seen more clearly at 24km in Scotland, does this make their visual impact necessarily more significant?

In answering this question, it is clear that potential visual ranges in Scotland (as opposed to visibility dependent on weather conditions) are generally significantly higher than in England and Wales. Having considered these issues fully the steering group recommended a seaward outer limit of visual significance of 35km for seascape units rather than 24km as a precautionary principle (it was also noted that the Moray Firth proposed offshore development is beyond the 24km limit of visual significance proposed by CCW and adopted by BMT Cordah). However we must stress that this does not mean we are making any recommendations for amending the DTI distances of visual significance, further research is needed.

In the absence of any other robust data inland we were guided by the Hill *et al.*, study and used a similar landward limit of visual significance of 10km. However we stress that visual range is likely to be greater in Scotland and further study is needed to assess how this would affect visual significance. Generally though, it was considered by the consultants and steering group that beyond this distance it was generally reasonable to assume for such a strategic study that the sea would play a diminished role in views meaning that it would be a landscape rather than seascape unit.

2.4.2.4 Zones of theoretical visibility

Visibility assessment of seascape units includes calculating zones of theoretical visibility (ZTV) of a particular development scenario and some reasonable distance limit needed to be applied. The practice and theory relating to this complex area is brought together and discussed in Benson *et al.* (2002) where the following distances are recommended.

Table 1 Recommendations for ZTV in relation to overall height

Height of turbines (total including rotors)(m)	Recommended ZTV distance (km)
50	15
70	20
85	25
100	30

That study made assessments relating to onshore turbines in 2002. Technology has moved on and offshore turbines are considerably larger than the heights used in that study. This study uses a development scenario of 150m turbine height (see Section 2.4.3) and therefore the distance for the ZTV has been increased to accommodate this increased height. For the ZTV analysis, a 35km distance seaward and landward was

used. The team was also guided by current practice in assessing impacts of offshore windfarms, a distance of 35km has also been used for the ZTV analysis in the Burbo ES (Casella Stanger, 2002).

2.4.3 Development scenario selection

Impacts of offshore windfarms will vary with distance from shore, height and number of turbines etc. and therefore a development scenario was adopted to make the assessment of sensitivity of seascape units to windfarms consistent. All judgements contained in this document regarding sensitivity of seascape are related, except where otherwise stated, to this scenario. One scenario was chosen rather than several for two main reasons. Firstly, clear information was received from the industry via the Scottish Renewables Forum (SRF) regarding the scale of windfarms likely to be developed in the near future. We have developed a scenario in consultation with SRF and the offshore industry which reflects the next generation of development. The second reason is due to the developmental and complex nature of this work. Not enough is known yet about the landscape and visual impacts of offshore windfarms and it would be promoting a false sense of accuracy to consider more than one type of development scenario if these had relatively minor differences in height, distance from shore or numbers of turbines etc. Consideration of this level of detail would also be beyond the scope of this strategic study. The development scenario parameters are set out in Table 2 and explained below.

2.4.3.1 Turbine height

According to BMT Cordah (2003), offshore turbines are likely to move into the range 3–5MW and with a maximum height from sea level (to blade tip) of 150–160m. Beyond these capacities and sizes, it is possible that the industry would be moving into an area of diminishing returns. The turbines approved at Robin Rigg (Solway) and proposed at Burbo Flats (Liverpool Bay) are 130m (maximum). A small pilot study for this study calculated the ZTV of both 150m height and 160m height and it was concluded that for a strategic study differences were minimal and there was no useful purpose in using limited resources to analyse a number of minor differences in height. A height was therefore fixed at 150m. Prototypes at this height currently being developed have a 90m high tower (diameter of 5m at the base tapering to 3.5m) and blades of 60m in length.

2.4.3.2 Size of windfarm

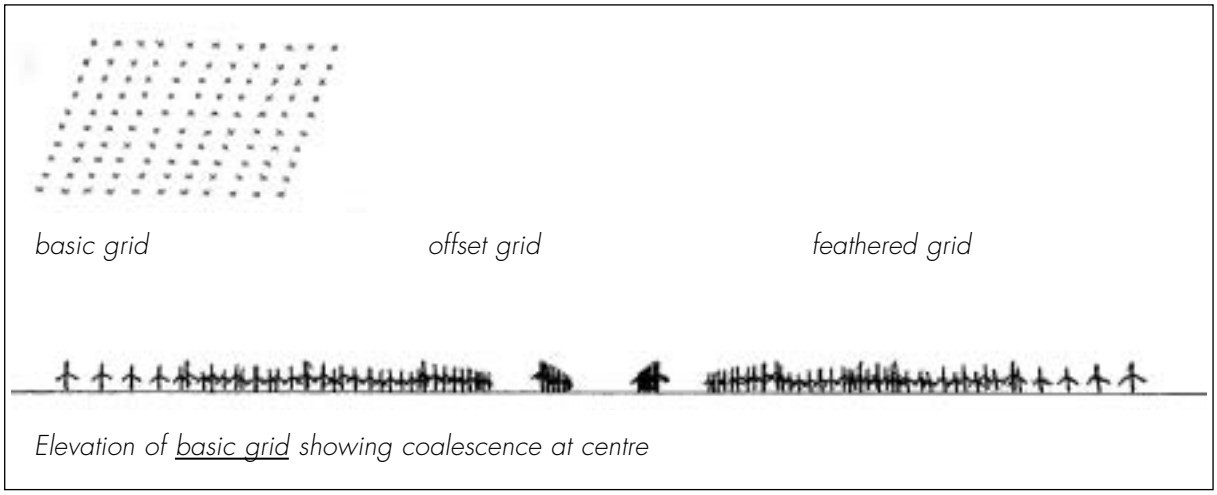
Under Round 1 of the Crown Estate permissions policy an upper limit on turbine numbers was set at 30. The Robin Rigg 60 turbine windfarm is actually two proposals side by side being developed simultaneously. Under Round 2 no limit on turbine numbers was set. Advice received on numbers being considered in Round 2 and in other developments internationally resulted in a scenario of 100 turbines covering an area of around 25km^2. This is presuming an average spacing of around 550m between individual turbines. However, advice (SRF) is that developments of upwards of 250 turbines may be developed in the near future.

2.4.3.3 Layout

Layout of windfarms is generally a compromise between capturing maximum wind, creating as harmonious a visual effect as possible and allowing for nature conservation interests. The grid structure means that the horizontal extent of the farm as seen from the coast is lessened. The offset grid which is proposed at Codling

Bank is stated as being more visually harmonious as it allows avenues of visibility to the horizon through avenues of turbines from many more viewpoints than the straight grid. Analysis of current developments and advice from SRF has indicated that at the moment developers are usually using a basic grid pattern. This study has therefore assumed a scenario of a 10 x 10 turbine grid covering a square of approximately 25km^2. It must be noted that this sort of layout will have different effects than offset grids or grids including 'feathering out' which may look more natural from certain viewpoints but have a larger horizontal extent. Figure 4 below illustrates the three layouts discussed here in plan view and an elevation of the basic grid pattern we are using in our scenario. These diagrams are for illustrative purposes only. The elevation shows that when looking straight on to the centre of the grid coalescence occurs in the centre rows which may increase visibility and further out a wind wall effect may be created which would make visibility of focal points beyond the windfarm difficult.

Figure 4 Turbine layout and associated visual effects



Elevation of basic grid showing coalescence at centre

2.4.3.4 Distance from shore

Distance from shore is a crucial factor in assessing seascape and visual impacts. One set distance was decided on in order to aid assessment and make assessment consistent. The distance decided on was 8km from shore for the following reasons:

- 8km is set by CCW/DTI as being at the limit of high visual significance and was used as a coastal exclusion zone in the DTI SEA report.
- current offshore developments and those consented/proposed are on average around this distance from shore (see Appendix E). The team was also able to obtain some visualisations around this distance in order to aid our assessment of impacts.

2.4.3.5 Colour of turbines

The usual colour of turbines is a matt white or light grey. For offshore turbines the base is coloured bright yellow for 25m above sea level. This is a navigational safety requirement. These colours are assumed for this scenario. In terms of visibility it is the contrast of turbines with their background rather than their colour which will determine visibility. This will change dramatically according to lighting and weather conditions. Visits to North Hoyle windfarm by the consultants showed that a variety of colour/contrast effects were

noticeable at the same distance according to atmospheric conditions. These ranged from turbines being grey against a lighter sky, white and bright yellow against blue sky and sea, turbines being tricolour with yellow base, grey tower and white blades and nacelle where the sun was hitting them. Due to the very large area of the development colour can also vary from one side of the windfarm to the other according to where the light is shining and where it is in cloud.

2.4.3.6 Summary of development scenario parameters

Table 2 provides a summary of the development scenario parameters described in the above text.

Table 2 Summary of development scenario parameters

Turbine height	150m
Number of turbines	100
Area of windfarm	25km^2
Layout	Basic 10 x 10 grid
Colour of turbines	Matt light grey/yellow base 25m above SL
Distance from shore	8km
Water depth	Max 50m

2.5 Review of Landscape Character Assessments

2.5.1 Overview

The first stage of assessing the character of Scottish seascapes was to review the extensive series of landscape character assessments and related documents produced by SNH. This review comprised of:

- Eighteen Landscape Character Assessments (SNH, 1996–1999)
  The programme of landscape character assessment (LCA) undertaken by SNH provides comprehensive coverage of Scotland. A total of 18 of the landscape character assessment studies were reviewed, these being the assessments that covered coasts within their study areas. A summary of this review can be found in Appendix C. This was the main resource for the descriptions of coastal and hinterland character and is discussed further below.

- *Analysis of National Landscape Character Types in Scotland* (David Tyldesley and Associates,1998)
  This study collates information from the SNH programme of landscape character assessment and defines national landscape character types (NLCTs), identifying 60 Level 2 types and 20 more strategic Level 3 types*. It was considered that NLCT Level 3 typology would be most useful to review for the study as it would be more manageable in view of its intended strategic scale. However, this work was considered to be of limited value to this study as it provides no location references or detailed characteristics of coastal character types. Nevertheless, the mapped boundaries of level 3 types were of some assistance in the division of the coastline into separate character types. See Figure 5a.

* In order to develop a national landscape character typology classification for Scotland all the original LCTs were examined for similarities and regrouped at three levels for use at a strategic scale. From the original studies 354 LC types (Level 0) were identified across the country and where they were essentially the same LCT apart from name, they were merged to form Level 1 (260 LCT's). The reclassification of similar LCTs in the national dataset produced 122 national types as Level 2. A subsequent broader reclassification of Level 2 produced 57 national LCTs as Level 3. As further more detailed work is undertaken (eg in Loch Lomond and Trossachs National Park LCA, 2005) the LCTs identified at different levels may be slightly revised.

- *Landscape Character Vignettes* (David Tyldesley, 1999)
  This study defines 18 natural heritage settings and gives a brief description of each. 15: Fresh Waters (Firths and Estuaries), 16: The Coast (The Land Margin), 17: The Coast (The Shore – Intertidal) and 18 The Sea (Surrounding Seas) are identified. These have only limited relevance to the capacity study being very broad areas principally defined for management purposes.

2.5.2 Conclusions on landscape character review

LCAs in the main define coastal types or areas on the basis of the characteristics of the coastline. With a few notable exceptions, this largely relates to whether the coast is rocky or 'hard', forming cliffs, or whether it is soft, forming sandy beaches, often with dunes and other deposition features. Exceptions to this are the following LCAs:

- the series of LCAs covering Caithness and Sutherland and Skye and Lochalsh, where more detailed coastal edges are influenced by the hinterland, and to some extent marine views and where only significant coastal features are defined as character types in their own right. The Lochaber and Ross and Cromarty LCAs follow this pattern to some extent although are less detailed;
- the Fife LCA also considers coastal (with some landscape 'hinterland' elements), intertidal and maritime components;
- the Moray Firth LCA, which describes to some extent the relationship between land and sea more fully and the character of the marine element of seascape;
- the LCAs covering the island groups of Shetland, Orkney and the Western Isles, where the majority of types defined abut the coast, although surprisingly little description is given of the character of the marine element and relationship of land and sea.

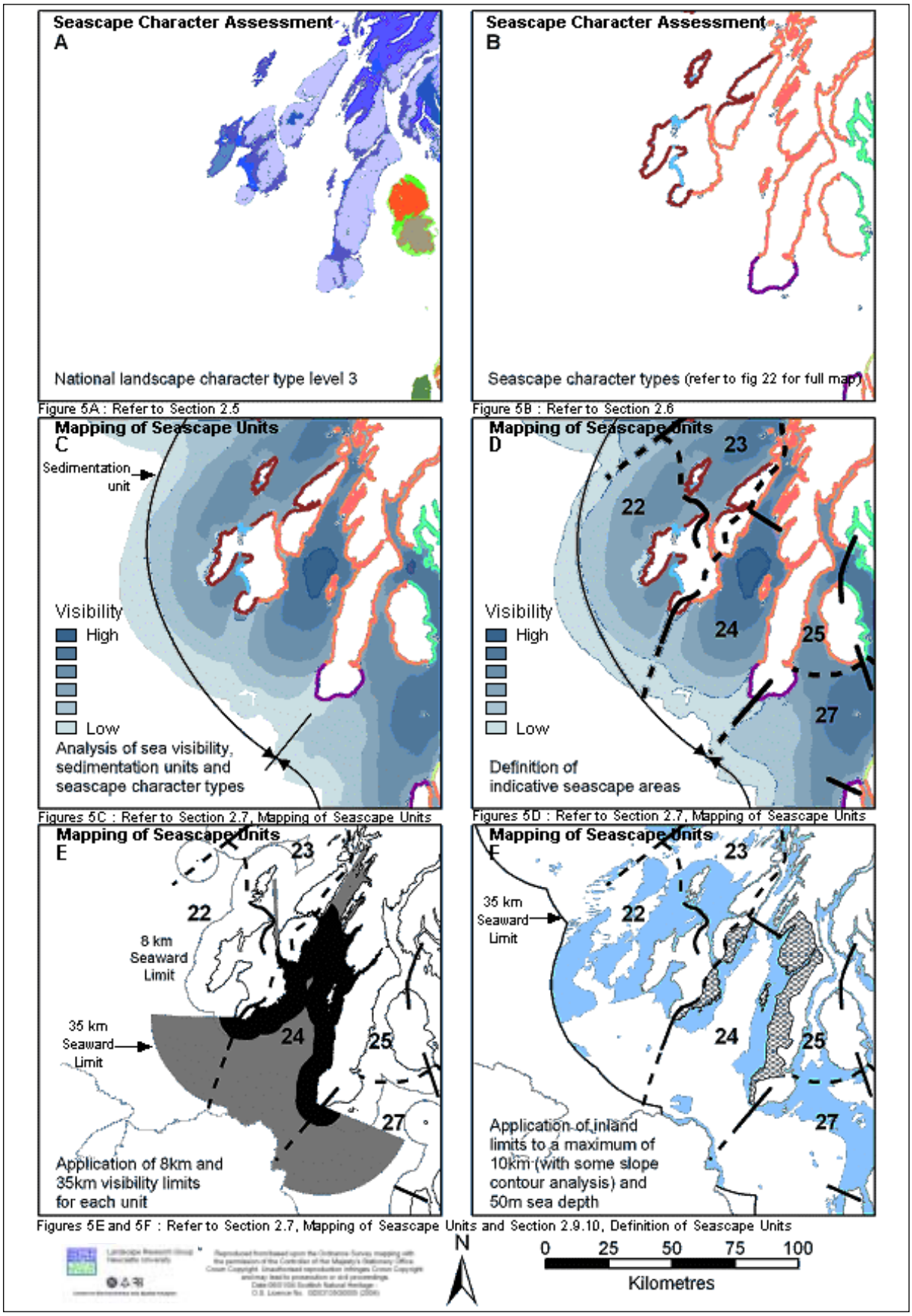
Whilst there are differences in the level of detail and way in which the coast is described within the LCAs, there was sufficient information on coastal character to inform the study. There were also found to be many similarities in the descriptions of coastline character within the LCAs and scope for amalgamating these into two broad types; hard and soft coastlines. Different characteristics were added to these two basic coastal types when descriptions of hinterland and adjacent landscape types or areas to the coast were evaluated. Consideration of the marine element of seascape character added a further element and some of this was gleaned from the LCAs, although much of this needed to be considered from first principles.

Amalgamated and slightly simplified coastal types defined from the LCA review were mapped and informed the basis of seascape character types. To this was added hinterland and marine character. The *National Landscape Character Types* (David Tyldesley, 1998) helped with mapping, cross checking and simplifying coastal types for a strategic study.

2.6 Seascape character assessment

Hill *et al.* (2001) split seascape up into three elements, hinterland (or landward), coastal and marine. Coastal character and to a large extent hinterland character was gleaned from the LCAs and related studies. The marine element is particularly difficult to characterise being normally a flat expanse of water. However, there will be bodies of water with different attributes; exposed and generally rougher waters, sheltered and

Figure 5 Key stages of the methodology



calmer, marine phenomenon such as whirlpools, busy with shipping or remote etc. The JNCC Regional seas information has some limited information relating to character of the sea mainly exposure, tidal ranges and wave patterns. Other information such as shipping lanes, oil and gas exploration infrastructure, popular sailing areas, marine phenomena were gathered from a wide variety of sources including sailing guides, pilot books and admiralty atlases. In addition the knowledge and experience of the team, steering group and SNH landscape advisors was invaluable.

The eastern coastline of Scotland is largely defined in relevant LCAs on the basis of whether a cliff/rocky coastline or sandy with dunes and links occurs. Adding in the character of the hinterland and views was a relatively straightforward exercise for these areas.

On the west coast of mainland Scotland and the islands the character is much more complex due to the significance of the marine view (the relationship between land, sea, islands and sounds). Few of the LCAs covering the west coast consider the character of the marine element, so consequently the team needed to draw on their own experience and other written material here.

A table of seascape character types using coastal character with hinterland and marine character added was drawn up (see Appendix C). These three elements were then drawn together in an overall description of 13 seascape character types with locational details (see Appendix D). This was then mapped and used as one of the spatial criteria in identifying and defining indicative seascape areas (see Figures AD 1 and AD 2 in appendix D). Figure 5 illustrates the key stages in this methodology with 5a and b showing the initial stages that involved definition of seascape character types.

2.7 Mapping of seascape units

Indicative seascape areas were defined in consultation with the Steering Group. A range of existing spatially defined areas were considered (coastal sedimentation cells, seascape character types, coastal geometry, aspect and visibility assessment) and used as a basis for this key exercise (see Figures 5 c & d).

Using these layers of information the coastline was divided up, resulting in 33 indicative seascape areas. These areas were then assessed for their sensitivity to a fixed scenario for offshore wind energy development by reference to a detailed set of criteria (see Section 2.8).

In order to assess the relative visibility and values (eg ratio of seascape covered by NSA) of all the areas, landward and seaward boundaries were applied to each area to create ***seascape units.*** As explained in Section 2.4.2.3 "Distances of Visual Significance", these boundaries were defined by 10km inland from coastline and 35km from coast to sea (see Figures 5 e & f). An additional seaward boundary of 8km was added for two reasons. Firstly to compare the 8km from coast and 35km from coast visibility scenarios. Secondly, 8km is the distance from shore on which we have based the development scenario for this study. Some narrow areas of sea cannot therefore physically accommodate this scenario and within the 8km buffer we can then see which areas are unfeasible for this scenario of development (see Figure 2). A description of the visibility analysis which supports the delimitation of seascape units is in Section 2.9.10.

2.8 Seascape sensitivity assessment

2.8.1 Review of potential effects

Offshore windfarms have the potential to create effects and impacts during construction, operation and decommissioning. Because the former are temporary, and the latter unknown (but presumed to eliminate any effect on seascape), we propose to place most emphasis on operational effects. As well as considerations of size and visibility, potential effects on seascape and visibility include movement, seasonal and weather effects, navigation and lighting at night etc. These factors are discussed below in Section 2.8.2 and relate to particular aspects of seascape sensitivity criteria that have been developed for this study. The assessment of onshore effects, including sub-station infrastructure, overhead power lines and related issues, has not been undertaken due to the strategic nature of the study and would need to be considered on a case by case basis.

2.8.2 Sensitivity criteria

We have developed the following criteria from our experience with onshore capacity studies but have amended them to take account of both seascape (as opposed to landscape) and the strategic desk-based approach of this study where fieldwork is not a major part of the assessment method. These criteria were also developed from a wide range of literature on the potential effects of offshore windfarms. They are broadly divided into physical and perceptual criteria.

Table 3 provides a summary of the main points which were considered under each criterion when assessing the seascape areas for their sensitivity to windfarms.

Note: This table is included to aid transparency of professional judgements but it must be stressed that it is a very simplistic account of the team's discussions and deliberations and must not be considered or used on its own without reference to the accompanying notes and illustrations. Seascape assessment is not a quantitative science and many of the characteristics of a seascape cannot be simply put into a 'decreases sensitivity' or 'increases sensitivity' box without reference to the overall context. Many of these criteria are interrelated rather than mutually exclusive and so additional care needs to be taken that certain aspects are not double counted.

Table 3 Criteria for seascape sensitivity to offshore windfarms

Criterion	Tend to increase sensitivity	Tend to decrease sensitivity
Scale and openness	Small scale, enclosed, views to horizon limited by landform Introduction of an element of scale into previously un-scaled area Where scale is huge and smaller elements (turbines) would detract and vice versa Where openness is a key characteristic and introduction of built elements would compromise this.	Large scale, open views
Form	Intricate, complex, rugged forms Where great simplicity is the key characteristic and introduction of vertical structures into very horizontal composition would compromise this.	Flat, horizontal or gently undulating Simple forms

Table 3 *(continued)*

Criterion	Tend to increases sensitivity	Tend to decrease sensitivity
Settlement	Small scale, traditional, historic settlements. Small clustered villages Lack of infrastructure	Linear settlements, urban form, larger scale infrastructure
Seascape Pattern and Foci	Complex or unified pattern which would be disrupted by turbines. Important focal points eg headlands, offshore islands, mountains peaks.	Simple pattern Lack of natural focal points
Movement	Where stillness is a key feature Where/when movement is highly natural, irregular or dramatic (on exposed coastlines, waves crashing) and regular mechanical movement of turbines would distract.	In busier areas where turbine movement relates to other forms of mechanical movement present eg cars, boats, aircraft. Where/when waves are gentler and slow, regular movement of turbines could compliment lapping of waves.
Lighting	Where the area is unlit at night. Little impact of lights from sea and land traffic. Where lighting is from scattered small settlements, lighthouses etc and windfarm lighting would introduce a new, different scale	Area is already well lit at night Lights of sea and land traffic present
Aspect	Turbines would interfere with sunrises and particularly sunsets Where turbines would be most often backlit, thereby increasing contrast and visibility.	Turbines away from sunrise and sunset positions Turbines front lit
How Experienced	From secluded coastline, intimate coastal roads and footpaths. From important viewpoints and elevated positions where the focus is the view and not the activity.	From main coastal, busy roads. Crowded beaches where focus is on beach activities.
Modification Naturalness Remoteness	Undeveloped seascape Highly natural, unmanaged Remote or isolated	Highly developed seascape Highly modified/managed Not remote
Exposure	Sheltered and calm seascapes Where seascape is extremely exposed such that the perceived wild and elemental nature is a key characteristic and development would significantly change this perception.	Open, windy seascapes where exposure is present but does not provide an perception of elemental or wild seascape character and development would be perceived as relating to windiness.

2.8.3 Physical aspects

2.8.3.1 Scale and openness

The issue of scale is complex with offshore developments and becomes much more difficult when thinking at a strategic level. Scale issues obviously depend on the magnitude of the development and again we stress here that we are using a specific development scenario and our conclusions are limited to this. Turbines will most often be viewed from land in a flat expanse of sea and in the absence of any other elements it is difficult for the observer to assess the scale of development. In instances where there are other elements in the sea which introduce a scale comparison eg islands, views to headlands, oil and gas infrastructure and where the viewer has an idea of the scale of these elements, then the scale of turbines becomes easier to

appreciate. In certain circumstances assumptions made about the size of turbines can affect the appreciation of scale of other elements and vice versa.

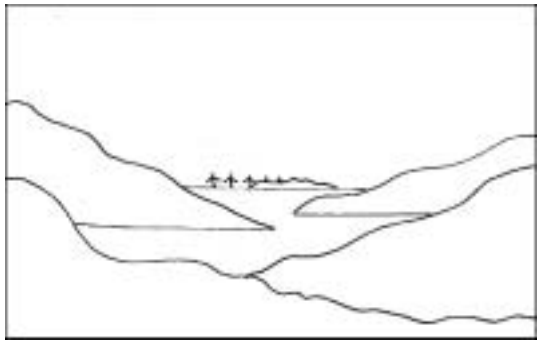
Scale issues relate to the vertical scale of turbines, the horizontal spread of the windfarm and the scale of the plan area covered by the windfarm. Scale issues will be dependant on the distance of the development from the coast and on whether there is any landform or other development beyond the windfarm (views of islands or distant mountains etc) where there could be conflicts of scale between elements.

The layout and number of turbines will determine the horizontal scale of the development. Horizontal scale will diminish with greater distance. Our review of visualisations and photomontages contained within the environmental statements for the Burbo and Robin Rigg offshore windfarm developments, show that at distances of around 8km the windfarm takes up approximately 30% of the horizon whereas at a distance of around 35km the windfarm takes up around 7% of the horizon (at an arc of view of 76°). Although these photomontages were using smaller scenarios of windfarm, in terms of the height and numbers of turbines, than this study is considering, the comparative figures were found to be useful.

The amount of horizon the development occupies will be determined by distance from shore and also by how much horizon can be seen in that view. As this study uses a development scenario at a distance of 8km from shore the horizontal extent of turbine development in relation to sea in view becomes most important. In this sense, large scale open seascapes (eg very linear coastlines) will be better able to accommodate development than small scale, enclosed seascapes (bays, inlets, sea lochs and inner firths) where development may take up more of the horizon as views towards the sea are more likely to be contained and/or framed by headlands. (Note that in large open seascapes visibility is likely to be higher but this is assessed separately in the visibility analysis, here we are discussing scale effects not visibility.)

Where seascapes are large scale and open and scaling elements absent, this can result in development being seen within a very simple context with sensitivity thus potentially being decreased. Where development may be viewed from within a small scale seascape where views to the sea are limited and framed then the presence of large scale development, even though located some distance from shore, can conflict with the scale and characteristic enclosure of the seascape.

Figure 6 **Turbines conflicting with slot views.** Where the horizontal extent of the sea view is limited turbines may dominate horizon line.
Turbines may also conflict with the focal point of the slot view to sea particularly if there is a distant focus such as island or distant mountains. In this example, turbines may also detract from the strong overlaying and interlocking pattern of landform and water (see 'pattern and foci' criterion).



The horizontal extent of turbines may also obscure or intrude upon views to landmasses behind them or to sunsets. Some simple calculations were carried out using the development scenario and a landmass with horizontal dimension of 10km and vertical dimension of 800m at its highest point (similar to the dimensions of the island of Rum). The windfarm is always viewed at a distance of 8km with a view to the landmass behind. When the landmass is 20km from the viewer the windfarm obscures the horizontal dimension of the landmass. When the landmass is 35km away from the viewer the windfarm completely obscures the views to it both in a horizontal and vertical dimension.

Vertical scale may also be important when turbines are viewed in relation to other elements in the same seascape. Some islands, mountains and headlands are not very high but appear so due to the steepness of their slopes rising straight out of the sea. Turbines would have the potential to diminish the large vertical or apparent vertical scale of natural elements.

Figure 7 **Headland and stack without scaling elements.** The vertical scale of the headland and stack look impressive due to their steepness although it is hard to ascertain the actual height. The stack is also a key focal point in this view.

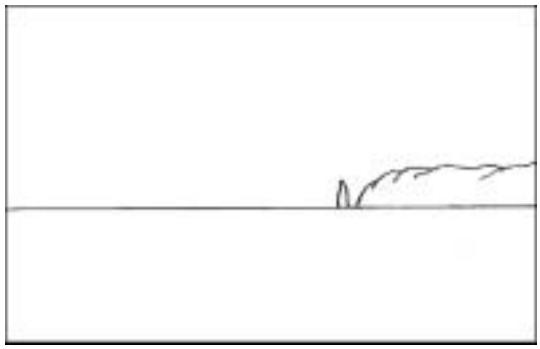
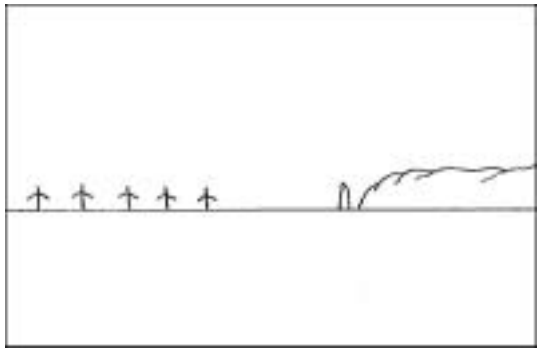


Figure 8 **Turbines decrease apparent vertical scale of headland and stack.** The introduction of turbines may have the effect of diminishing the apparent scale of the natural features. The viewer will tend to scale the stack from their perception of the height of the turbines. Also the turbines detract strongly from the focal points of the natural features.



The scale of area taken up by the development becomes an issue when it is viewed from elevated viewpoints or from aircraft. The scale of the nearby coastline becomes important in this instance, for example, an area of 25km^2 is larger than many small islands and scale conflicts could occur when these are viewed within the same area (see Figures 9 and 10).

Figure 9 **Plan view of windfarm with intricate coastline.** The plan area of the wind farm (shown by the shaded box) may conflict in scale with an intricate coastline made up of smaller scale seascapes and offshore islands, many of which are smaller in area than the windfarm. The rigid linear patterns of the grid would also contrast with the highly natural and broken coastline.

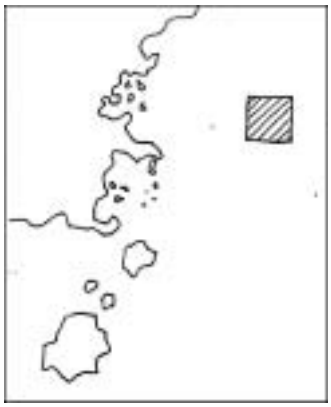
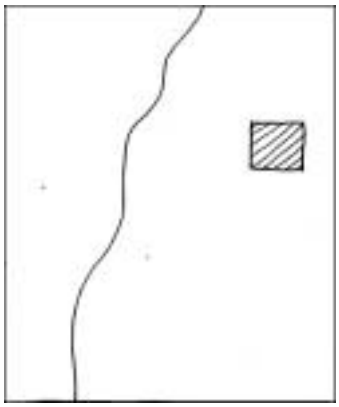


Figure 10 **Plan view of windfarm with simple coastline.** Where a coastline is linear and relatively featureless, scale is more difficult to appreciate and therefore less likely to conflict with the scale of a windfarm. The form of the windfarm also relates more easily to the linear nature of the coastline in plan view eg when seen from the air or from elevated viewpoints.



2.8.3.2 Form

Where seascape form is relatively flat and simple the relatively simple forms of wind energy developments could relate to this characteristic (see Figure 11). However putting tall vertical structures into an essentially horizontal composition will influence change and may compromise the simplicity which is often a key seascape characteristic. Each seascape unit will be assessed on its particular character. Where the seascape form is more complex and intricate, the straight, rigid lines of wind energy development may particularly conflict and cause visual confusion between differing forms (see Figure 12).

Figure 11 Simple coastal landform

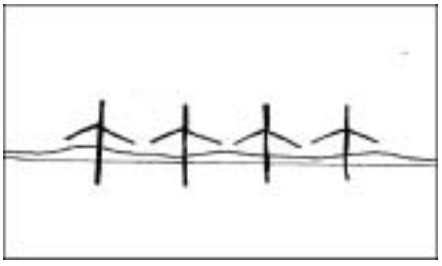
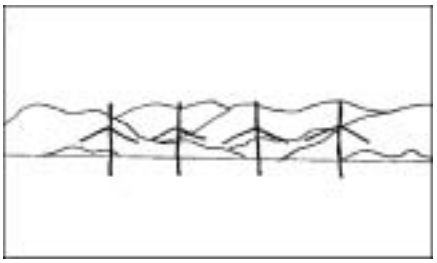


Figure 12 Complex coastal form



Here, we are essentially talking about landform and shape but it is possible that the sea itself may have a different character in specific locations eg places where there are Atlantic rollers or more calm sheltered bays. In addition, marine phenomena such as the Corryvreckan whirlpools north of Jura need to be taken into account.

2.8.3.3 Settlement

The nature, scale and pattern of built development/settlement is important and here, all built development and infrastructure has been considered. It is important to note that settlement has only been considered in terms of how it relates to the character of the seascape, not the importance of visibility and views from settlement. The visibility analysis is a separate part of the study. In general the scenario of development considered in this study would not relate well to small scale, traditional or historic settlements or features. Windfarm development is more likely to relate to linear developments, urban forms and areas where some larger scale infrastructure exists than to small clustered villages where scale and character contrasts are greater.

2.8.3.4 Seascape Pattern and Foci

Here we are talking predominantly about 'natural' patterns although built development is mentioned where it is important for this criterion eg focal points of power stations. This is an important criterion particularly on the more intricate coastlines where delicate overlaying patterns of landform create complex compositions and where turbines may conflict with the inherent pattern and focal points (see Figure 6). Where the pattern is simple and there is an absence of focal points there is usually more scope to site development; however an extremely simple seascape may also be important due to its lack of features and where the expansiveness and openness are valued qualities, particularly where these offer a foil to a more settled or enclosed landscapes inland.

2.8.3.5 Movement

In this criterion we have looked at whether movement is present and the sort of movement. In areas where there is little movement and stillness is a key characteristic then a large windfarm development will introduce movement and make a significant difference to the character. The type of movement is also important. The regular, mechanical movements of turbines are different in character to the natural, irregular movements of waves crashing for example. Other movement such as shipping, boats and aircraft would be considered to be more in character with turbines. Movement from within the viewing context is also important, for example, if viewed from a busy settlement or from roads.

2.8.3.6 Lighting

In this criterion we have assessed the potential impacts of the development on the night time character of the seascape. Lighting of the windfarm may introduce a new feature into a seascape, although this needs to be considered in the context of existing lighting along the coast and out at sea and the present ability to appreciate night skies.

2.8.3.7 Aspect

Aspect relates mainly to how the development is lit by natural light and also the impacts it may have on the appreciation of sunsets and sunrises. These conditions will vary according to the seasons and the position of the rising and setting sun will vary from the more northerly areas of Scotland to the southerly regions.

We have assumed a turbine colour of light matt grey. When front lit by the sun (and side lit to a lesser extent) turbines will, in clear conditions, appear a lighter colour and will be less visible, particularly when viewed against the horizon which is always a lighter colour than the rest of the sky. Turbines are more visible when they are backlit and especially at sunset when they become silhouettes and the contrast between them and the sky is at its greatest. Generally northerly aspects have less sensitivity as turbines will usually be front lit and will not interfere with sunrises or sunsets. However in summertime the sun moves far to the north and in the more northerly areas the sun rises well to the north east giving different effects. In westerly aspects turbines will not only be more visible at sunsets but could create a diverting focus from appreciation of sunsets. Again, in more northerly areas in summertime the sunsets would be in a north westerly direction. Other lighting effects include the highlighting of turbines when viewed against dark stormy skies where strong colour contrast can occur. Such effects are likely to occur periodically (and unpredictably) within all seascapes and, although noted, they were not considered in detail within the assessment. These variations should be considered more closely on a case by case basis.

2.8.4 Perceptual aspects

2.8.4.1 How seascape is experienced

In landscape assessments the perceptual sensitivity of landscapes is a human response often ascribed to different categories of viewer (or receptor) such as tourists, residents or workers etc. It is assumed that each of these category of receptor has different perceptions of the landscape and therefore different levels of sensitivity to change. We consider that a more useful way of categorising receptor sensitivity is to assess how that landscape is being experienced. For example this could be whether a particular seascape is mostly experienced from a main coastal road, from intimate minor roads giving varied and changing views, from crowded sandy beaches in holiday resorts where the focus is on beach activities or from secluded bays and isolated viewpoints where the focus is on views rather than activity, by boat or by climbing over mountain ranges. We consider whether views are glimpsed, open or panoramic, from sea level or from elevated positions.

2.8.4.2 Modification/Naturalness/Remoteness

Seascapes can be perceived as being natural or remote without being either in a true ecological or physical sense. The amount and nature of modification is related to these perceptions. For instance, in some cases, a modified agricultural landscape in the hinterland can appear natural and even remote, as in the case of some sparsely settled crofting landscapes. Generally the introduction of built development into previously undeveloped and remote seascapes can bring about a transformative change to the perception of that seascape. Development in previously developed areas may lead to a gradual rather than transformative

change, although it is important to note the scale and character of existing and proposed development as this will influence sensitivity to change. Here the terms used in NPPG13: Coastal Planning are useful in distinguishing isolated, undeveloped and developed coastlines. In general isolated, remote and highly natural areas are most vulnerable to character change as it is in these areas where development of this scale is likely to have a transformative effect.

2.8.4.3 Exposure

Exposure to the elements gives a good rationale for the siting of wind energy developments as set out in *Guidelines on the Environmental Impacts of Windfarms and Small Hydroelectric Schemes (SNH, 2001b*). This rationale would be served by siting windfarms in most places 8km offshore but some seas are perceived as being more exposed than others, the Atlantic coast compared to a more sheltered firth for example. In more sheltered waters large scale wind energy developments may appear disproportionate to the perceived wind resource. However, exposure also overlaps with the perceptual issues of wildness and naturalness which would be altered by large scale development. In areas which are perceived to be very elemental and 'wild' in terms of weather and exposure, for example, coastlines which are frequently buffeted by wild weather, with waves crashing against cliffs and areas with huge Atlantic rollers, development could compromise these qualities. We have considered each seascape unit and have balanced these factors according to the characteristics of the area in question.

2.8.5 Forces for change

The environment and seascapes are dynamic. For seascapes where there are significant and relevant forces for change, there is a possibility that a cumulation of both small and major, short term and long term changes (usually in the form of development) will create significant change to the seascapes in an area. However, because this may happen incrementally, these seascapes will be perceived as gradually less sensitive as more development takes place and this therefore increases the likelihood of more development occurring. It is therefore essential that the study assesses the forces for change and any implications for current and future capacity for offshore windfarms.

These forces for change have been drawn from (a) the SNH Landscape Character Assessments, (b) the steering group, (c) local development plans and other development proposals as known, (d) the wind energy and electricity industries and (e) SNH Natural Heritage Futures series.

Forces for change are outlined in Section 3 of this report and discussed in terms of how they may impact upon the sensitivity of each seascape unit. The main general forces for change that relate to seascapes are listed below:

- fisheries;
- coastal aquaculture;
- recreation/tourism;
- climate change/sea rise/coastal defences;
- shipping;
- mineral extraction eg coastal superquarries;
- land claim;
- marine and coastal policy.

These are discussed under each seascape area in the results section (Section 3).

2.8.6 Seascape sensitivity assessment

By working through each criteria and making qualitative judgements on how the windfarm scenario would affect that aspect of seascape an overall assessment was arrived at based on a ratings scale shown below in Table 4. In determining the sensitivity of a seascape to development we are assessing change and the nature of change to that area. It is crucial to note that we are not making judgements about whether that change is positive or negative, socially acceptable or unacceptable. Our remit in this study is to provide assessments of the likely changes which will occur in Scottish seascapes if development occurred.

Table 4 Definitions of seascape sensitivity ratings

LOW SENSITIVITY (score 1) Key characteristics of seascape are robust and are able to accommodate development without significant character change; thresholds for significant change are very high. Wind energy development relates to seascape character.
LOW-MEDIUM SENSITIVITY (score 2) Key characteristics of seascape are resilient and are able to accommodate development in many situations without significant character change; thresholds for significant change are high. Many aspects of wind energy development relate to seascape character.
MEDIUM SENSITIVITY (score 3) Key characteristics of seascape are vulnerable but with some ability to accommodate development in some situations without significant character change; thresholds for significant change are intermediate. Some aspects of wind energy development relate to seascape character.
MEDIUM-HIGH SENSITIVITY (score 4) Key characteristics of seascape are sensitive and development can be accommodated only in limited situations without significant character change; thresholds for significant change are low. Few aspects of wind energy development relate to seascape character.
HIGH SENSITIVITY (score 5) Key characteristics of seascape are fragile and are unable to accommodate development without significant character change; thresholds for significant change are very low. Wind energy development conflicts with seascape character.

2.9 Visibility assessment

2.9.1 Strategic assessment of visibility using a Geographical Information System (GIS)

Different visibility analyses were carried out at various stages in the methodology (see Figures 3 and 5), as follows:

At an early stage in the study, mapping of land to sea and sea to land visibility within 35km landward and seaward boundaries was carried out to inform steering group discussions about the approach to visibility analysis. The 50m depth limit was added to the sea to land analysis. These analyses are described in Sections 2.9.4, 2.9.5, 2.9.6 and 2.9.7.

To determine seascape areas as a basis for the seascape sensitivity assessment (see Section 2.7). seascape character units were mapped (see Figure 3). For this task the visibility of the sea from the land was mapped (limited to 35k seaward of the coast). The resultant patterns of visibility (Figures 23) were used alongside seascape character types and sedimentation cells to determine seascape areas (see Figure 5c and 5d). This visibility analysis is described in Section 2.9.4 and 2.9.6.

To delimit seascape units (see Section 2.7). Seascape areas need to have a defined seaward and landward boundary in order to compute the relative visibility and values. For this task 10km landward and 8km and 35km seaward boundaries were applied to determine the extent of each unit (Figures 5e, 5f, 17, 18 and 19). The reasons for the 10, 8 and 35km parameters are explained in Sections 2.4.2.3 and 2.7. This visibility analysis is described in Section 2.9.10 and the results illustrated in Figure 25.

Visibility analysis was then carried out (see Figure 3) to determine comparative visibility indices – a quantitative measurement of the relative visibility of the development scenario – for each seascape unit. Sea to land visibility analysis was carried out, as described in Sections 2.9.4 and 2.9.5. The parameters used were visibility from areas of sea of up to 50m depth, up to 35km seaward, with a landward boundary of 10km. Section 2.4.2.3 explains the choice of parameters and Appendix F explains why the sea to land (rather than land to sea) visibility analysis was used to determine visibility indices. The results are illustrated in Figure 30.

Other visibility analyses where carried out to map visibility from ferry routes (Section 2.9.8) and National Scenic Areas (Section 2.9.9). These are not included in the capacity assessment but are illustrated in Figures 26 and 27 as they may help to inform the assessment of the effects of specific proposals.

The following sections outline the methodologies that were adopted.

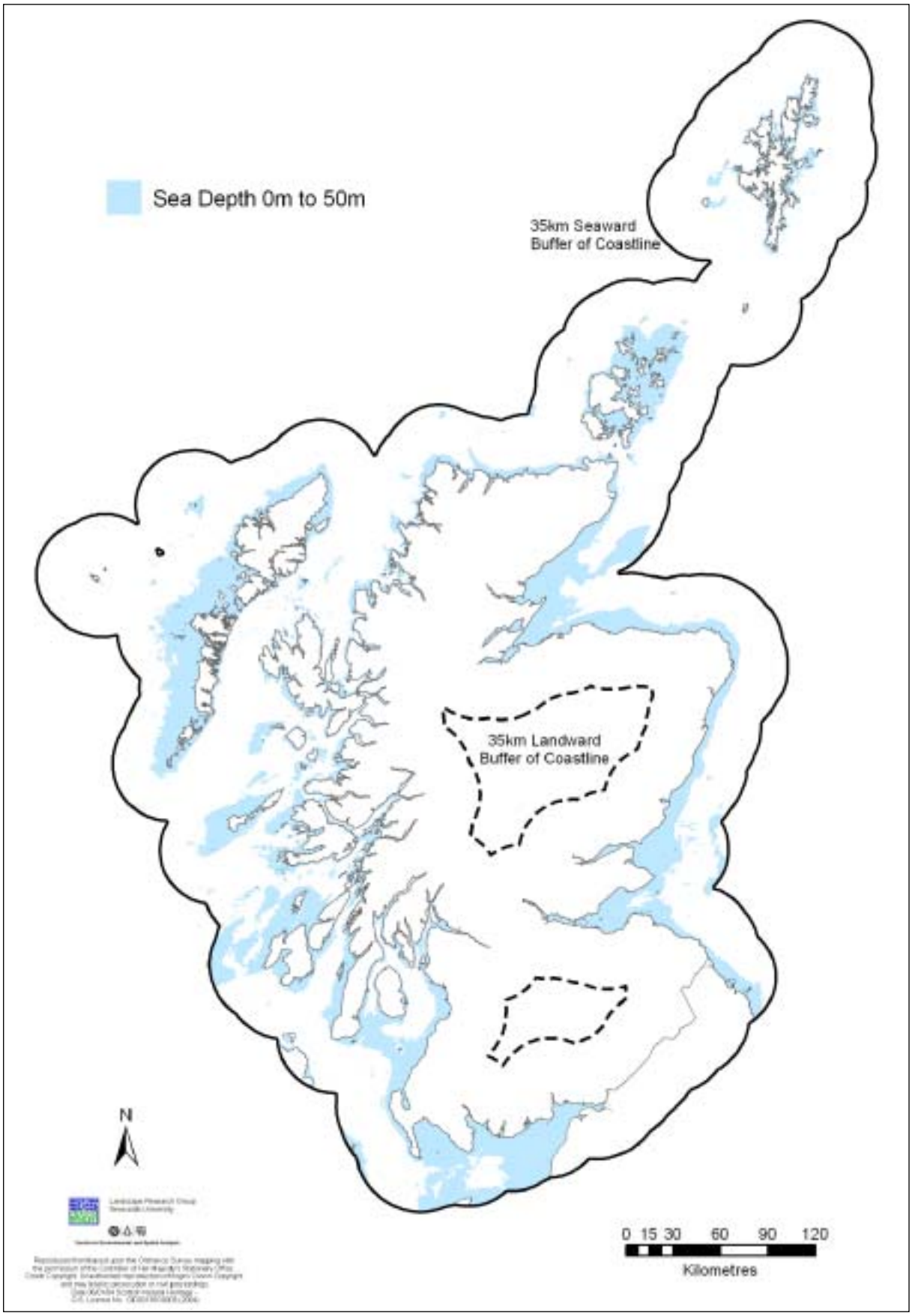
2.9.2 Background to visibility analysis

Visibility analysis has been undertaken for the whole of the Scottish coastline, based on a broad study area shown in Figure 13. The visibility analysis can be split into four calculations:

- visibility of sea from the land;
- visibility of land from the sea;
- visibility of the sea and land from ferry routes;
- visibility of landscape designations from land and sea.

All visibility analysis has been carried out using the in-built function, part of the Spatial Analyst extension in ArcGIS v8.3, called Viewshed. This in-built function is one of many that are available for this type of analysis within generic GIS software.

Figure 13 Broad study area for visibility analysis

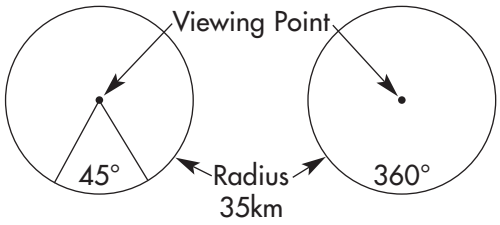


Visibility analysis identifies those areas on a map that can see a single or many specified objects, for example, wind turbines. Visibility analysis requires the following basic elements:

- a Digital Elevation Model (DEM), that describes height over a topographic surface. For all visibility calculations a DEM with a resolution of 50m by 50m was used;

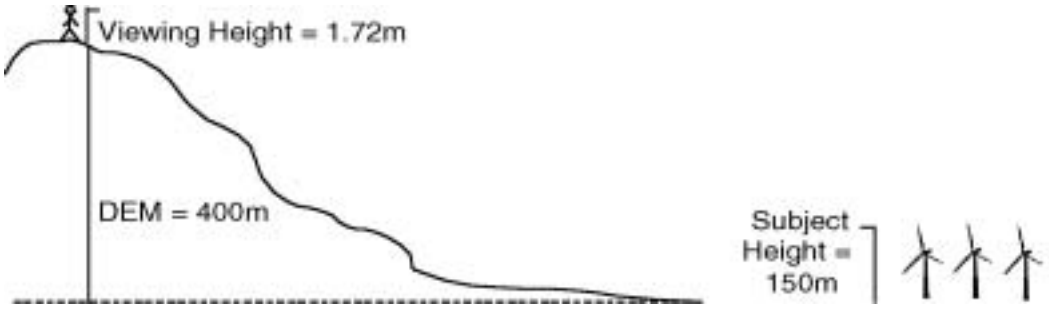
- a set of predefined ***viewing points*** can be used in the analysis. Viewing points can take the form of any feature such as ferry routes or viewpoints or the whole land surface. For an area, a grid of viewing points that covers the surface has to be created. For each viewing point it is possible to set the field of view or ***azimuth*** ie complete at 360º or at a defined azimuth of 45º;

Azimuth and Radius:



- in any visibility analysis, it is possible to set a distance limit beyond which visibility is no longer calculated. This ***radius*** can be set at any specified distance or is not set ie limitless. This brings in the issue of theoretical limits of visibility (see Section 2.4.2);

- heights are then chosen above the DEM height for the viewing points. Viewing points represent individuals standing on the Scottish coast. Therefore the average height of a person (1.72m) is added to the whole of the DEM within the radius limit that has been set. In the example shown below this particular viewing point has an overall height of 401.72m;

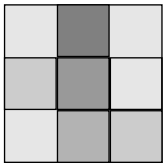


viewing point observation points

- the point which is being viewed, the ***observation point,*** must also have a set height, ***the subject height***. In the example above the observation points represent offshore wind turbines with a height of 150m;

- the output or results of the analysis, a ***visibility surface***, are usually recorded in Raster format. Raster format uses a grid structure to store geographic information as illustrated and described below.

Raster Format:



1	5	1
2	4	1
1	3	2

Each grid cell (representing a viewing point) contains a figure that is equal to the number of observation points that that grid cell can 'see'. If there is only one observation point, each grid cell that can see that observer point is given a value of 1. If there is more than one observation point the number in the cell reflects how many observation points that grid cell can see.

2.9.3 Calculating visibility

Calculating visibility identifies those grid cells in a DEM that can see one or more than one observation point within predefined parameters. Using one observation point as an example the visibility map would contain grid cells that are classed as:

- a grid cell that can see the given observer point = 1;
- a grid cell that cannot see the given observer point = 0.

For each observation point the calculation is repeated individually. Each viewing point grid cell accumulates a visibility score. The visibility surface, the result of the visibility analysis, contains cells with a value that indicates how many observation points each individual cell can see.

To summarise there are five key parameters that can be defined:

- subject height: of the point being observed (in addition to the DEM height);
- viewing height: of the observer (in addition to the DEM height);
- radius: distance limit of visibility calculations;
- azimuth: field of view;
- output grid: resolution of the visibility surface.

2.9.4 Parameter justification

2.9.4.1 The parameters selected in this visibility analysis reflect the strategic nature of the requirements

- 150m = turbine height to blade tip for selected windfarm development scenario;
- 1.72m = the average height of a person;
- 12.32m = viewing height for ferry routes. Due to the variability between the types of ferries, the number and height of their viewing decks and the variability in loads between trips the average height of a person on the lower deck of a Caledonian MacBrayne ferry is taken as a viewing height.

- A 1km x 1km grid size for observation points was used, based upon the findings of the studies in Wales (Hill *et al*. 2001);
- 35km grid extent of observation points landward of the coastline reflects the furthest possible limit inland from which a viewer could see an offshore turbine;
- 35km grid extent of observation points seaward of the coastline and cut to a 50m bathymetric depth reflects the furthest possible limit offshore that you could theoretically place an offshore turbine within territorial waters.

2.9.4.2 Visibility surface output resolution

In the assessment of seascape visibility, Hill *et al.*, (2001) used a high-resolution output grid of 50m by 50m. This required the splitting up of the coastline to alleviate computation time. This method also introduces error when the individual calculations are merged. Due to the much larger area of Scottish coastline, a 500m by 500m grid was adopted. This resolution decreases computation time and alleviates the need to split the visibility calculation. A 500m output, as shown in the *Landscape Capacity Study for Onshore Wind Energy Development in the Western Isles (Newcastle University 2004),* is of sufficient resolution for a strategic study as it is still possible to determine localised differences in visibility in relation to topography. The results support the qualitative assessment of wind turbine developments in seascape character units. In terms of the resolution of the visibility surface created there are two variables:

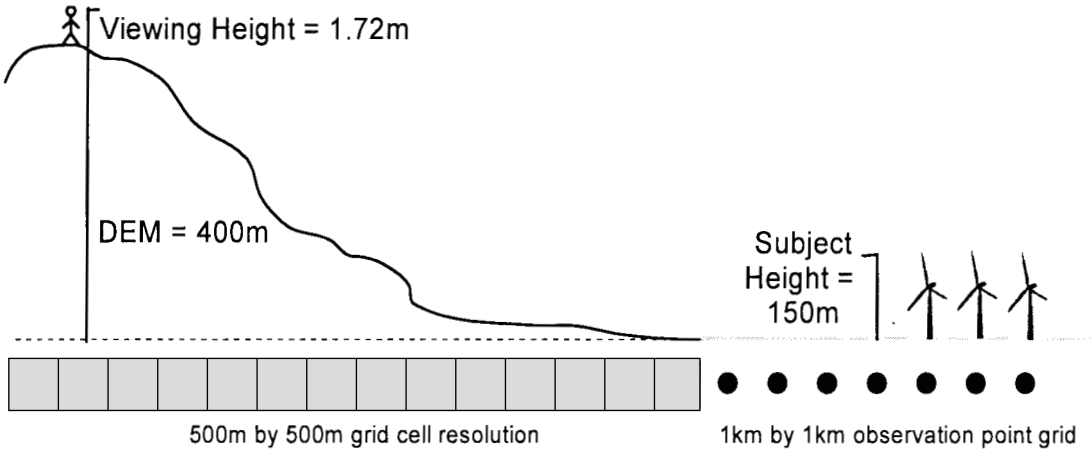
- the spacing of the observation points, covering an area (Figure 14), along a linear route eg road or ferry route (Figure 16);
- the size of the cell at which the results are presented – visibility surface.

The following sections describe how the requirements of the project are reflected in the specification of parameters given above. The method of data capture is also described along with an explanation of the results.

2.9.5 Visibility of land from the sea

Task: Calculate visibility of land along the coastline from the sea. This calculation was carried out early in the project to provide a general picture of the variations in visibility of the land from the areas of sea which are 50m depth or less.

A buffer of 35km seaward of the Scottish coast was overlain with 1km grid squares. Each grid square is then converted into a central point – the centroid – which forms that cell's observation point. All observation points with an underlying sea depth of greater than 50m have been removed according to the development scenario parameters. Each remaining observation point has the following parameters as shown in the diagram below and in the following table:



Parameter	Description
Viewing point	Grid size = 500m x 500m Grid extent = 35km landward from coast
Observation Points	Grid size = 1km x 1km Grid extent = 35km seaward from the coast (ZTV) and 0–50m sea depth
Subject Height	150m representing an offshore wind turbine
Viewing Height	1.72m representing the average height of a viewer standing
Radius	35km = Zone of theoretical Visibility
Azimuth	360º = Complete field of view
Visibility Surface	Output resolution = 500m x 500m

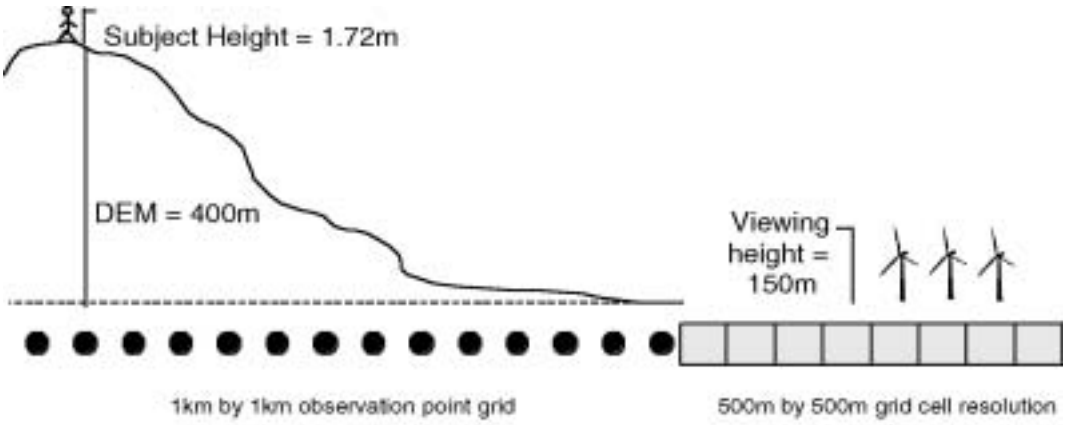
The visibility surface identifies areas on land that are most susceptible to seeing offshore wind turbines at sea and therefore conversely represents those area on land which are most visible from the sea. By having the observation points on sea only, the visibility surface on land (see Figure 14) contains a number for each individual grid cell that equates to how many of the observation points over the sea that it can 'see' – the relative visibility of the land from sea.

In Figure 14 the grid cell that can 'see' 956 observation points represents a person standing on land (the viewer) who can 'see' 965 offshore wind turbines if those wind turbines were placed every 1km at a sea depth of 50m or less. The visibility surface therefore represents the susceptibility of any point on land within 35km of the coast of being able to see an offshore wind-turbine based on the parameters defined above.

2.9.6 Visibility of sea from the land

Task: Calculate visibility of sea along the Scottish coastline from the land. This calculation was carried out early in the project to provide a general picture of visibility of the sea from the land. This calculation was used, along with seascape character types and sedimentation cells, to determine seascape character areas.

A buffer of 35km (outer limit of zone of theoretical visibility) landward of the Scottish coast has been overlain with 1km grid squares. Each grid square is then converted into a central point – the centroid – which forms that cell's observation point. Each observation point has the following parameters as shown in the diagram below and in the following table:



Parameter	Description
Viewing point	Grid size 500m x 500m Grid extent = 35km seaward from coast
Observation points	Grid size = 1km x 1km Grid extent = 35km landward from the Coast (ZTV)
Subject height	1.72m representing a person standing on land
Viewing height	150m representing an offshore wind turbine
Zone of visibility	35km = Zone of theoretical visibility
Azimuth	360º = Complete field of view
Visibility surface	Output resolution = 500m x 500m

The visibility surface identifies areas of offshore wind turbines that would have relatively greater or lesser onshore visibility. By having the observation points on land only, the output visibility surface contains a number for each individual grid cell that equates to how many of the observation points on land that it can 'see' – the relative visibility of the sea from land.

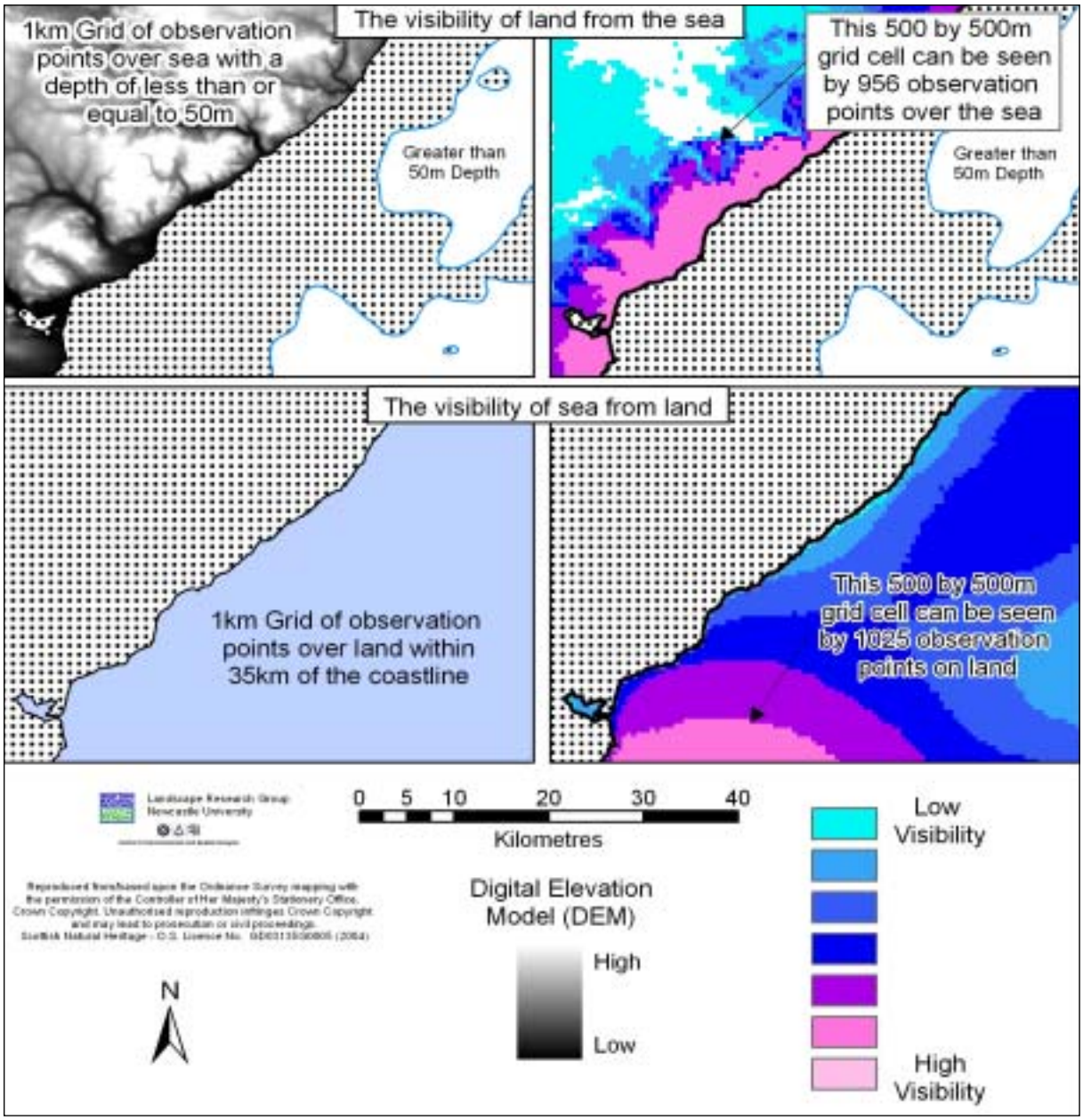
In Figure 14 the grid cell that can 'see' 1025 observation points represents an off-shore wind turbine that can be seen by 1025 people standing on land if a person was standing every 1km within 35km of the coastline (the theoretical limit of visibility). The visibility surface therefore represents the relative visibility of offshore wind turbines from land based on the parameters defined above. The higher the visibility count the more visible the offshore wind turbine is from land.

Please note that the subject height is always associated with the observation point. Observation points over land represent a person. Observation points over the sea are representative of an offshore wind turbine.

2.9.7 Interpretation of results

Taken together the results of both calculations can be used to determine which areas on land are where you are most likely to see wind turbines from and also which areas over the sea with offshore wind turbines are most visible from land. As can be seen, care needs to be taken in the interpretation of findings as you can have areas of 'sea' with low visibility scores at the coast immediately adjacent to land with high visibility scores such as area A in Figure 15. These areas coincide, in this example, with steep cliffs.

Figure 14 Calculating an area based visibility



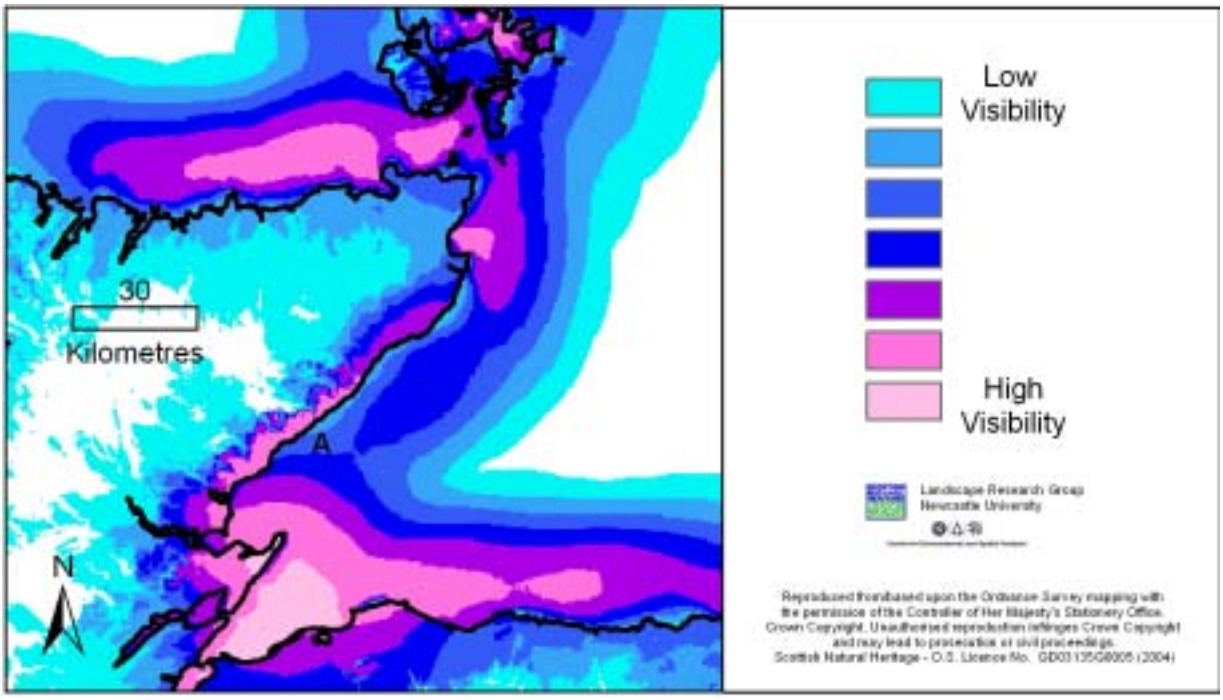
2.9.8 Visibility of the sea and land from ferry routes

The majority of ferry routes servicing the Scottish coast, sourced from OS Meridian data, have been converted from a route or line, to a stream of individual points from which visibility can be assessed (Figure 16). A point has been created every 100m along each ferry route. Visibility was calculated using the following parameters:

- object Height: 150m;
- viewing Height: 12.32m;
- radius/ZTV: 35km;
- azimuth: 360°;
- output Grid Size: 500m.

The context and use of this part of the visibility work is described in Section 3.3.1 of the report.

Figure 15 Interpretation of visibility surfaces



2.9.9 Visibility of landscape designations from land and sea

All areas designated as National Scenic Areas (NSAs) and National Parks were converted to a grid of observation points of 1km by 1km resolution. NSAs are predominantly land-based but some also include areas of sea. Consequently, the observation points for both land and sea are as follows:

Observation points on land

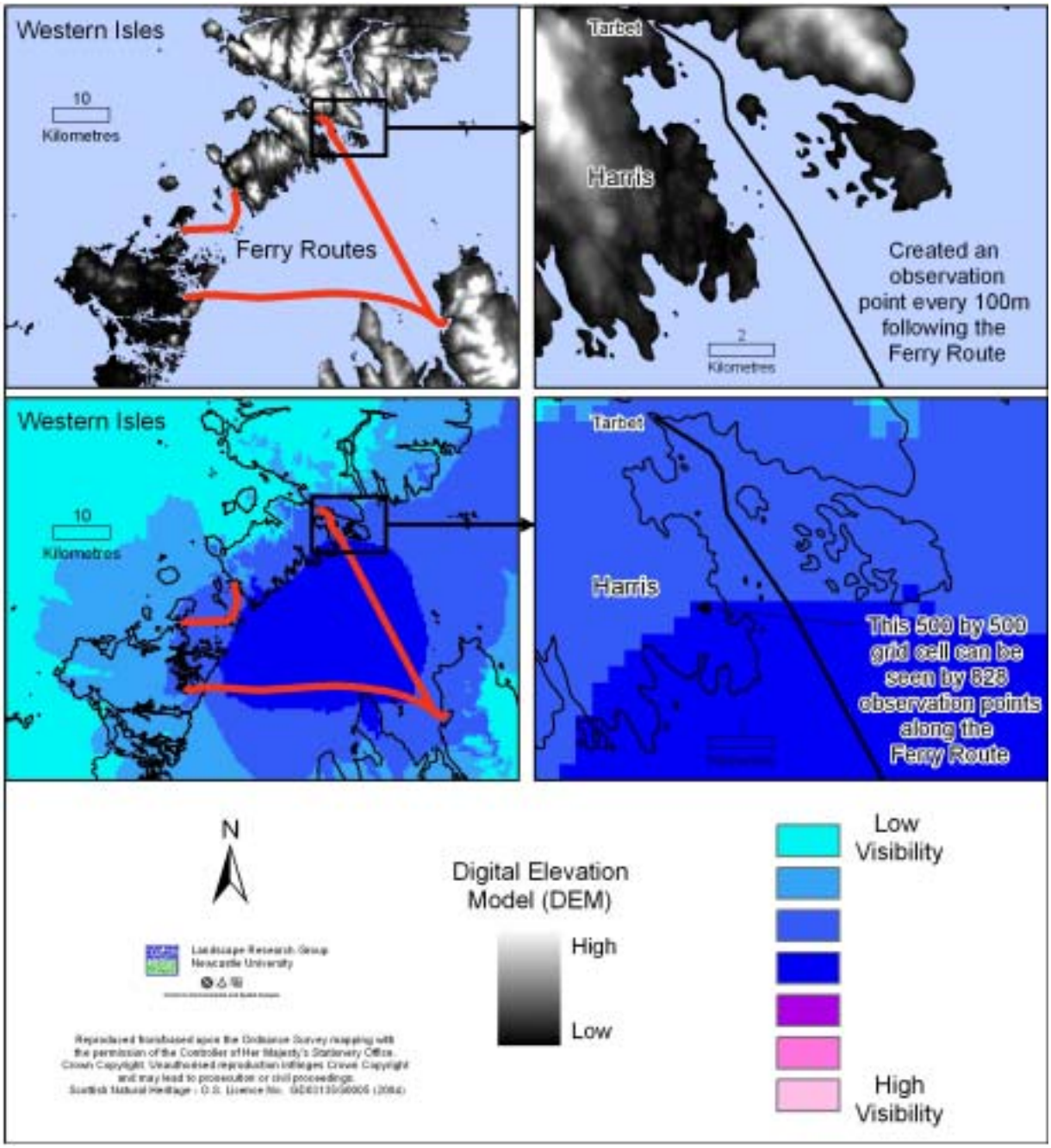
- object Height: 1.72m;
- viewing Height: 150m;
- radius/ZTV: 35km;
- azimuth: 360°;
- output Grid Size: 500m.

Observation points over the sea

- object Height: 150m;
- viewing Height: 1.72m;
- radius/ZTV: 35km;
- azimuth: 360°;
- output Grid Size: 500m.

The context and use of this work is explained in Section 3.3.1.

Figure 16 Calculating visibility for a linear route



2.9.10 Delimitation of seascape units

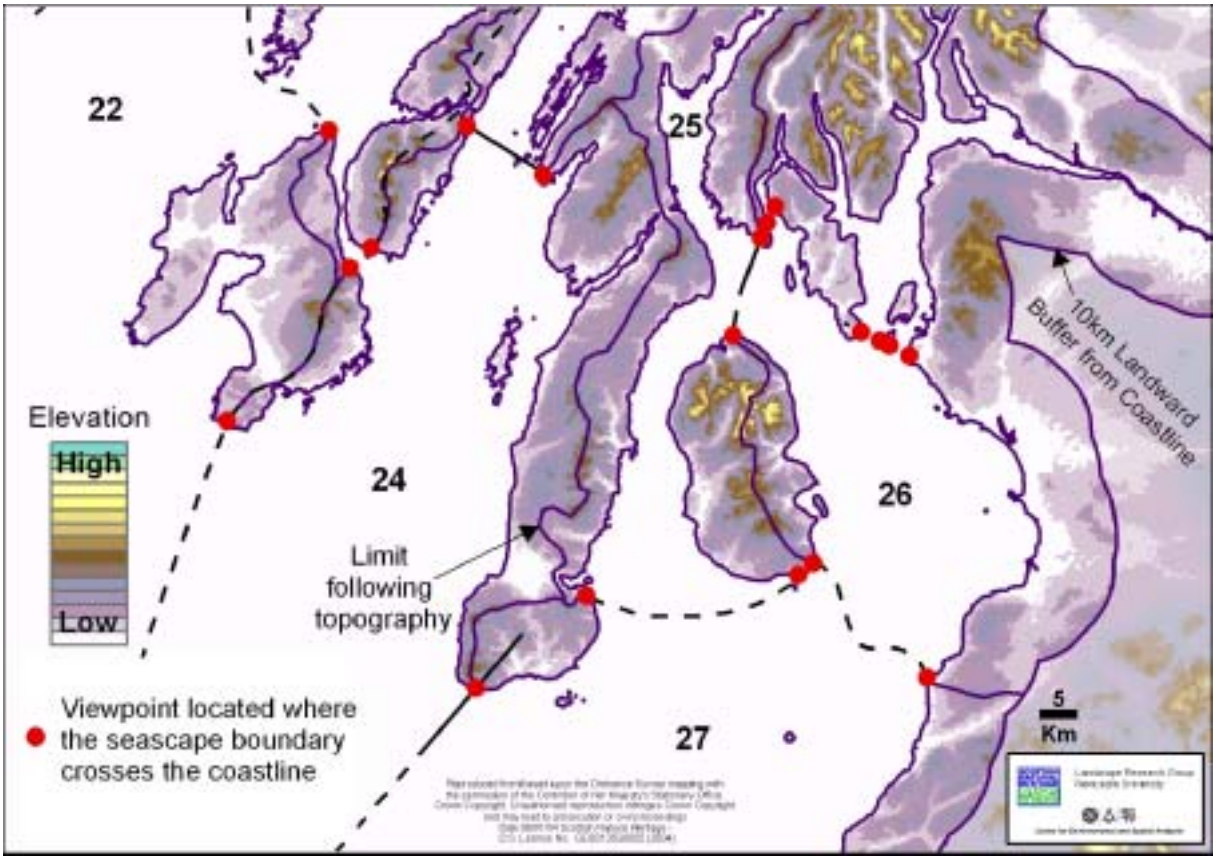
Once indicative seascape areas were defined along the coastline, using the methods outlined in Section 2.7, these needed to be converted into defined seascape units so that the relative visibility and values could be assessed. There are two stages to this process, establishing a seaward limit and a landward limit.

2.9.10.1 Establishing a landward limit

Where the boundary of the indicative seascape area crosses the coast this represents the furthest extent along the coastline of the given seascape area. A 10km landward limit was applied in order to calculate a relative index of visibility. Boundaries between each unit were drawn from the coastal point inland following contours until the 10km buffer was reached. Following contours defines those areas that look into

each individual unit, although along this boundary it is acknowledged that there is intervisibility between the two adjoining units. Where island land masses are too narrow to have a 10km buffer around their coastline, contour analysis defined landward boundaries between seascape units (Figure 17).

Figure 17 Establishing a landward limit at 10km



2.9.10.2 Establishing a seaward limit

Intervisibility is much easier to determine in order to define the seaward limits of a seascape unit. The point at which the boundary of an indicative unit crosses the coast was converted to a point. Two seaward limits for each seascape unit have been calculated, 8km and 35km.

The areas of sea that each point could see were then derived for each seaward distance limit using a Viewshed calculation using the following parameters:

- object Height: 1.72m;
- viewing Height: 150m;
- radius/ZTV: 8km and 35km;
- azimuth: 360°;
- output Grid Size: 500m.

The results for both an 8km and 35km limit can be seen in Figures 18 and 19. Using this technique it is therefore possible to determine areas of sea that can be seen in both units and define those areas that are in shadow from individual seascape units.

Figure 18 Establishing a seaward limit at 8km

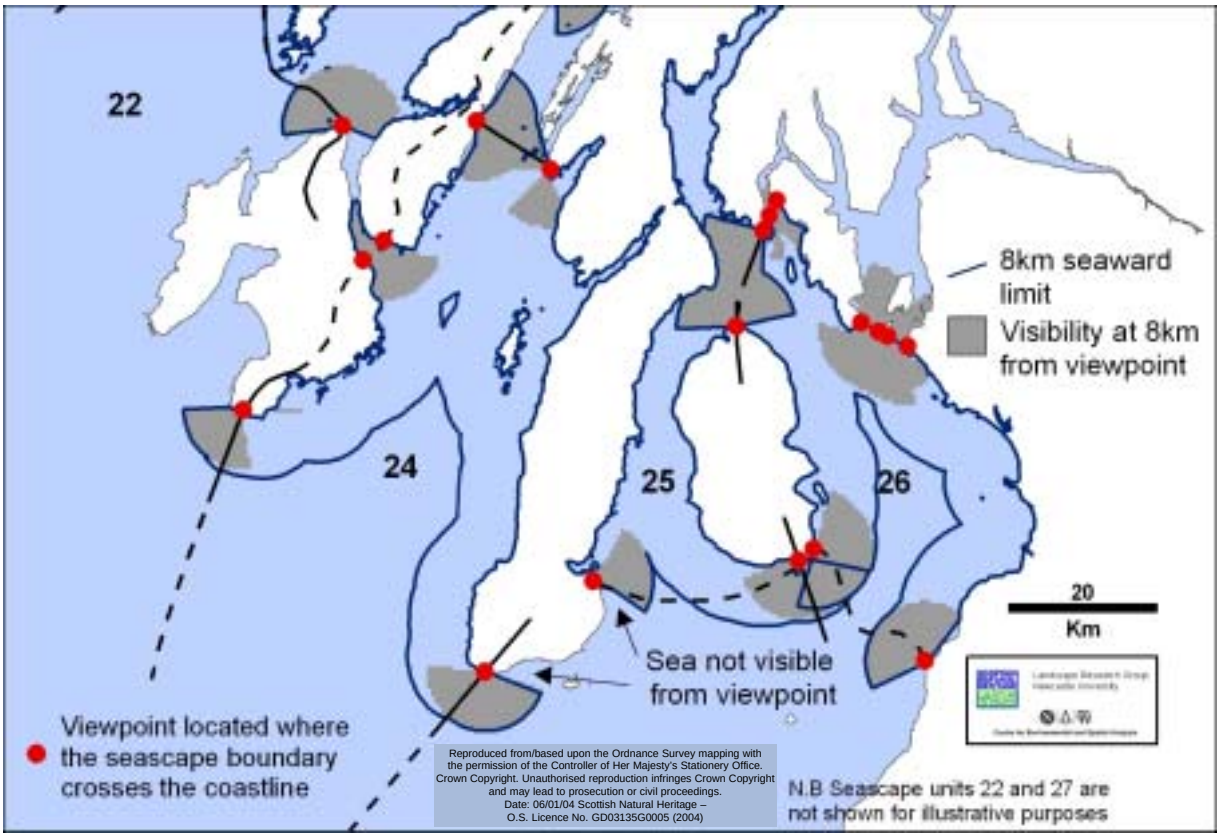
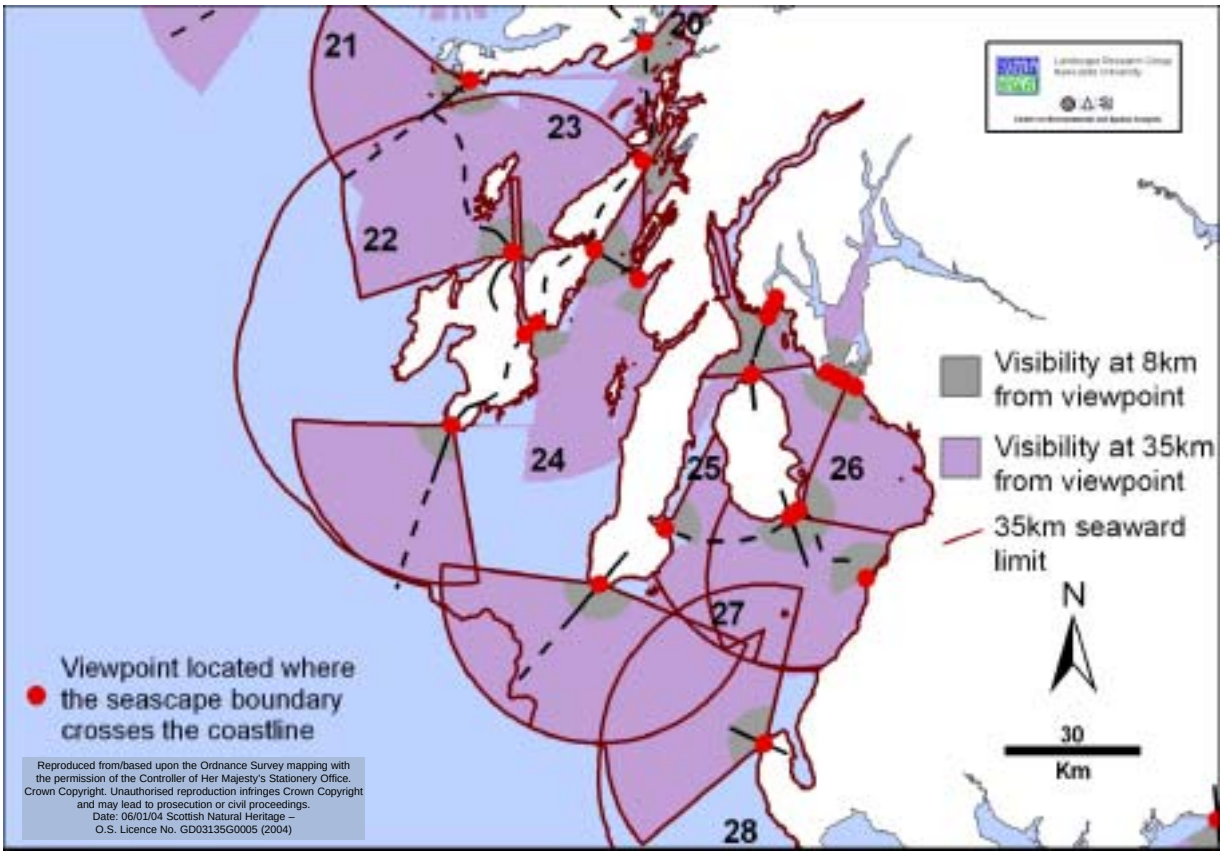


Figure 19 Establishing a seaward limit at 35km



2.9.10.3 Meteorological patterns and effects on visibility.

The above describes the basic *theoretical* visibility analysis. In actuality visibility is affected by many other things as described in Section 2.4. We have reviewed the issue of visibility with particular reference to the offshore and coastal meteorological and atmospheric conditions. We also attempted to gain information to ascertain the patterns of visibility for regional areas of Scotland. However, our overall conclusion is that visibility is complex, depends on a multitude of variables, is difficult to measure accurately and very few sources of reliable information exist.

The Met Office is the only source of information for the kind of statistics required for a more detailed and locational study on meteorological visibility patterns. Other studies have used Met Office visibility tables to make assumptions about visibility patterns. The Met Office can provide 10 year averaged visibility statistics for each weather station. The outputs are in the form of tables showing all the categories of visibility from the lowest to the highest and showing what percentage of time that value was recorded during that month representing an average monthly value in each visibility category for the last 10 years. Visibility is recorded from the lowest value of 100m up to 1km, then in intervals of 1km up to 30km then it is recorded in intervals of 5km up to the maximum category of 'above 80km'. Only the minimum visibility is recorded, for example if in one direction visibility is only 5km that is what is recorded even though in another direction the visibility is 20km. Therefore there is likely to be a consistent underestimate of visibility. Visibility is assessed using both human and instrument observation depending on which stations are manned. Significant margins of error are possible when using instruments to measure visibility.

Actual visibility has proved difficult to measure objectively. Good quality visibility data are scarce compared with data for temperature/rainfall. Instruments to measure visibility mostly use photo electric cells which measure the scattering of light from a small column of air. This has proved useful at night for runways etc but sampling of small volumes of air leads to errors arising from insufficiently representative samples. Human optical observations remain the most reliable. Although instruments have become more sophisticated, consultation with a meteorological academic (Dr Mike Smith, Institute of Atmospheric Science, Leeds University) confirmed that there are still significant errors in using a small sample of air in a column to measure visibility over long distances.

Although other studies have used Met Office statistics to make assumptions regarding visibility no health warnings appear. For these reasons we would approach Met Office statistics cautiously. They were also cost prohibitive for this strategic study that would have required obtaining statistics from a large number of weather stations to gain accurate regional results.

Therefore we researched a number of general meteorological studies to piece together a picture of weather trends and effects that impact on visibility of offshore development. These effects are outlined in the results Section 3.3, with further detail contained in Appendix B.

2.10 Seascape values

Values have been considered as a separate and distinct exercise during the project. Some seascape-landscape values are already made explicit through statutory designation such as National Scenic Areas, and these are easily incorporated into the study, but separate from the basic seascape sensitivity assessment. However, more local seascape values are particularly complex. These values often arise through a close

cultural association with the sea and land. The seascapes may also be highly valued by many other non-local stakeholders for many other reasons, for example as being high in spiritual, tourism, cultural or recreational values. Due to the complexity and locality of these issues we have limited this study to the already defined values listed below. **However we must stress that this does not represent a complete list for more local and detailed studies.** In general, we have used and as necessary refined and adapted the "values" used in the existing SNH onshore guidance (SNH, 2002c):

- World Heritage Site
- National Scenic Areas (NSAs)
- National Parks (NPs)
- Regional Parks (RPs)
- Wildland Search Areas
- Areas of Great Landscape Value (AGLVs) or equivalent regional designation
- an Inventory of Gardens and Designed Landscapes in Scotland

GIS analysis was carried out to determine the percentage area of each of the above values for each seascape unit and therefore an 'objective' assessment of the value of each unit was arrived at.

2.11 Seascape capacity

The seascape capacity assessment is based on deskwork, and involved the integration of the previous elements described, as shown in Figure 5. Evaluation of capacity has been arrived at by assessing character sensitivity, visual sensitivity and seascape value. Each of these elements has been assigned a rating and the ratings added up to determine a measure of capacity. Ratings are explained in the results Section 3.1 of the report.

It should be noted that the capacity assessment is unrelated to any Government or other targets or policies. That is, capacity of seascape units is based entirely on a combination of carefully defined criteria and robust definitions of sensitivity, visibility and values. The relationship between the findings on capacity and relevant policies are addressed separately in Section 4. **It must be stressed that capacity findings presented in this report are relative (between seascape units) and not absolute**.

2.12 Cumulative effects

The issue of cumulative effect is complex and multi faceted. It was beyond the scope of this study to carry out detailed cumulative impact assessments. In this study we have given an overview of the main issues and highlighted any known current or proposed developments that may cause cumulative effects on a strategic level. This is discussed further in Section 3.6.

3 RESULTS

3.1 Introduction

This section of the report sets out the results of the study and comprises four parts; seascape character sensitivities, visibility analysis, values and overall capacity associated with seascape units.

3.1.1 Seascape sensitivity

The following section describes the sensitivity of each seascape unit in numerical order. They should be read with reference to the seascape unit map shown in Figure 22. A thumbnail map of each unit illustrates the 35km seaward and 10km landward limits, and also shows the 8km seaward buffer and 50m depth limitation zone. See the examples below in Figures 20 and 21 illustrating two sample areas.

For each seascape unit the seascape character types present are listed (refer to Appendix D for full description of these types), a brief description of key characteristics are listed, then sensitivity is assessed using criteria outlined in Section 2.8 of the report. Each unit is given a sensitivity rating from 'low' (score 1) to 'high' (score 5). The overall results are presented in Figure 29.

Many of the areas within each unit were not feasible for this scenario due to narrow stretches of water or sea depth. However, we have still subjected each seascape unit to the sensitivity assessment as the general descriptions on character may be helpful in providing information transferable to other scenarios or forms of development. However, it is important to stress again that all our conclusions on sensitivity relate to one development scenario.

Figure 20 Thumbnail map of Seascape Unit 4

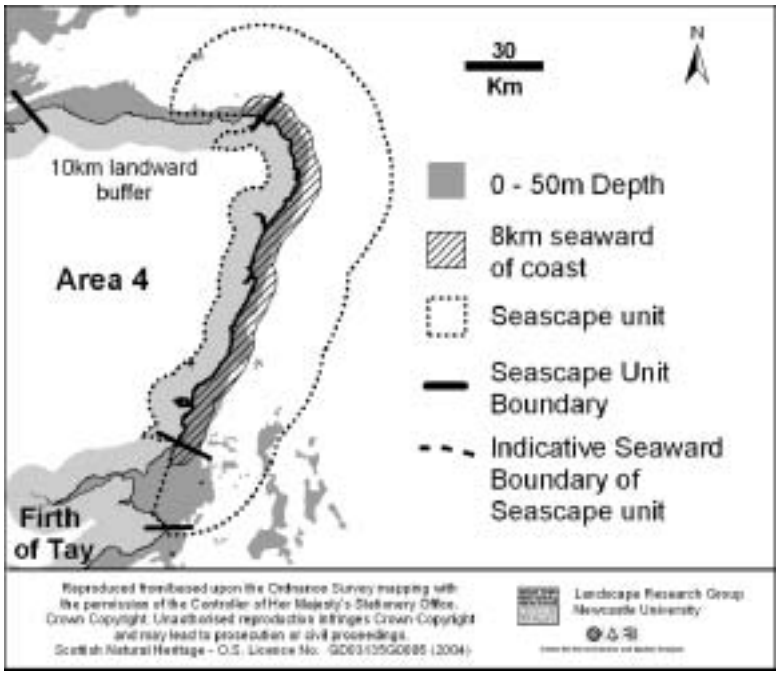
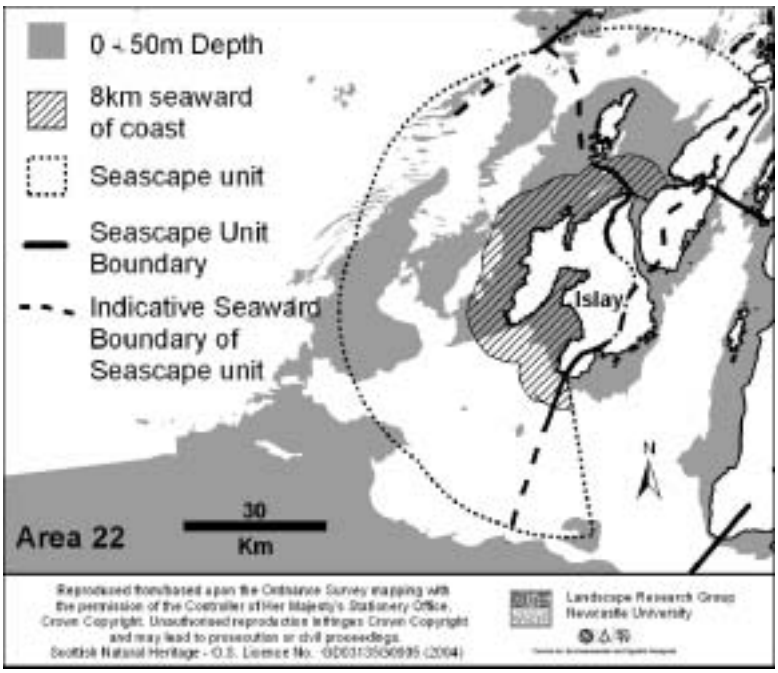


Figure 21 Thumbnail map of Seascape Unit 22



3.1.2 Visibility analysis

This section presents the comparative visibility results for each seascape. These are taken from GIS calculations on basic visibility relating only to a 10km landward limit, 35km seaward limit and 50m sea depth limit. Each seascape unit is given a visibility rating ranging from 'low' (score 1) to 'high' (score 5). The results are presented in Section 3.3 and in Table 5 and Figure 30.

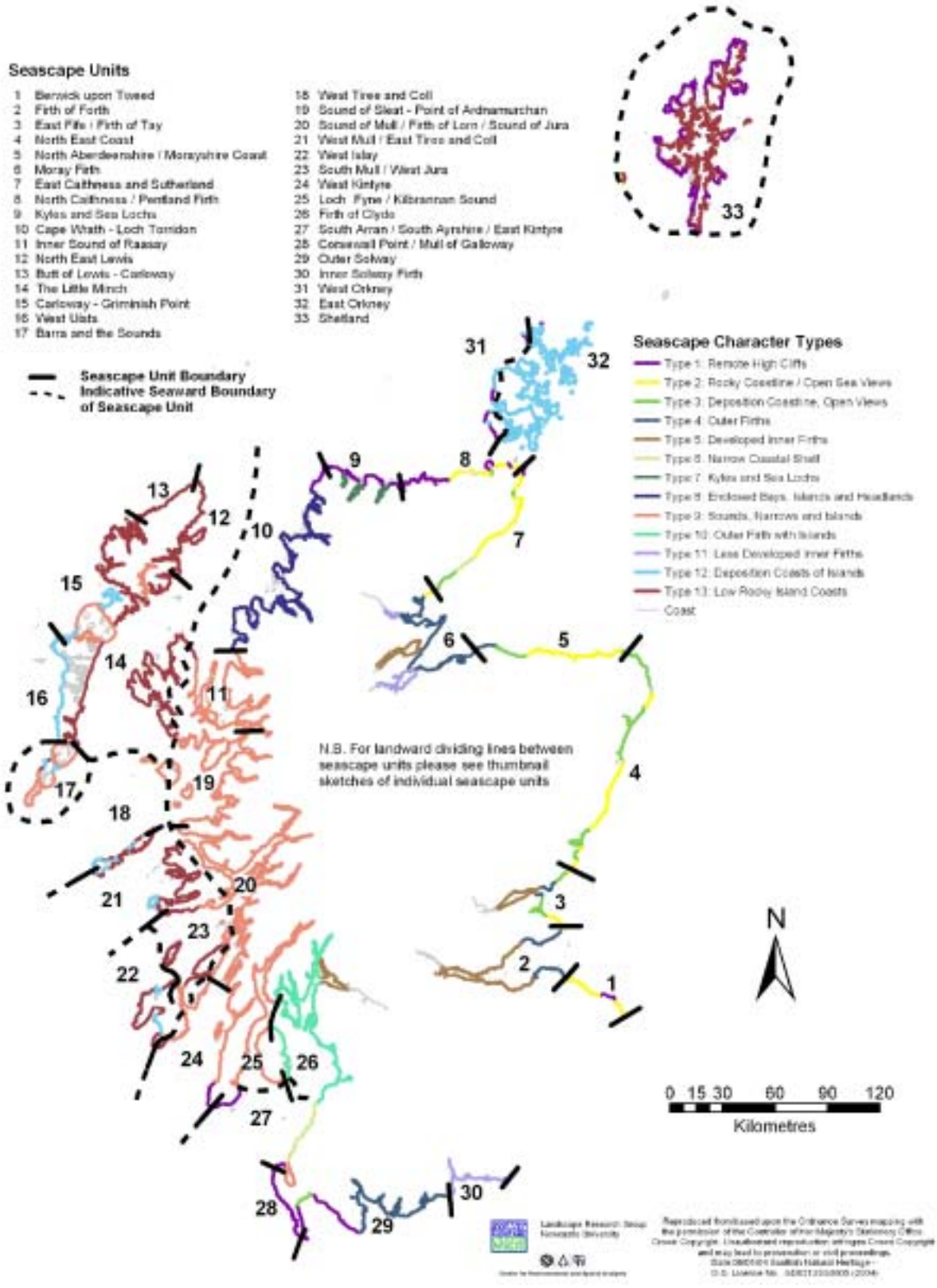
3.1.3 Values

A value rating was assigned to each seascape unit by analysing the percentage of area in that unit covered by land which has a national, regional or local designation or value placed on it. The values used were National Scenic Areas, National Parks, Regional Parks, Areas of Great Landscape Value, Gardens and Designed Landscapes and Wildland Search Areas. By a system of weighting different designations to reflect their importance and then addition of percentages a numerical scale of results was transferred into five ratings similar to the sensitivity and visibility ratings from 'low' in value (score 1) to 'high' value (score 5). The results are shown in Section 3.4 and in Table 6 and Figure 31.

3.1.4 Capacity

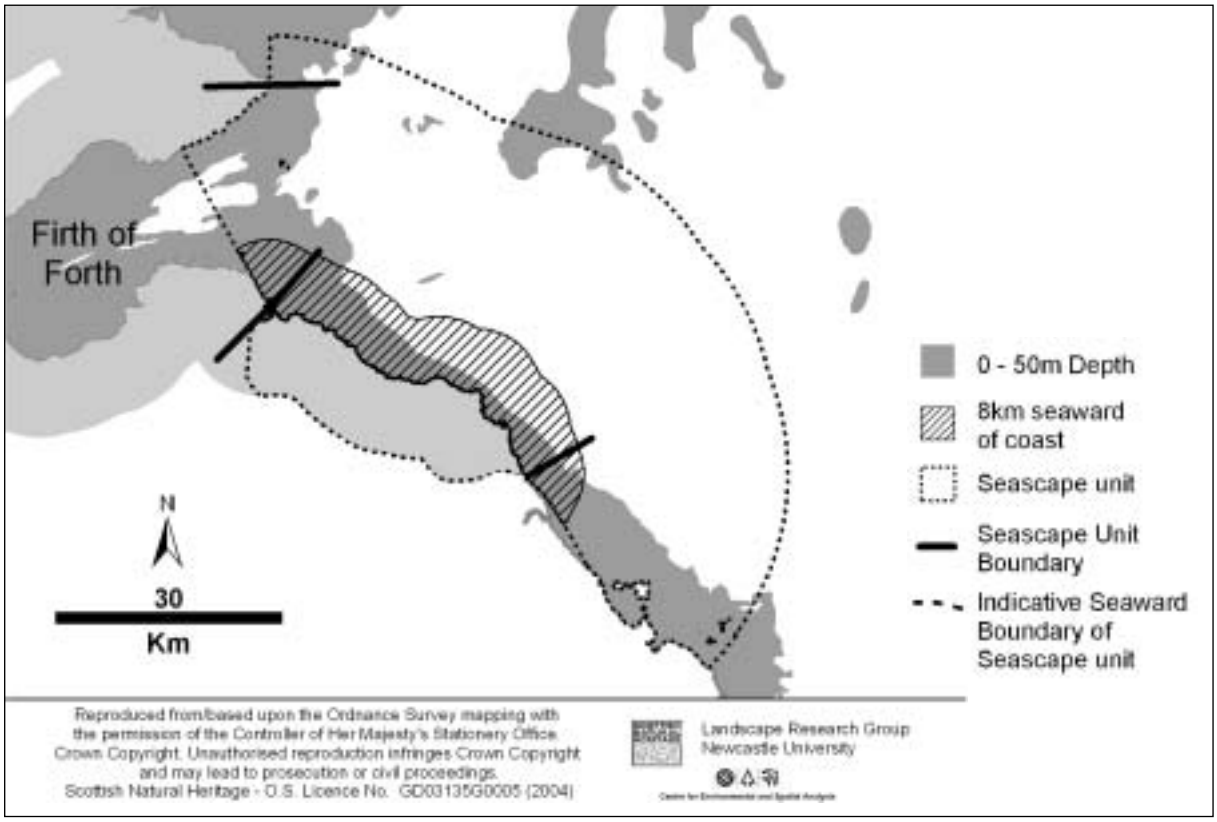
In this study, capacity is defined as sensitivity + visibility + values. Note that no weightings are applied here on the different factors. For example, landscape sensitivity is not weighted as having twice the importance as visibility etc. To arrive at a final capacity value for each seascape unit we have added all the factors together. For example if a seascape unit scored 3 for sensitivity, 2 for visibility and 4 for values then its final capacity value would be 3+2+4 = 9. Note that these are relative not absolute values. Values have then been converted into a five point rating from 'higher' capacity (score 1) to 'lower' capacity (score 5). The results are presented in Section 3.5 and in Table 7 and Figure 32.

Figure 22 Seascape unit map with character types



3.2 Seascape character sensitivities

3.2.1 AREA 1: BERWICK UPON TWEED



Seascape Character Type(s)

Mainly comprises Type 2: Mainland Rocky Coastline with Open Sea Views although a small area of Type 1: Remote High Cliffs encompasses St Abbs Head.

Key Characteristics:

- rocky coastline with few major headlands and with cliffs generally rising up to 30m height and occasional small sandy bays;
- productive arable farming up to coastal edge;
- views over the North Sea are wide and open with ships highly visible;
- villages and small towns located in sheltered bays or inlets;
- some isolated industrial features within East Lothian including Torness nuclear power station, cement works etc;
- St Abbs Head more remote and sparsely settled, comprising high cliffs backed by moorland.

Scale and Openness

Fairly straight coastline results in little containment and provides expansive views of open sea. Turbines could relate to this expansiveness but could affect apparent scale of high cliffs.

Form

Generally elevated, rolling hinterland with inland hills forming an edge to coastal farmland. No significant headlands (apart from St Abbs Head) and inlets. There are localised variations in geology and detail of rugged cliff coastlines which would not be compromised by windfarms sited 8km from coast. In general, the simplicity of the coastal form and the sea could relate to the form of turbines.

Settlement
Small compact settlements with traditional fishing origins (eg Eyemouth, Dunbar), isolated farms in hinterland. Although predominantly rural in character, some isolated industry occurs south of Dunbar and includes the nuclear power station at Torness and cement works. Small caravan parks are sited along the coast, usually associated with settlements. Turbines could relate to large scale industrial elements on coast, although these only occupy a relatively small part of the unit and care should be taken not to encroach on views from the more remote St Abbs Head further south.

Pattern/foci
Localised focus of headland at St Abbs and power station at Torness. Agricultural field patterns and rock platforms at base of cliffs have a strong pattern. Turbines would form new foci in this seascape but would be likely to form one of a number of industrial foci if seen in conjunction with Torness (ie not be dominant). Turbines may visually compete with the strong foci of high cliffs of St Abbs present in some views

Lighting
Little lighting on land and none on sea apart from ships. Torness power station is illuminated at night although this is a generally dark area.

Movement
Key transport corridor accommodating the A1, main east coast railway and busy shipping lane with ships often in view. Small, busy harbours at Eyemouth and Dunbar.

Aspect
East facing and turbines would be backlit in the morning. Inland hills tend to limit views of sunsets.

How experienced
Experienced from transport corridors (major rail and road routes), settlements and from beaches and generally in the context of activity. Phenomenon of the haar can create a certain mystery at times with striking effects.

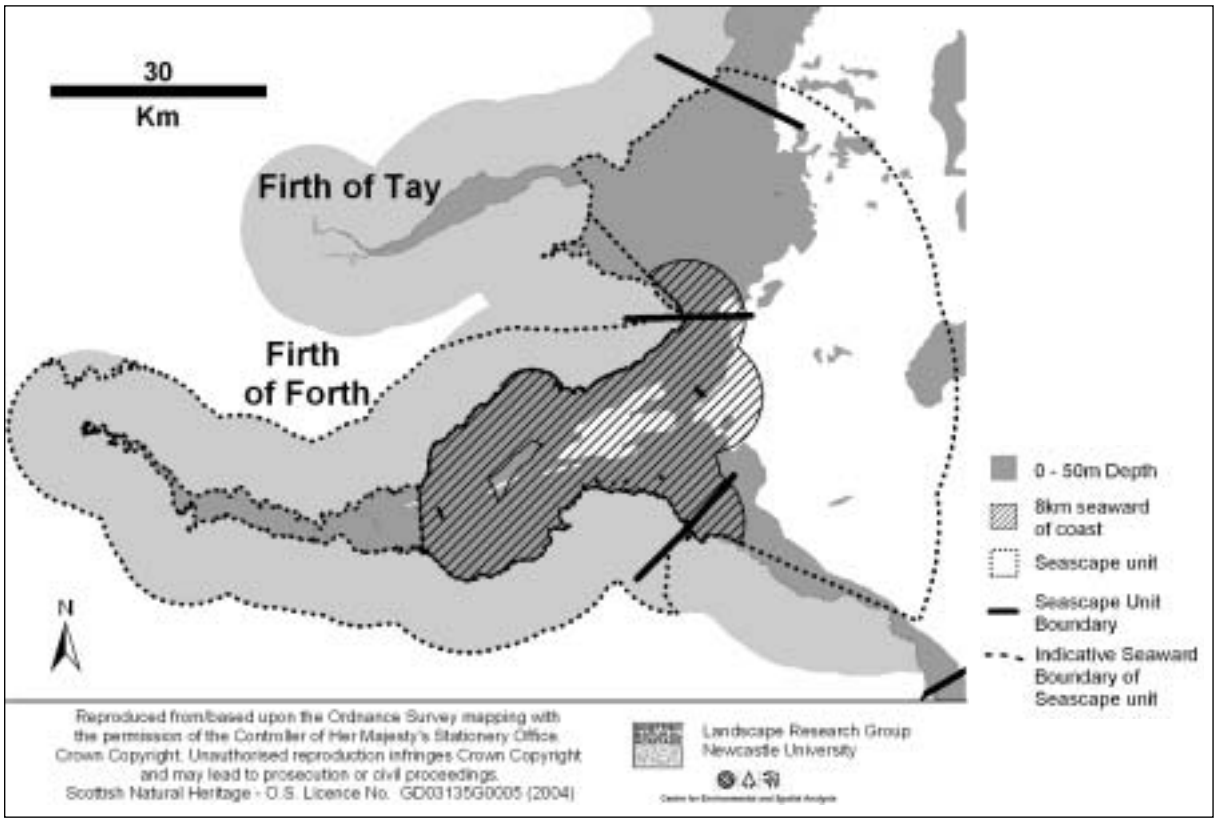
Modification/Remoteness/Sense of Naturalness
Intensive agriculture, busy transport routes on land and sea and localised industry in parts gives a modified feel although the presence of small traditional settlements and a strongly rural hinterland counters this impression. Presence of large tanker ships. The high cliffs, moorland and sparse settlement of St Abbs Head has a more naturalistic character.

Exposure
Fairly exposed due to openness and lack of shelter provided by landform. St Abbs particularly exposed and windswept.

Sensitivity
Low – Medium Sensitivity. Turbines would relate to the relatively large scale seascape and generally linear coastline. Existing development and transport infrastructure already give a localised developed character in places and busy shipping lanes are present in the sea. Wind energy would relate to the perception of exposure but may conflict with the scale and character of traditional settlements and the dramatic coastal edge which exists in some sections of coastline.

Forces for Change
Pressure for onshore wind energy development within the Lammermuir Hills adjacent to this unit and this may increase sensitivity in some areas due to potential cumulative impacts.

3.2.2 AREA 2: FIRTH OF FORTH



Seascape Character Types: Type 4: Outer Firths and Type 5: Developed Inner Firths

Key Characteristics:

- long sandy beaches interspersed with low rocky headlands;
- backed by arable farmed carse of varying width contained by Lammermuirs in East Lothian; coastal wooded braes contain a narrower coastal edge within Fife;
- well settled coastal fringe with Edinburgh and other large urban areas present;
- industry, bridges and infrastructure are a feature, some rigs and ports in Firth;
- views focus on distinctive islands within Firth and on land either side;
- firth well used for recreation, including sailing, golf and holiday resorts.

Scale and Openness

Semi-open character in outer Firth within a broad bay but with views funnelled towards open sea. Inner Firth forms a narrow plane of water, strongly contained by hills. Scale is medium-large in general (medium scale in Inner Firth). Turbines would visually dominate the smaller scale of the Inner Firth but could fit with the broader expanse of water and overall larger scale of the Outer Firth.

Form

The light, smooth plane of the Firth is highlighted by contrast with highly textured land. More incised form in Inner Firth; broader, flatter land profiles in Outer Firth. Isolated islands and igneous hills (eg Arthur's Seat, Berwick Law etc) form distinct features. Turbines would interrupt continuity of hill profiles and appreciation of incised form and containment of Inner Firth but would have fewer impacts on the more open horizontal form and flattened landform of the Outer Firth, provided that turbines were located to avoid interruption on views and the landscape setting of distinctive hills and islands.

Settlement
Well settled with large urban centres and a number of isolated large scale industrial features, these increasingly towards the Inner Firth area. Former fishing villages (now popular holiday destinations) on coastline of outer Firth have strong relationship to coast. Communications (eg the A1, railway line) are aligned parallel to the coast. Turbines could relate to tall structures located on the coastal edges of the Inner Firth (few of these are located within the Firth itself) although these features are absent in the Outer Firth and sensitivity therefore increases.

Pattern/Foci
Islands, distinctive hills and foci, such as Berwick Law, Edinburgh Castle and Arthur's Seat, form key foci. Man made elements such as bridges, oil rigs, Cockenzie power station form focal points in the middle to Inner Firth. The Firth is a constant focus in views from the land due to the orientation of hill slopes and coastal fringe which draw the eye to the water. Turbines could disrupt views of focal points such as islands and distinct hills and would form a new focus.

Lighting
Relatively well-lit with settlements forming an almost continuous lit coastal edge around the Firth at night. Shipping and rigs also illuminated on the Firth. Darker in Outer Firth out to sea and therefore sensitivity would increase.

Movement
Although the Forth has limited movement within the sheltered Firth, this is generally a busy seascape with shipping movements fairly constant. Air traffic commonly round over the Firth prior to landing at Edinburgh.

Aspect
Eastern aspect of open sea; north/south views predominate either side of Firth.

How Experienced
This is a highly visible seascape seen from urban centres, communication routes including ferries and sailing routes. Strong intervisibility between Fife and Edinburgh/Lothians with the Forth providing a simple foreground to containing hills and numerous foci.

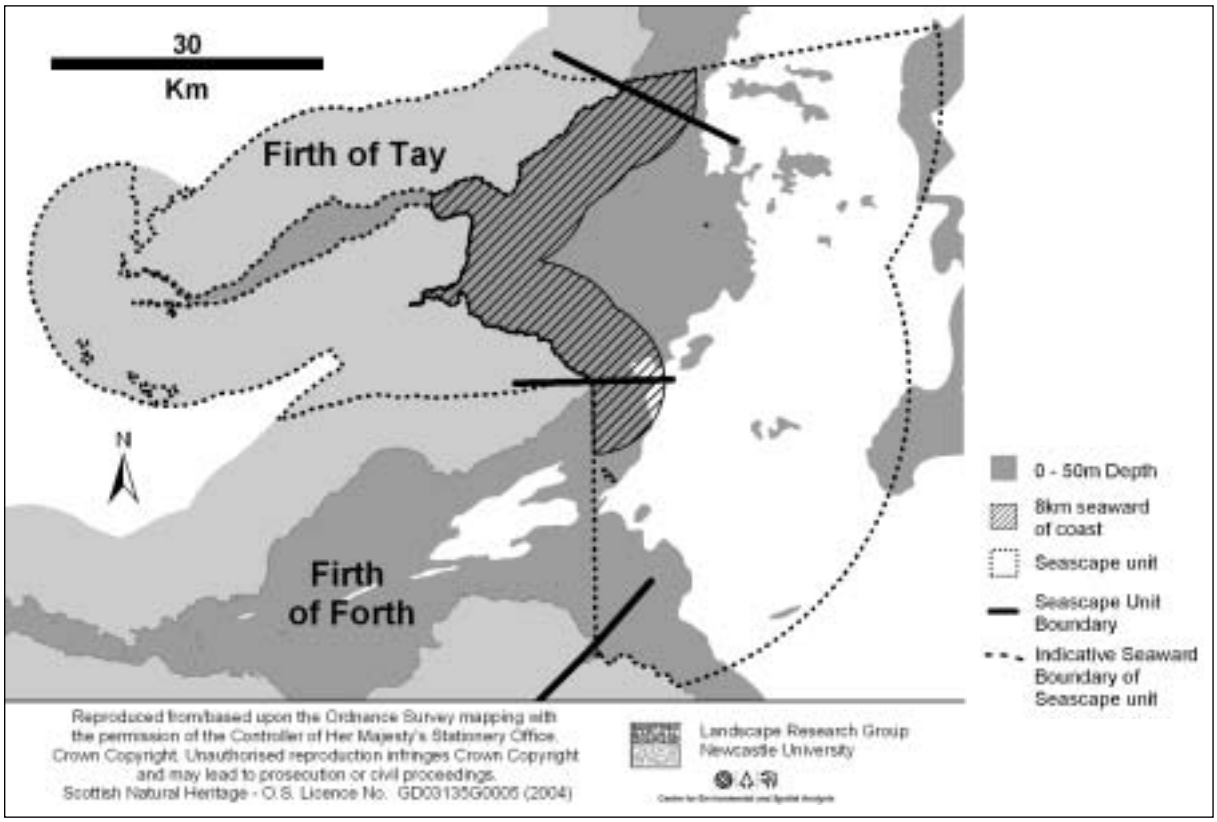
Modification/Remoteness/Sense of Naturalness
Highly modified Inner Firth where large scale industrial features are present. Seascapes of the Outer Firth have a naturalness which is diminished where development abuts the coast. Where extensive tidal flats occur eg Gullane Point/Aberlady Bay, there is a stronger sense of naturalness.

Exposure
Benign body of water – very limited exposure to elements due to shelter offered by land. More exposed character in Outer Firth.

Sensitivity
Medium Sensitivity. It would be physically unfeasible to accommodate the development scenario within the Inner Firth. While turbines could relate to the broader scale of Outer Firth and would have only minor impacts on flatter land profiles, they would diminish the focus of the water and be a new dominant focus. Scope exists to locate turbines at the transition between Inner and Outer Firths with the aim of relating to existing industrial structures on the fringes of large settlements eg Cockenzie/Kirkcaldy, yet avoid conflicts with the narrow scale and focus of the Inner Firth and more naturalistic character of the Outer Firth. Distinctive islands/hills form a focus which may be disrupted by turbines and careful siting would therefore be necessary and restrict scope for accommodating wind energy development within this seascape unit.

Forces for Change
Considerable development pressure on coastal fringes within and on the edge of settlements. As built development is a key characteristic of much of the unit, sensitivity is unlikely to alter.

3.2.3 AREA 3: EAST FIFE/FIRTH OF TAY



Seascape Character Type(s)

Comprises Type 3: Deposition Coastline with Open Views, Type 4: Outer Firths and Type 11: Less Developed Inner Firths

Key Characteristic:

- long sandy beaches interspersed with sections of low rocky coast/raised beaches – expansive intertidal shores around the Eden estuary, significant dunes systems at Tentsmuir;
- narrow coastal edge, contained by wooded hills west of Tay Bridge in North Fife expanding to broad, flat plain in North-east Fife under agriculture and forestry. Broader Carse of Gowrie to north of Inner Tay backed by Sidlaw Hills;
- well settled coastal fringe with Dundee and other urban areas sited against coast;
- industry, bridges and infrastructure are fairly contained around Dundee with few tall structures evident;
- views focus on the Tay and particularly inland to the Sidlaws and interior hills. Flattened profile towards Outer Firth;
- well used for recreation including sailing, golf and holiday resorts.

Scale and Openness

Medium to large scale overall. Containment of hills reduces scale in Inner Firth, flatter coastal landform and greater expanse of open sea increases scale in Outer Firth. Turbines could relate to more open expansive scale Outer Firth area but may affect appreciation of containment and relative scale of coastal hills in Inner Firth.

Form

Incised Inner Firth with strong containment of hills either side of Tay edged by intertidal flats and low lying

farmland. Flattened land profiles in Outer Firth. Low cliffs and rocky raised beaches around St Andrews and sedimentation features in North-east Fife add interest.

Settlement
Inner Firth has a strongly rural character with small settlements and isolated farms. Settlement concentrated on coastal fringe east of the Tay bridges and includes Dundee and towns in North Fife. Few large scale industrial features. The historic town of St Andrews has a particularly strong relationship to the sea.

Pattern/Foci
The Tay is the main focus; there are few islands or distinctive landform features within the Firth. Subtle patterns occur in intertidal zones. Forestry is distinctive around Tentsmuir.

Lighting
A well-lit coastal edge where settlements exist. Railway and road bridges cross the Tay and may be lit. Little illumination in predominantly agricultural Inner Tay west of Dundee and Outer Tay.

Movement
Shipping not so prominent as on Firth of Forth but a busy seascape in general due to settled character, roads and bridges.

Aspect
North/South aspect either side of Firth with settlement generally orientated to face the sea.

How Experienced
Coastal footpaths eg Fife Coastal Path, from settlements, golf courses, bridges and boats. Railway line and roads. This seascape is important in providing a setting to St Andrews, Dundee and other settlements. Internationally renowned golf courses are present on coast and development may affect perceptions of seascape. Many key views are experienced from low levels and so the dominance of the sea is reduced. There is a great amount of intervisibility between Fife and Angus/Perthshire where the firth is less developed.

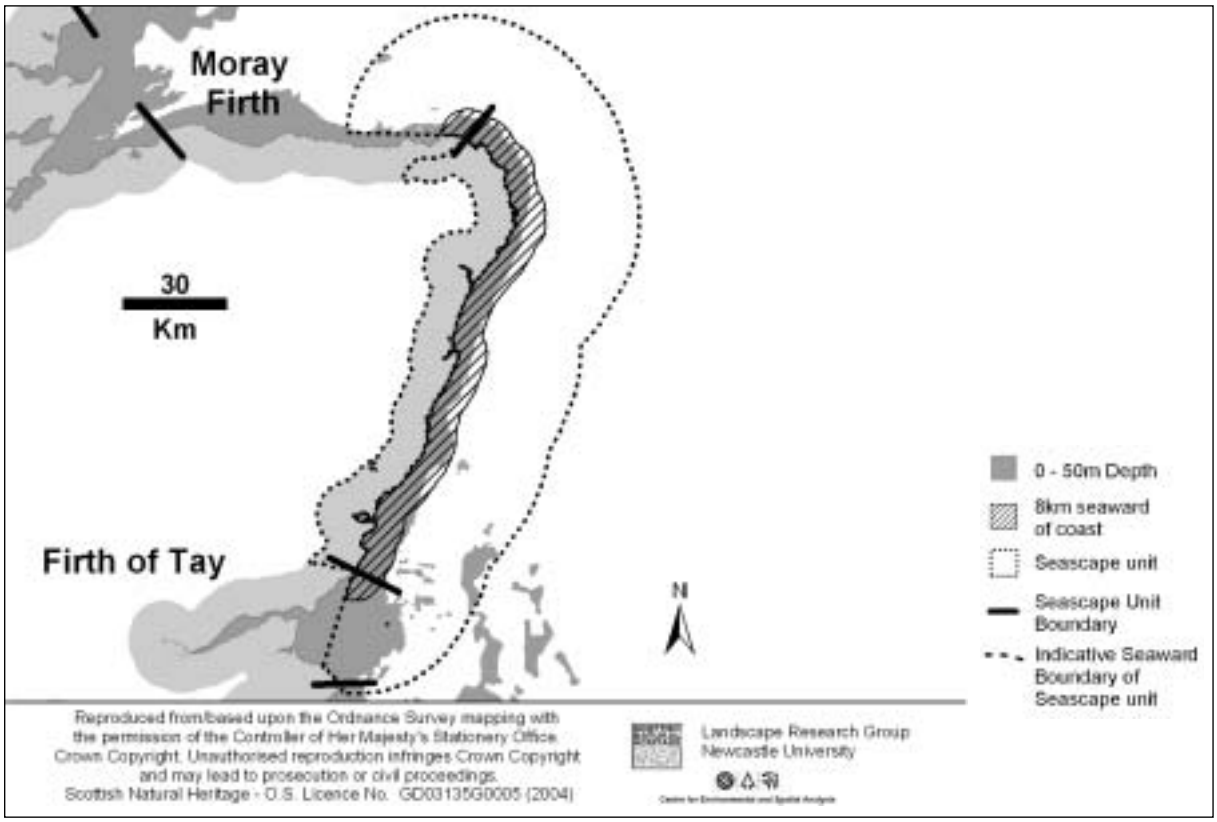
Modification/Remoteness/Sense of Naturalness
Highly modified in urban areas and with agriculture, forestry or golf courses forming immediate hinterland. Coastal intertidal zones have pronounced sense of naturalness which contrasts with the settled and modified nature of adjacent land. This seascape can feel remote in some areas eg Tentsmuir, although commercial forestry limits sense of naturalness to some extent.

Degree of Exposure
Sheltered in Inner Firth, more exposed in Outer Firth.

Sensitivity
Medium Sensitivity. It would be physically unfeasible to accommodate the development scenario within the Inner Firth. While turbines could relate to the broader scale of the Outer Firth and would have only minor impacts on flatter land profiles, they would diminish the focus of the Tay and be a new dominant focus within the contained space of the firth. Turbines would need to be carefully sited to avoid intrusion on the setting of settlements such as St Andrews.

Forces for Change
Some development pressure on coastal fringes within and on the edge of settlements. As built development is a key characteristic of much of the unit, sensitivity is unlikely to alter.

3.2.4 AREA 4: NORTH EAST COAST



Seascape Character Type(s)

Comprises Type 2: Mainland Rocky Coastline with Open Sea Views and Type 3: Deposition Coastline with Open Sea Views.

Key Characteristics:

- long, east-facing generally 'straight' coastline with many small indentations and few significant headlands and with open views out to North Sea;
- mix of long broad sandy beaches backed by dunes and low cliffs/rocky coastline;
- farmland predominantly backs coast; flat and low lying against deposition coast; gently rolling against rocky headlands/cliffs – some remnant heathland in places eg Findon Moor;
- frequent fishing villages and harbours and several sizeable urban settlements;
- industry is infrequent but large scale where it occurs eg St Fergus and Peterhead power stations are highly visible features within the lower lying north east.

Scale and Openness

Openness of sea in views gives huge scale. Turbines could relate well to this scale.

Form

Grampian foothills to the west edge a broad swathe of rolling farmland against the coast. The distance of these hills from the coastal edge limit their significance in views (views largely focus up and down the coast and out to sea rather than inland). Coastal edge comprises rugged sea cliffs with occasional distinctive inlets eg Bullers of Buchan, extensive sand dunes eg Forvie and small estuaries, and basins with saltmarsh eg Montrose and Ythan. Landform is not generally complex but in localised places turbines would conflict with the natural forms of these distinctive coastal features.

Settlement
Frequent fishing and harbour settlements of medium to large scale eg Aberdeen, Peterhead, Fraserburgh and Montrose. In addition there are small scale settlements at the foot of cliffs or near sand dunes, development would not relate to the scale of these. The A98 and railway is aligned along the coast. Historic castles and forts on headlands.

Pattern/Foci
Small scale pattern of indentations with castles a key foci on rocky promontories. Coastline itself, whether sandy beaches and dunes or cliffs, is a key focus, contrasting with the intensively farmed hinterland. Absence of industrial features except for gas terminal at St. Fergus and power station at Peterhead.

Lighting
Frequent settlements provide limited illumination.

Movement
Movement of weather systems and waves significant across open sea, shipping also. Movement on land limited. Around Aberdeen, helicopters and planes.

Aspect
Easterly aspect – turbines would be backlit in morning.

How Experienced
Footpaths along cliff tops provide access to castles, settlements and coastline. Minor roads close to coast. Railway and A96 parallel but set back from the coast however there are key views out to sea from trains on this stretch. Around Aberdeen a large population experiences the sea from popular beaches, promenades and from residences. Ferry traffic to Shetland, Orkney and Norway.

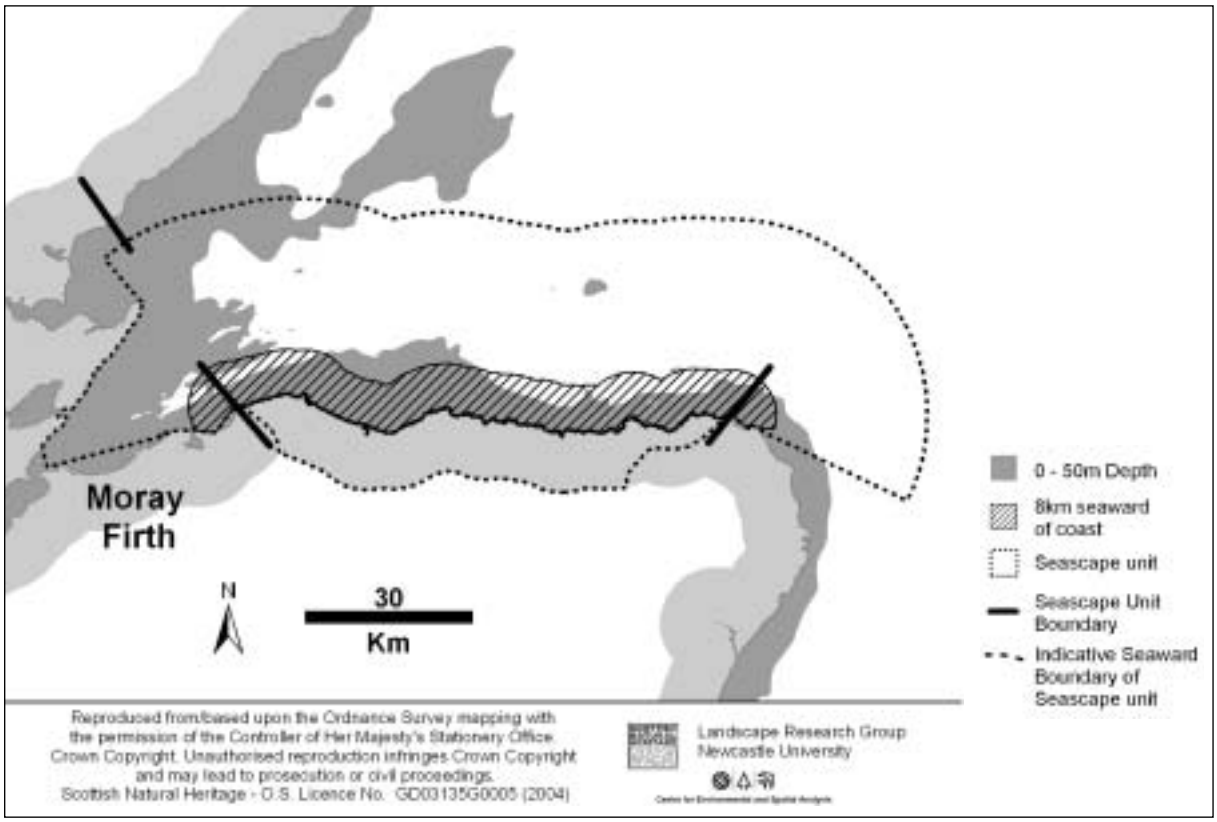
Modification/Remoteness/Sense of Naturalness
Intensively managed farmland abuts coast and limits sense of naturalness. The coastline and sea, in contrast, has a strong sense of naturalness, particularly where cliffs are very rugged or where extensive sand dune systems or estuarine flats occur eg River Ythan. Beaches are often backed by farmland with a rarely developed hinterland apart from areas close to Aberdeen so retain this naturalness. Not remote as farmland generally abuts coastal edge and settlements and roads run parallel to coast. Cold often grey North Sea with views of marine traffic. Historical associations with castles, forts and coastal settlements.

Degree of Exposure
This seascape unit feels highly exposed although is unlike the 'ocean' feel of the Atlantic coast. The expansiveness of the sea and limited shelter provided by the coast increases exposure particularly during storm conditions

Sensitivity
Low – Medium Sensitivity. Although there are few large scale industrial features on land and the area has locally distinctive and natural coastal features, the simple landform, relatively linear coastline, general absence of focal features and expansive scale of the sea are key factors in limiting sensitivity to development. Turbines would need to be carefully sited to avoid intrusion on the setting of settlements.

Forces for Change
Potential pressure for onshore wind energy development within Grampian Hills and this may increase sensitivity should cumulative impacts become an issue. Possible development of coastal trail (Nortrail) from Aberdeen along the Moray coastline.

3.2.5 AREA 5: NORTH ABERDEENSHIRE/MORAYSHIRE COAST



Seascape Character Type(s)

Comprises mainly Type 2: Mainland Rocky Coastline with Open Sea Views and a small section of Type 3: Deposition Coastline with Open Views.

Key Characteristics:

- north-facing generally 'straight' coastline with small indentations, few significant headlands and with open views to North Sea;
- low cliffs/rocky coastline predominates;
- farmland backs coast and this generally comprises a low lying gently rolling open plain with some remnant heathland present in places;
- small and widely spaced settlements clustered in the main at base of cliffs or inlets, many of these are of historic interest and all have a strong relationship to the coast.

Scale and Openness

The openness of the sea in views gives an expansive scale. Turbines could relate well to this scale.

Form

Generally low, although rugged cliffs interspersed with a few small sandy or stony bays/inlets. Rolling farmland abuts coast. The landform is not generally distinctive and turbines would not conflict with or intrude on significant features.

Settlement

Small, often tightly clustered, villages and towns located along the coast. Many of these settlements are

traditional in character with strong links to the sea. Few industrial features. Buildings tend to be small and turbines may dominate and affect the appreciation of their scale depending on distance and precise location of development.

Pattern/Foci

Small indentations of cliffs, wooded inlets and minor headlands form a distinct rhythmic pattern along the coast echoed by the foci of small villages and town in coves and inlets. The partial enclosure provided by rolling farmland against the coast focuses views on the sea.

Lighting

Lights from coastal towns, lights of oil platforms being towed in sea is not an uncommon sight. Flarestack of Beatrice platform visible on many nights.

Movement

Limited movement of shipping – some towing of oil platforms from Cromarty Firth.

Aspect

Northerly/southerly to land on either side of the firth, although could be backlit at sunrise if located towards open sea.

How Experienced

Base of cliffs often inaccessible and not visible from coastal roads. Villages and towns (and access roads down to them) offer key views. Key area for viewing wildlife (to see dolphins from coast) and from small boats. Spey bay marks end of Spey Way Long Distance Route Coastal paths and beaches are well used in the western part of this area.

Modification/Remoteness/Sense of Naturalness

This seascape unit has a feeling of being 'out of the way' because of its relatively sparse population and presence of small traditional settlements with close ties to the sea. The presence of many roads, steadings, farmlands, villages and castles etc prevent remoteness being a key characteristic. Intensive farmland backs coast and this reduces the sense of naturalness.

Degree of Exposure

A fairly exposed seascape.

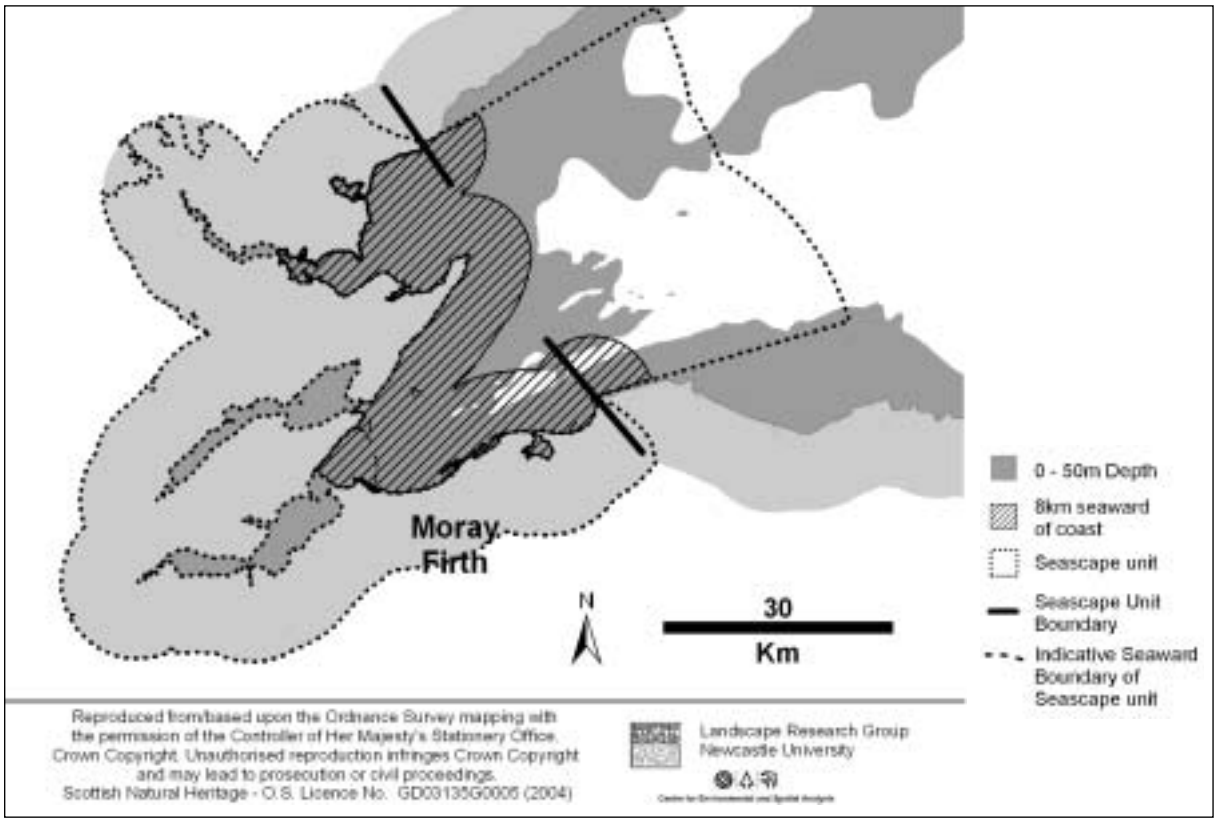
Sensitivity

Low – Medium Sensitivity. The simple landform, general absence of focal features and expansive scale of the sea are key factors in limiting sensitivity to development. Wind energy development may however affect the perception of this seascape unit where settlement is small scale and largely of a 'traditional' or 'historic' nature.

Forces for Change

No significant forces for change have been identified in this unit apart from development of possible Nortrail coastal trail.

3.2.6 AREA 6: MORAY FIRTH



Seascape Character Type(s)

Mainly Type 4: Outer Firths and sub type 4A: Smaller and Less Developed Outer Firths. Type 11: Less Developed Inner Firths and a small area of Type 5: Developed Inner Firths. Type 3: Deposition coastline with Open Sea Views, occurs in Golspie.

Key Characteristics:

- long sandy beaches interspersed with low rocky headlands;
- backed by gently rolling arable farmed plain of varying width;
- small hills on Black Isle contain a narrow coastal edge;
- well settled coastal fringe around Nairn and Inverness; sparser pattern of traditional fishing villages on Outer Firth;
- Dornoch Firth and Loch Fleet less populated, narrower and more contained;
- some isolated industry, bridges and infrastructure with oil platforms a feature;
- views focus on the sea and firths – mountains a focus to west;
- firth used for recreation, including sailing, dolphin watching.

Scale and Openness

Medium to large scale within Outer Firth where landform is flatter and the Firth widens to form a broad basin. The containment provided by steep sided coastal hills and the narrowness of the western side of this area reduces this scale within the Inner Firth. Turbines could relate to the open expansively scaled Outer Firth area but may affect appreciation of containment and relative scale of coastal hills in Inner Firth.

Form

Incised Inner Firths with a mountain backdrop to west. Generally flattened land profiles in Outer Firth. Low cliffs and rocky raised beaches around Black Isle. Long sandy beaches, spits and other significant sedimentation features eg raised beaches on Morayshire coast and outer Dornoch Firth/Loch Fleet to Golspie.

Settlement
Well settled coastal edge in places with Inverness located within the sheltered Inner Firth at the mouth of the Ness. Nairn, Dornoch and Golspie, holiday resorts with well known golf courses, are located on the coast in the Outer Firth. Smaller traditional settlements (many former fishing villages) are a feature of the Black Isle. Some isolated but large scale industry eg oil platforms and Nigg oil terminal within the Cromarty Firth and at Ardersier on the Moray Firth. There is an airport at Inverness and two large RAF bases at Lossiemouth and Kinloss.

Pattern/Foci
At a macro scale, there is a strong pattern of firths and bands of rolling farmland within this unit. More distinctive hills and mountains occur to the west of the Dornoch Firth and behind Golspie area. The backdrop of Ben Wyvis forms a key focus in some views. Isolated large scale industry, bridges and causeways over the firths are also key features with many of these 'interrupting' the smooth plane of water.

Lighting
Illumination of settlements around coastal fringes but generally sparse lighting in the Outer Firth. Oil platforms lit at night in Cromarty Firth. Flarestack at Beatrice platform visible out to sea. Lighthouses.

Movement
Shipping, summer liners to Invergordon. It is common to see oil platforms being towed fairly close to Moray coast to and from Cromarty Firth. Roads and bridges on edge and over firths. Dolphin watching boats and small crafts. Planes from Inverness airport occasionally round the Firth and there are frequent planes from RAF bases.

Aspect
Generally east, north and south with long distance views limited westwards from sea level due to presence of hills, however views down the Great Glen are common.

How Experienced
From settlements, roads and bridges over firths giving views east and west along water to interior mountains and out to sea, focussing on the horizon. End of Great Glen Long Distance Route in Inverness. From beaches, cliffs, small craft, liners.

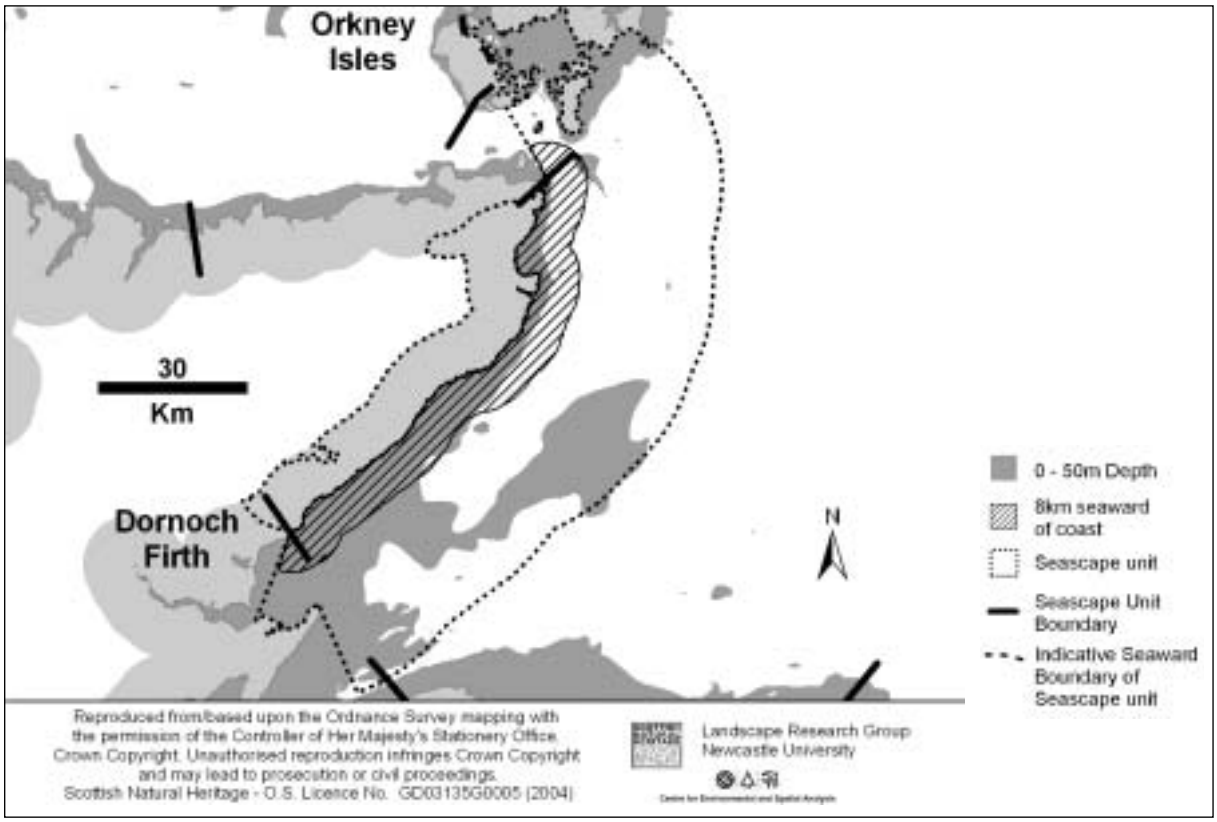
Modification/Remoteness/Sense of Naturalness
Generally a modified seascape, although with many semi-natural coastal components. Forestry on sedimentation features can contribute to a feeling of remoteness although also diminishes naturalness in contrast with coastal geomorphological features. Although a settled seascape with some main centres of population and near A9 and A96, in some places there is a feeling of being 'out of the way', particularly further north.

Degree of Exposure
Sheltered within Inner firth; more exposed on Ness points on Black Isle.

Sensitivity
Medium Sensitivity. It would be physically unfeasible to accommodate the development scenario within the Inner and Cromarty Firth. While turbines could relate to the broader scale of the Outer Firth and would have only minor impacts on flatter land profiles, they would diminish the focus of the Firth to some extent. Turbines could relate to industrial elements but may conflict with the scale of small fishing villages and increase the detractive qualities of these elements. Turbines may detract from the focus of views east along the firth and out to the open sea.

Forces for Change
Pressure to reclaim land from the sea to accommodate transport infrastructure, industry or landfill sites. Existing onshore windfarms present. Housing expansion at Nairn and Inverness. Development of possible Nortrail coastal trail. Sensitivity unlikely to be affected.

3.2.7 AREA 7: EAST CAITHNESS AND SUTHERLAND



Seascape Character Type(s)

Comprises mainly Type 2: Mainland Rocky Coastline with Open Sea Views and a short section of Type 3: Deposition Coastline with Open Views and Type 6: Narrow Coastal Shelf. A small area of Type 1: Remote High Cliffs occurs on the north eastern tip of Caithness.

Key Characteristics:

- predominantly low rocky coastline with few significant indentations or headlands, low cliffs are present in some areas;
- narrow coastal shelf a feature and this is tightly constrained by inland hills which direct views over sea and along strongly linear edge, usually farmed in strips;
- communications located within coastal shelf;
- tight knit villages and some crofting on coastal edge or located at base of cliffs – many of these have a strong traditional character;
- occasional sandy bays further north in Caithness backed by low lying and more extensive farmland.

Scale and Openness

Close to the coast the landscape component is small scale with a backdrop of large scale moorland and hills and strongly contained by steep sided hills, directing views out to sea. The sea in contrast is very open and expansive.

Form

Little variation in coastal edge, some high cliffs north of Helmsdale although generally insignificant low cliffs/rocky edge. A narrow linear coastal shelf is present. Views directed along the coast and out to sea. Hill tops generally not visible from coast.

Settlement
Sparsely settled with small settlements and isolated houses widely spaced and located within narrow inlets or on coastal shelf. No industry or large scale built features with exception of roads, railways and overhead power line located along the coastal fringe. Settlements often have a strong historic/traditional character and crofting pattern.

Pattern/Foci
Strong linear rhythm of containing hill slopes, narrow shelf, rocky coastal edge and sea. Also pattern of strip farming on shelf. The sea and the distant horizon of sea/sky comprises the key focus.

Lighting
Little illumination. Beatrice platform flarestack visible. Many light houses and distant views of lights on the Moray coast.

Movement
Generally limited movement on land with road/rail traffic sparse. Movement of sea can be a strong feature due to openness. Occasional shipping visible.

Aspect
Easterly aspect, turbines would be backlit at sunrise.

How Experienced
Road/railway aligned along coastal edge and from settlements.

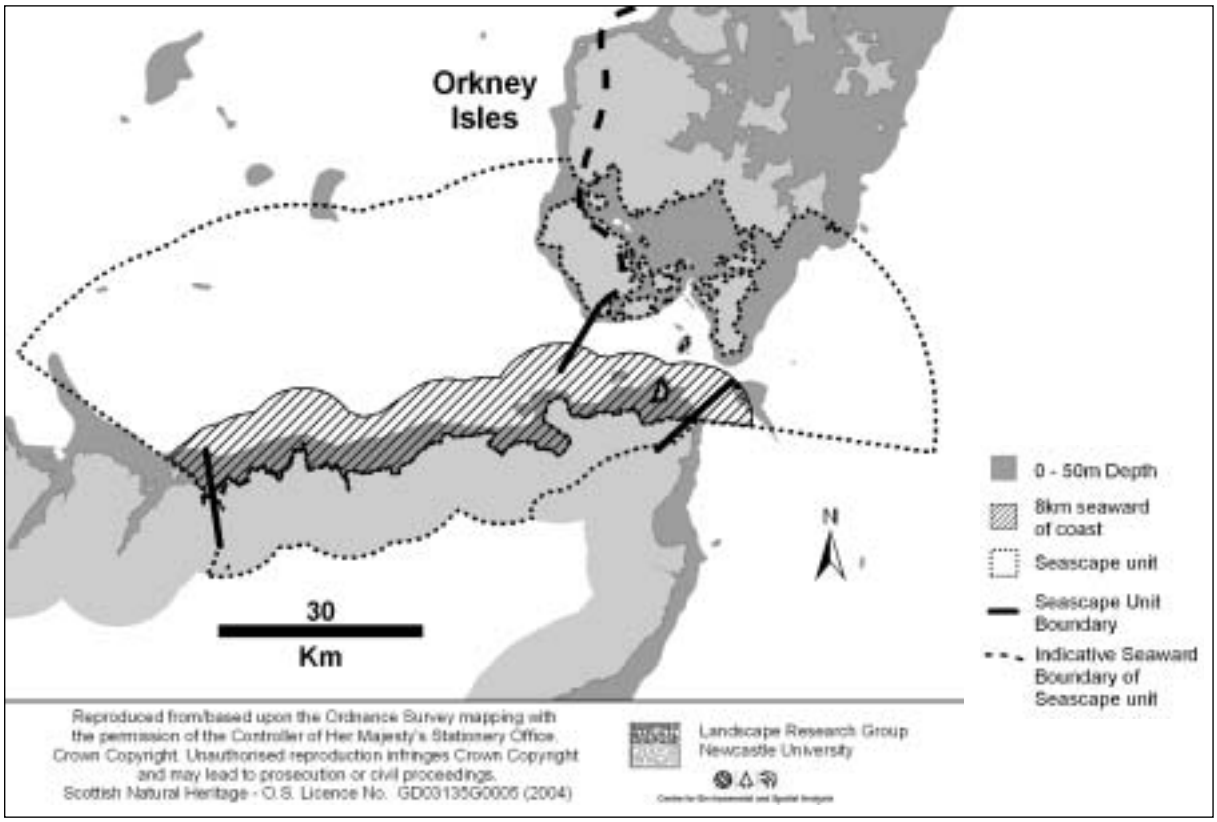
Modification/Remoteness/Sense of Naturalness
Sense of remoteness increases with travel northwards. Sense of this area being little developed due to knowledge of hinterland being vast, remote and with little habitation. The small scale and traditional character of settlements also emphasises the sense of remoteness, although communications/power lines evident along coast. Feels 'on the edge' due to sparse settlement, remoteness and closeness to sea.

Degree of Exposure
Exposed coast with little shelter.

Sensitivity
Low – Medium Sensitivity. Turbines would not disrupt the appreciation of the landform of the hinterland due to its simplicity of form and limitations of views inland. They could relate well to the expansiveness and exposure of the open sea but would also introduce an additional new industrial and illuminated feature into this seascape where Beatrice oil platform can be seen by day and night. This may further affect the perception of this area as being remote and 'undeveloped'. Turbines could also potentially visually conflict with the scale of small traditional settlements and the narrow coastal shelf if located too close to the coast.

Forces for Change
Pressure for onshore wind energy developments on hills adjacent to the coast. This may raise sensitivity due to cumulative impacts although restricted inland views (apart from those from the sea itself) would be likely to limit the significance of these. Possible development of Nortrail coastal trail.

3.2.8 AREA 8: NORTH CAITHNESS/PENTLAND FIRTH



Seascape Character Type(s)

Much of the western part of this unit comprises Type 1: Remote High Cliffs with Type 2: Mainland Rocky Coastline with Open Sea Views, occurring to the east. Small areas of Type 3: Deposition Coastline with Open Sea Views are also present.

Key Characteristics:

- tall cliffs particularly on headlands, interspersed with short sections of low rocky coastal edge with occasional beaches eg Sinclair's Bay;
- views to Orkney Islands with Hoy especially visible in places;
- gently rolling hinterland with extensive Caithness peatlands inland and farmland and crofting communities along coastal edge;
- Pentland Firth major shipping lane.

Scale and Openness

Pentland Firth relatively narrow with some views of islands, more open and expansive sea views further west. Generally low lying open hinterland – big skies, large horizontal scale and very open character and turbines could relate to these characteristics. Sea cliffs can have a large vertical scale and turbines may affect the appreciation of this.

Form

Generally simple rolling landform although indented in some places with dramatic high cliffs on headlands eg Dunnet Head. Turbines would relate to simpler landform where high cliffs and headlands less prominent but would intrude on views of distinctive profile of Hoy further east.

Settlement
Frequently scattered small farms and groups of housing sited along coastal fringe and in wider farmed plain to the east, although few larger settlements. UK Atomic Energy Authority at Dounreay and associated power lines locally intrusive features on coast. Coast road provides main access.

Pattern/Foci
High cliffs and headlands and views to Orkney key foci. Small houses form minor foci due to open character of hinterland.

Lighting
Ships, lighthouses, coastal settlements, Dounreay ex-power station.

Movement
Although the Pentland Firth is a major shipping lane, overall this is not an especially busy landscape. Ferries to Orkney from Scrabster.

Aspect
Northerly aspect, turbines potentially front lit for much of the day.

How Experienced
From main coast road aligned parallel to the coast and from settlements. Ferries, beaches, Dunnet Head, windsurfers.

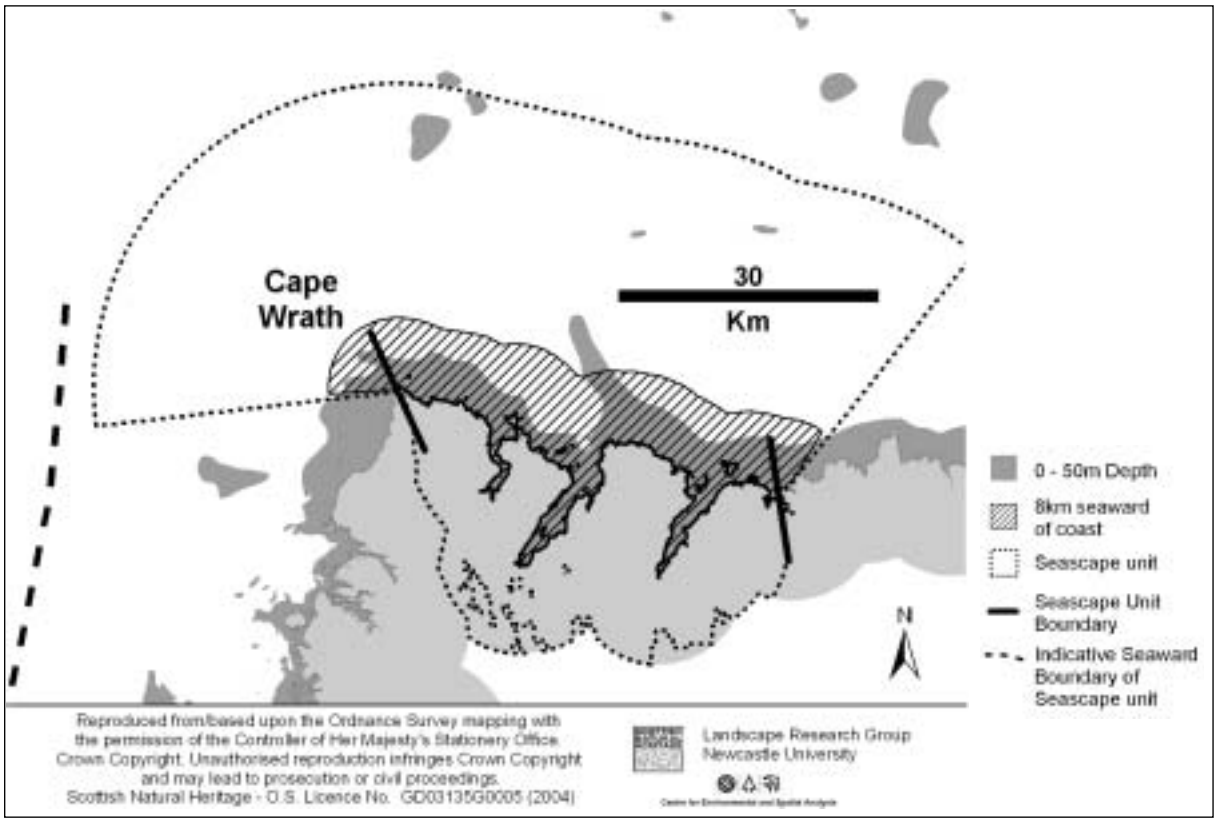
Modification/Remoteness/Sense of Naturalness
The sparseness of population gives this area a remote feel. Coastal features and extensive peatlands inland provide a sense of naturalness with human influence appearing minimal. Although an isolated feature, Dounreay affects the perception of this area being 'undeveloped' to some extent. The remote high cliffs are exhilarating and awe-inspiring coastlines due to the great height of cliffs giving elevated and distant views and being particularly dramatic when the sea is turbulent. The lower rocky coastlines with occasional sandy bays are generally backed by settled and farmed landscapes and have a settled but strongly rural feel.

Degree of Exposure
Can be very exposed with turbulent seas. This area is particularly popular with windsurfers.

Sensitivity
Medium Sensitivity. Turbines could relate to the expansiveness of the sea and simple coastal forms. Turbines would conflict with high cliffs where the coastal edge is distinct and where views of Hoy are a strong feature. Therefore to the west of this area there is a greater sensitivity. However, the Pentland Firth is unfeasible for this scenario due to the narrowness of sea at this point. The perception of this area being remote is likely be affected by development.

Forces for Change
Pressure for onshore wind energy development along the coast may increase sensitivity due to potential cumulative impacts. Possible grid connection – overhead line along entire length of this area for onshore windfarms. Possible development of Nortrail coastal trail. Decommissioning at Dounreay power station.

3.2.9 AREA 9: KYLES AND SEA LOCHS



Seascape Character Type(s)

Type 7: Kyles and Sea Lochs and Type 1: Remote High Cliffs apply to this seascape unit.

Key Characteristics:

- deeply indented coastline, forming a transition between the open sea and the glens and straths;
- sea lochs tend to form a narrow inlet of water, strongly enclosed by steep high hills; kyles tend to be broader, surrounded by a low and gently sloped landform;
- populated along their shores with small settlements concentrated at bridging points at the inlet mouth;
- access routes are aligned around the shoreline or over the kyles via causeways;
- kyles are often shallow with intertidal sand and mud flats; containing headlands have an increasingly exposed character with rocky shores and cliffs and views of open sea;
- the containment of kyles and sea lochs limits experience of the open sea, with views focussing on land either side and on an often mountainous interior;
- remote high cliffs on headlands.

Scale and Openness

Kyles and sea lochs are strongly contained by mountain and hill slopes. Medium scale in general although mountains have a large vertical scale. Turbines would dominate narrow contained channel of water and may also affect perceived scale of mountains.

Form

Narrow linear form of kyles/sea lochs. Diverse form of interior mountains. Turbines would conflict with complex mountain profiles and their contrast with smooth planes of sheltered water.

Settlement
Most of relatively small population is along coastal fringe in small settlements concentrated at bridging points at the inlet mouth.

Pattern/Foci
Mountains and inlet of water key foci, diverse patterns of vegetation (farming, woodland etc) and shore line settlement. Turbines would introduce large scale man-made feature and conflict with these foci.

Lighting
Lighting associated with settlements.

Movement
Some traffic movement on roads and causeways, bombing range at Cape Wrath.

Aspect
Generally east-west views within Kyles/Sea lochs but eye is drawn northwards towards the sea and northerly aspect on headlands.

How Experienced
Roads, causeways and from settlements, beaches.

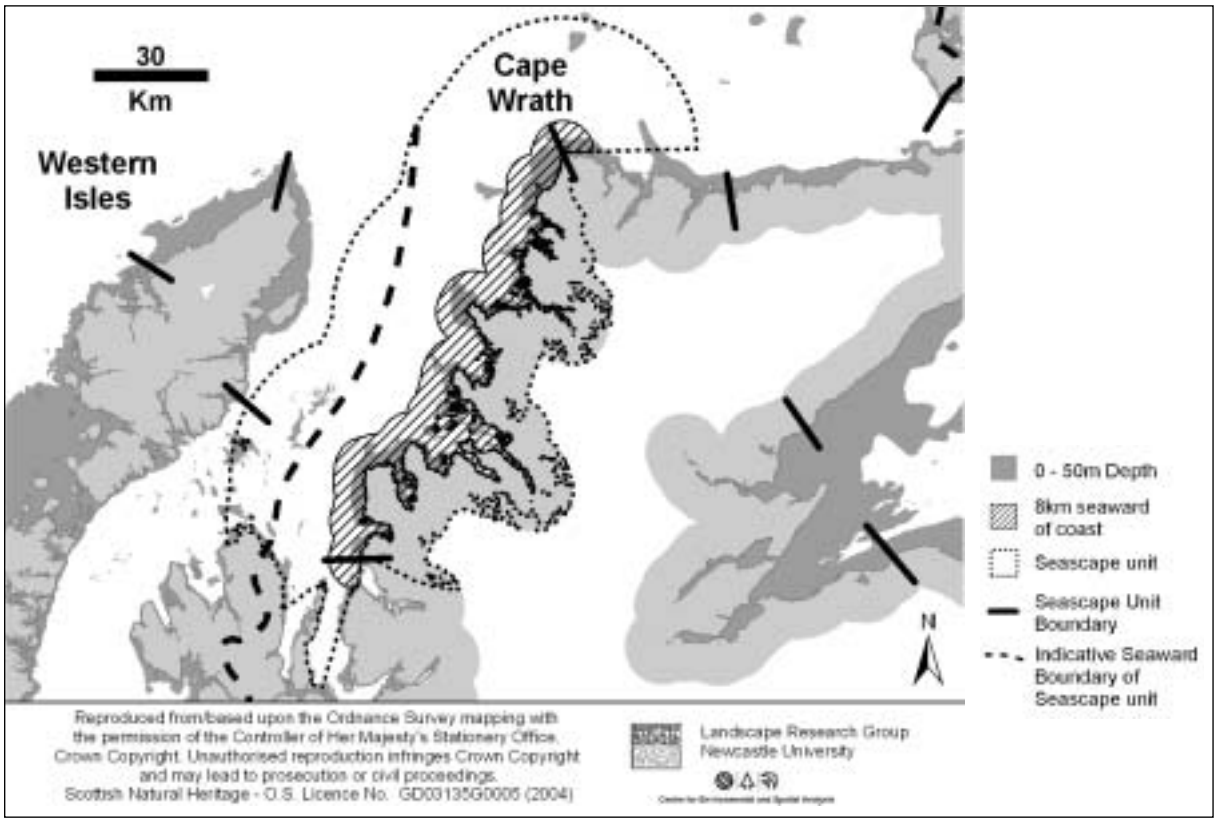
Modification/Remoteness/Sense of Naturalness
Human influence present due to settled character of coast, although not highly modified due to absence of industrial features and the low-key character of crofting. Mountainous interior and moorland on higher slopes give a strong sense of naturalness and remoteness. Highly diverse and scenic character. Feels, and is, on the edge of a wild remote landscape.

Degree of Exposure
Exposed on headlands due to relationship with open sea but within kyles and sea lochs sheltered and enclosed.

Sensitivity
Medium – High Sensitivity. It would be physically unfeasible to accommodate the development scenario within the kyles and sea lochs. Headlands between the Kyles have a large scale and more open and exposed character which turbines could relate to. The perception of wildness associated with the high cliffs due to their sheer scale, exposure and remoteness would however be affected by development. Lochs are sensitive to turbines located outwith the loch but which form a focus when looking out to sea from the loch.

Forces for Change
Some limited pressure for onshore wind energy development may increase sensitivity due to potential cumulative impacts.

3.2.10 AREA 10: CAPE WRATH – LOCH TORRIDON



Seascape Character Types

Type 8 – Enclosed Bays, Islands and Headlands covers most of this area with Type 1 – Remote High Cliffs at the northern tip.

Key Characteristics:

- diverse and dramatic predominantly rocky coastline;
- high cliffs, exposed rocky headlands, small inlets and bays, offshore islands. Larger inlets/sea lochs – Loch Broom, Little Loch Broom, Loch Ewe;
- sparse traditional settlements concentrating in sheltered inlets;
- hinterland comprises rough moorland and mountains many of which provide distinctive focal points;
- exposed, remote and highly natural area with strong wildland and scenic qualities;
- geology very apparent.

Scale and Openness

Vertical scale is large and is accentuated by the steepness of the landform. Views of turbines from the sea with mountains in the background may compromise this effect as turbines would introduce a scaling element. The drama of high cliffs (200m) may be diminished from certain viewpoints by the scale of the offshore turbines. Smaller scale seascapes in bays and inlets where the sense of enclosure is strong. Development would dominate these smaller scale areas.

Form

Complex mountainous hinterland and highly indented coastline which rises dramatically in places provides a diversity of landform. Rocky headlands produce a series of broad bays and sealochs with many small islands and skerries. The presence of islands gives the marine element interest and complexity. Offshore development may conflict with the highly complex, natural and organic forms present.

Settlement
Sparse. Where present small scale crofting and fishing settlements tend to be located around sheltered inlets. Although there is little settlement its character and scale would conflict with a major offshore industrial scale development.

Pattern/Foci
Complexity of mountains, inlets and islands form a layered pattern, creating a diverse and highly scenic natural landscape. Focal points are provided by the islands and distinctive peaks. Offshore development does not relate to this natural pattern and may conflict with or distract from views of focal points.

Lighting
This is a dark area. There may be some views out over to Lewis where lights can be seen at night but this will require the right conditions. Fish farms are lit, including feed barges. Windfarm lighting would cause a significant change to this area.

Movement
This is a remote area with little movement inland. There are few main roads. There will be some activity in and around the settlements and sailing and fishing vessels. Movement of the water and waves will be predominant on exposed headlands.

Aspect
This has a westerly aspect and at sunset the turbines would be backlit increasing their visibility.

How Experienced
From minor, quiet roads predominantly and from small settlements, from beaches and mountains, ferries from Ullapool – Stornoway, tourist trips to Summer Isles. There would be glimpsed views of the sea and coastline providing a constantly changing vista. This area is popular with walkers and those seeking a wildland experience requiring intimate involvement with the landscape. The sight of a large industrial development would conflict with this.

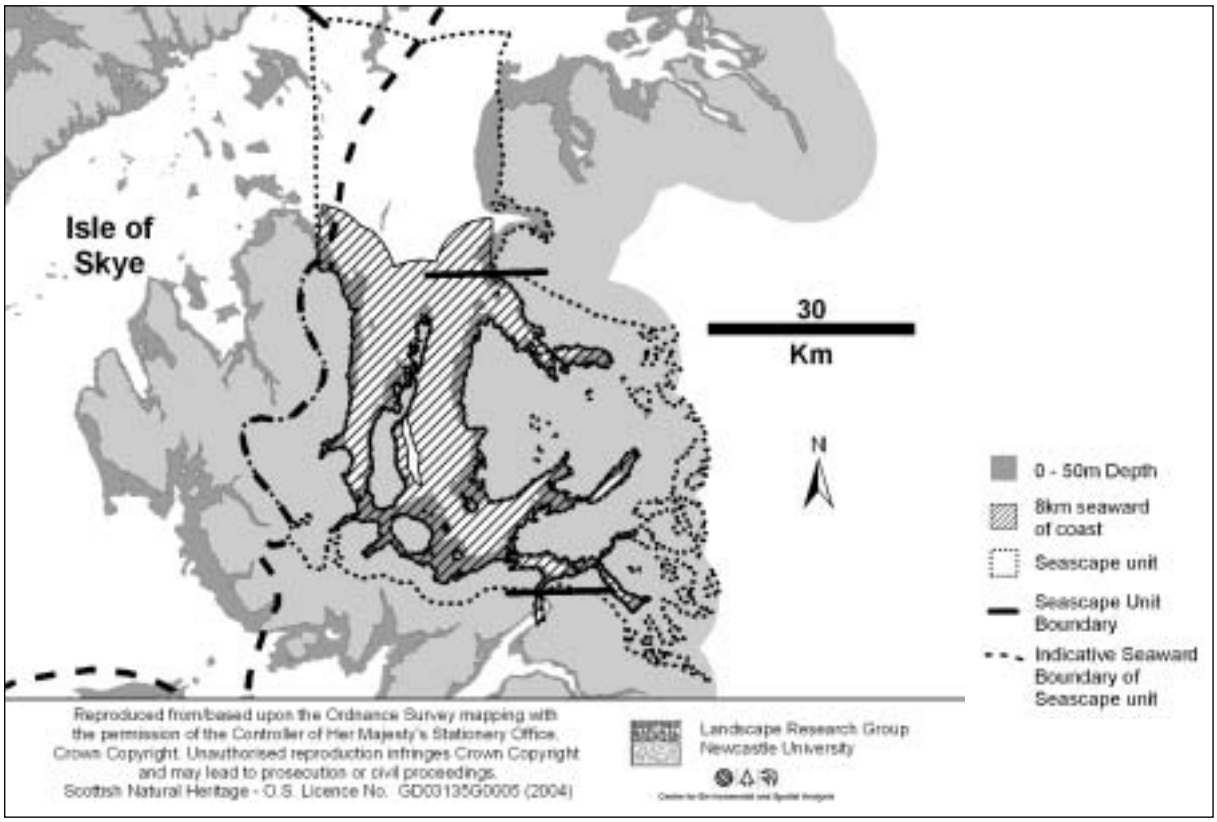
Modification/Remoteness/Sense of Naturalness
This area is highly natural with little modification apart from some telecommunications masts and fishfarms in the lochs. Sense of remoteness particularly strong from exposed headlands reached by dead end roads and from within mountainous hinterland. Some MOD activity around Loch Ewe.

Exposure
This area is very exposed and elemental but the complex nature of the coast means that some inlets can be very sheltered. Frequent westerlies buffet the coast here.

Sensitivity
High Sensitivity. Development would conflict with the key characteristics of this type which are complexity of landform and pattern, high naturalness and remoteness qualities. A major development on the scale of this scenario would cause a transformative change to the seascape character.

Forces for Change
Increased pressure from tourism as greater access is provided in these areas will cause higher demand for visitor facilities and infrastructure, masts (although pressure is mainly from airwaves – emergency services), access roads. On shore renewable energy, and offshore and shoreline wave power and commercial forestry are all possible future developments. A long term force for change is the exploration of the western oil fields and the possibility of associated development in this area. This area is very vulnerable to change as its key characteristics are dependent on the highly remote and natural elements. These would be compromised by a cumulation of development. Western Isles sub sea cable could landfall in this area – leading to onshore substation and overland cables & pylons or poles.

3.2.11 AREA 11: INNER SOUND/SOUND OF RAASAY



Seascape Character Types

This area is made up of predominantly Type 9 Sounds, Narrows and Islands. Type 13 Low Rocky Island Coast represent two small sections at the edges of this area.

Key Characteristics:

- an area of two sounds divided by the Island of Raasay and bordered by the east coast of Skye and the West coast of the mainland;
- coastline mainly rocky rising steeply from the sea in some parts of Skye and Raasay;
- coastline fragmented and indented in places with islands forming focal points;
- long sea Lochs Kishorn, Torridon, Carron and Loch Alsh.

Scale and Openness

Semi-enclosed with slotted views out to sea. Vertical scale of sheer mountainous coastline may be compromised by development eg Loch Kishorn and the Applecross mountains.

Form

Complex and distinct forms, ever changing variations in seascape due to interaction with layered headlands, lochs, mountains and islands. However there is a sense of unity as all forms are highly natural and linked together with water. Large scale development would greatly disturb this unity of different forms. It may also interrupt views of distinctive mountain profiles eg Applecross Mountains and serrated profile of Skye Cuillin.

Settlement

Largely traditional small scale settlement. Toll bridge over to Skye and some telecommunications but largely undeveloped. Former oil fabrication yard at Kishorn.

Pattern/Foci

Natural layered land and water patterns. Focal points Cuillin and Dun Caan on Raasay, large and small islands in Inner Sound.

Lighting

Little or no lighting in this area apart from fish farms and small settlements. Lighting of windfarms would cause significant change.

Movement

Sounds and sealochs usually still. Traffic not significant. Fish farms, island ferries – Raasay, ferries from Mallaig.

Aspect

All aspects due to complex orientation of islands and mainland.

How Experienced

From quiet roads which wind around coast and sealochs giving changing vistas. From ferries and tops of mountains, from settlements. Glimpsed views of open sea from elevated points on A87 on Skye but views often contained by landform from this road.

Modification/Remoteness/Sense of Naturalness

Settlement sparse. A highly natural landscape with a strong sense of remoteness in particularly inaccessible areas eg Northern tip of Raasay.

Exposure

Fairly sheltered due to containment from landform.

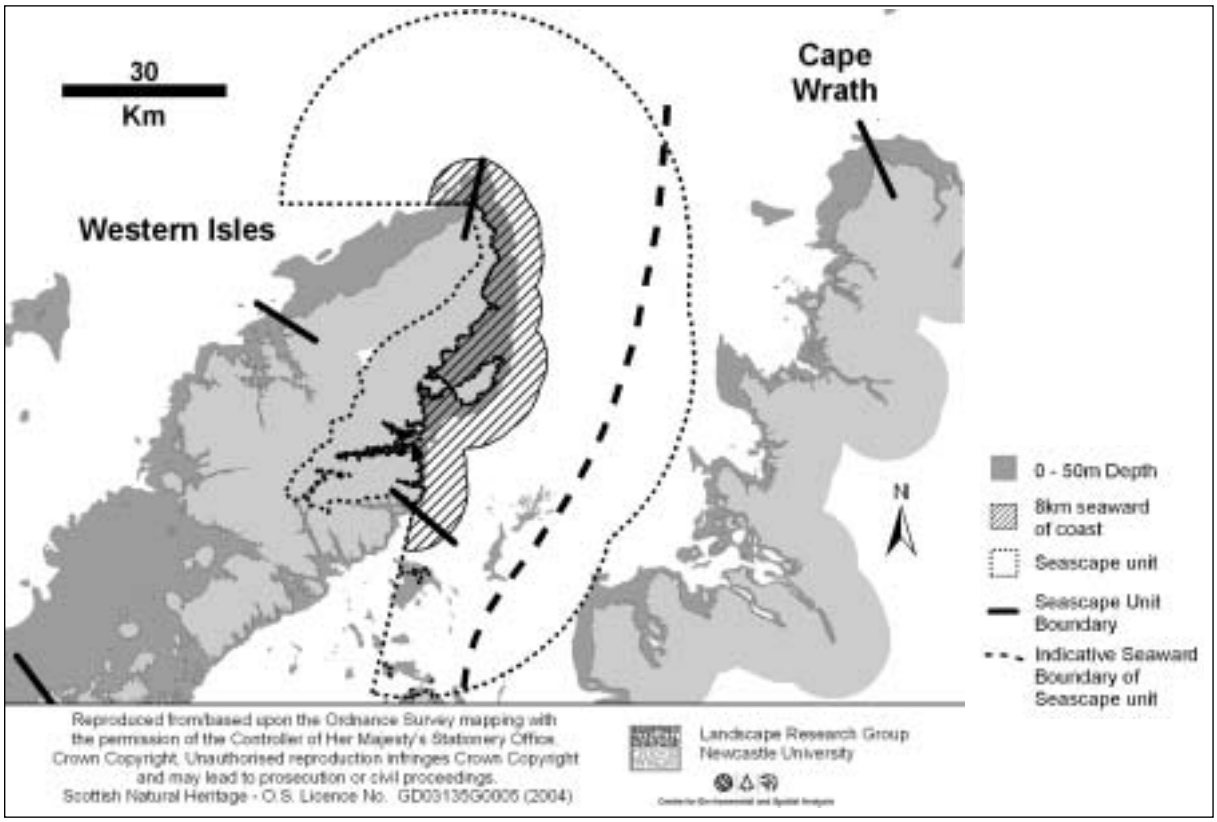
Sensitivity

High. It would be physically unfeasible to accommodate the development scenario within sea lochs and narrow stretches of sea between islands. Development of this scale would completely dominate seascapes in this highly contained area. This is also a highly natural area with qualities of remoteness in places – development would not relate in form or character and would detract from distinctive natural forms like those on Trotternish Peninsula.

Forces for Change

Long term oil and gas exploration, Loch Kishorn yard. Increased pressure from tourism. Onshore wind turbines, fish farming.

3.2.12 AREA 12: NORTH EAST LEWIS



Seascape Character Types

Type 13 Low Rocky Island Coasts

Key Characteristics:

- low rocky coastline, cliffs and fragmented coastline in places backed by moorland;
- sparsely settled. Small crofting settlements along coastline. Large settlement at Stornoway with some industrial development, airport and busy port;
- views of the Minch and beyond views of distant hills on mainland particularly distinctive Assynt;
- parts of this landscape feel remote except Stornoway area.

Scale and Openness

Fairly open and large – medium scale apart from to the south of this area where the landscape is more contained and smaller scale around Loch Eireasort.

Form

Horizontal emphasis particularly to the north of Stornaway and on the Eye Peninsula, gently undulating with cliffs at coast. The form becomes more complex further south with a more fragmented and contained seascape.

Settlement

Sparse settlement in the north, major settlement around Stornoway and crofting settlements elsewhere. Some uninhabited areas. The scale and form of development would be significantly different to existing development even at Stornoway which has some industry but nothing on the scale of the windfarm scenario.

Pattern/Foci

Foci and pattern varied. Foci include views to Assynt on clear days, important headlands and peninsulas eg Tolsta and the Eye peninsula. Turbines would conflict with slotted views of sea from sealochs.

Lighting

Stornoway will be lit but the rest of the seascapes and out at sea the area is dark.

Movement

Busy port at Stornoway. Turbines could relate to this but generally the rest of the area is fairly quiet including some uninhabited areas to the north of Tolsta.

Aspect

Easterly aspect, turbines will be backlit at sunrise thus increasing visibility.

How Experienced

From settlement, roads, ferries. There is a heritage trail from Tolsta to the North of Lewis and open sea views over to Skye are important here.

Modification/Remoteness/Sense of Naturalness

There is modification in parts, around Stornoway and some telecommunications masts etc. The crofting patterns, whilst traditional, can in places appear in contrast to the rougher, wilder and more natural surroundings. Generally though a largely natural and remote area, particularly in the hinterland of Lewis.

Exposure

Feels exposed to the north of this area where coastline becomes more linear, hinterland is flatter and sheltered areas are fewer.

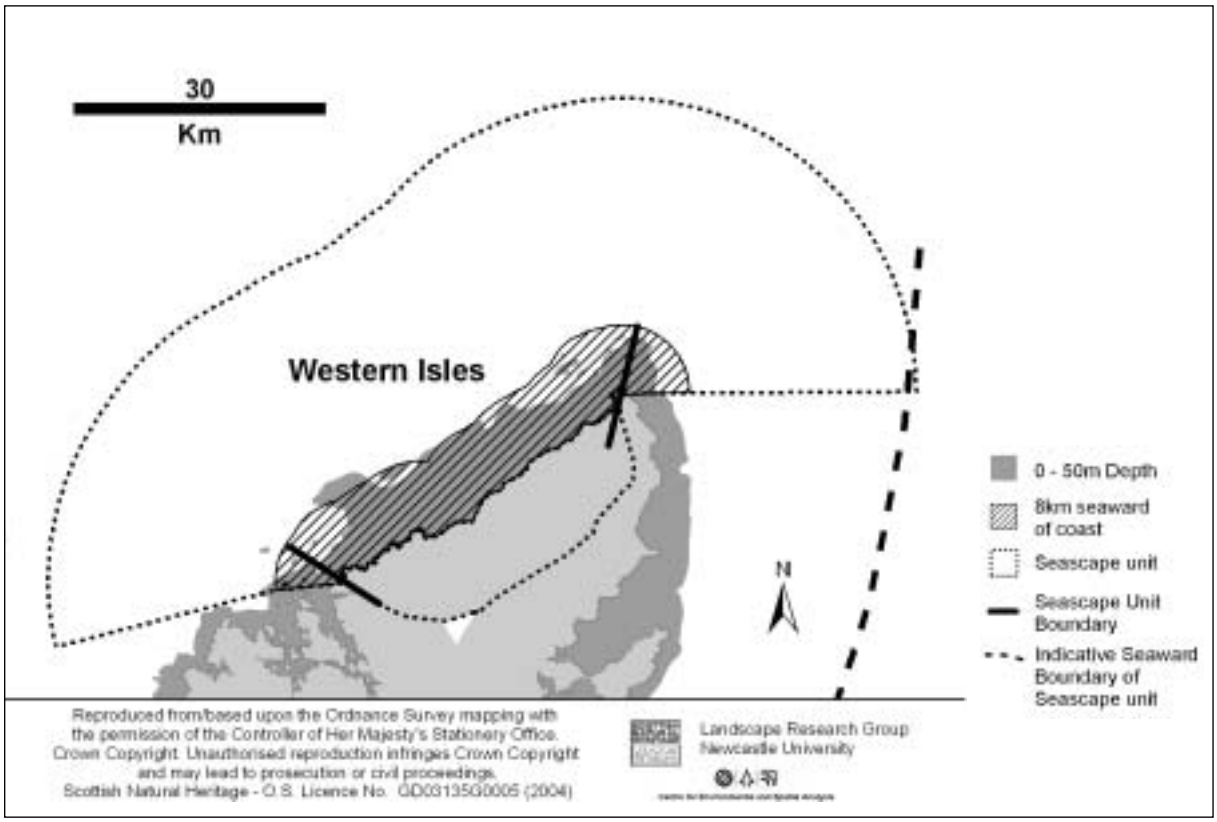
Sensitivity

Medium – High Sensitivity. Turbines would relate to the linear coastline and simpler hinterland to the north but conflict with qualities of remoteness and naturalness. Further south a windfarm would conflict with more complex landform although the port and industry at Stornoway provides an area of developed nature where turbines could relate. Elsewhere settlement is small scale and traditional and development would not relate to this character. Distinctive views of mainland mountains create greater sensitivity in this unit as a windfarm would conflict with the focus of these important views.

Forces for Change

The Western Isles Council is strongly promoting the area as the 'renewable energy centre' of Europe. There is likely to be a substantial change over the next decade of the perception of the landscape character of the Western Isles as applications for large onshore wind energy developments are considered and possibly constructed. The Barvas Moor proposal has the potential to dramatically change the character of north east Lewis and cumulative effects of onshore and offshore development would be likely to emphasise this change and reduce the sensitivity of this Seascape Unit to future development. This may lead to a greater sensitivity at this point in time when these landscapes and seascapes are on the threshold of major change. Overhead cables and onshore substation for Lewis – mainland sub sea cable.

3.2.13 AREA 13: BUTT OF LEWIS – CARLOWAY



Seascape Character Types

Type 13 Low Rocky Island Coasts.

Key Characteristics:

- low rocky coastline rising to cliffs in places;
- backed by moorland behind coastal fringe of crofting settlements;
- linear coastline with open views of Atlantic, occasionally limited by undulating landform;
- exposed.

Scale and Openness

The scale is fairly large and open. There are some small ridges which run perpendicular to the coast and which provide some limited containment but generally the hinterland is flattish and open with wide views of the open sea. Turbines could relate to the scale and openness of this stretch.

Form

The hinterland is an extensive flat plateau of moorland with a strongly defined linear coastal edge. This is a relatively simple form and turbines could relate to this.

Settlement

Throughout this area there are small scale coastal crofting settlements. Individual buildings are small and tend to be detached. The settlements are not large enough to create any consistent visual screening of the sea which is a dominant characteristic. There are some traditional black houses but the majority of houses are fairly modern and grey lacking visual appeal. The industrial scale of development would conflict with the feeling of small scale self reliance that many of these settlements have.

Pattern/Foci
Settlements are the main foci in this area with some dramatic cliffs at the Butt of Lewis. There is a simple pattern of flattish hinterland backing a fairly linear settled coastal strip. Depending on conditions and distance from shore offshore development could become a main focal point for large stretches of this coastline but would relate to the simple linear patterns.

Lighting
There are some street lights in the larger settlements and settlements generally will provide some light. There is a lighthouse at the Butt of Lewis. However the area of sea is dark without any significant shipping and the lighting of such a development would be a substantial impact.

Movement
There is little movement on the sea, occasional ships and boats. The movement is mainly caused by wind and waves in this very exposed stretch of coastline. The settlements are also fairly quiet and it is often possible to pass through them and have the impression that there is no one around. The elements dominate the sense of movement.

Aspect
West facing onto open Atlantic. The sun setting would be the dominant focus at night the appreciation of which would be compromised by backlighting and artificial lighting at dusk of wind development.

How Experienced
From settlements and long roads with open views of sea. Calanais is a major tourist attraction but views of sea from there are limited.

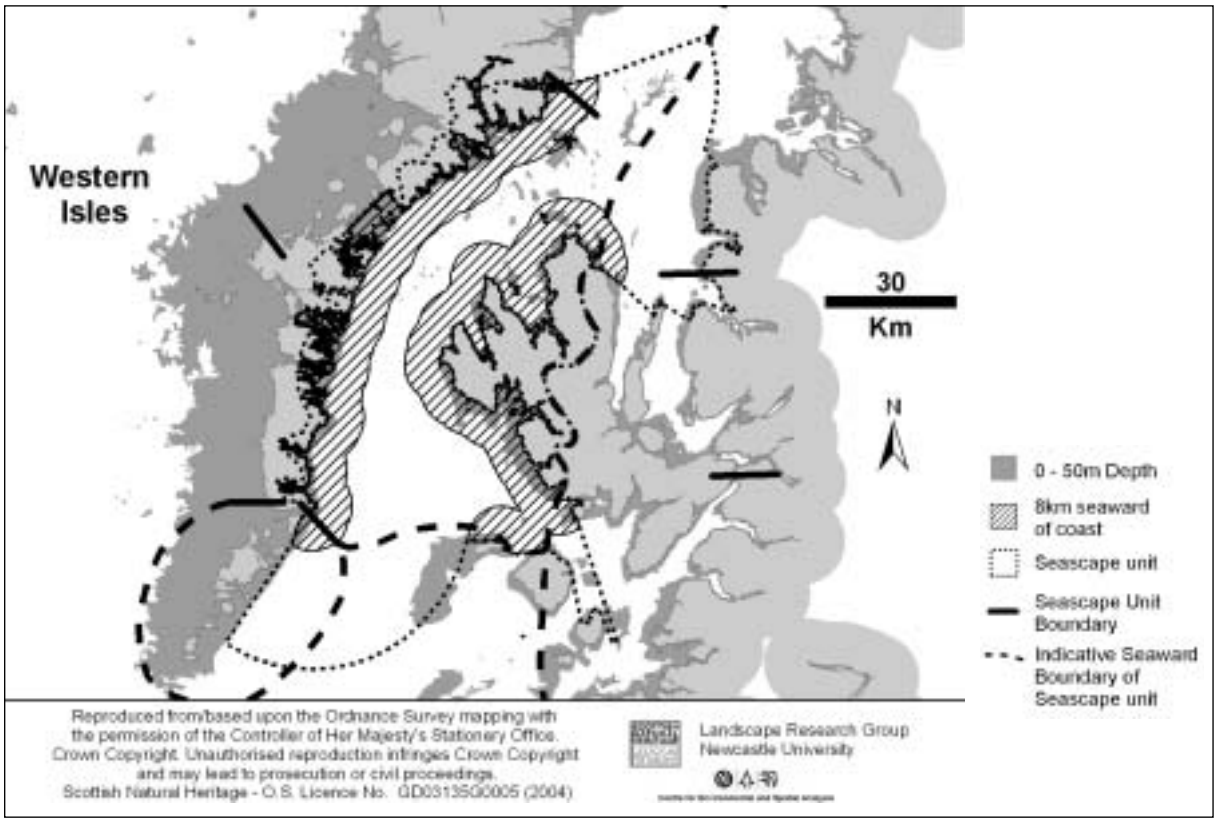
Modification/Remoteness/Sense of Naturalness
Small settlements and crofting are the only real modification, some masts in places. The elements and natural landscape dominate these areas and so there is a strong sense of naturalness even around settlements.

Sense of Exposure
These areas are highly exposed to the full force of the Atlantic swell. They feel and are at the very edge of the British Isles. Whilst wind power would relate well to the concept of harnessing the power of the elements, the industrial nature and scale of development would conflict with the feeling of looking at a wild and untamed sea.

Sensitivity
Medium Sensitivity. Turbines could relate to the large scale, open seascapes and simple linear forms and patterns but the industrial nature and scale would conflict with the small scale settlement and crofting character and would cause a major focal point for a large stretch of sea where none other exists. It would also detract from the dominating experience of a wild and exposed coastline causing a substantial change of character.

Forces for Change
There are some onshore windfarm applications in Western Isles including a very large scale one at Barvas Moor. If these go ahead then the landscape of Lewis will undergo a substantial change of character. The addition of a large offshore windfarm would create wind energy landscapes and seascapes and a great deal of the wild and elemental character of these areas would be lost. Overhead cables – grid connections.

3.2.14 AREA 14: THE LITTLE MINCH



Seascape character types

Type 13 Low Rocky Island Coasts, and Type 9 Sounds, Narrows and Islands.

Key Characteristics:

- heavily indented and rocky fragmented coastline of eastern Harris and the Uists with distinctive 'Knock and Lochan' hinterland; contained sounds and narrows also present on this western coast eg Loch Seaforth and Sound of Harris;
- indented coastline of western Skye contains long, narrow sealochs;
- settlement small scale with traditional crofting;
- hinterland largely moorland with large areas of remote undeveloped land;
- views of Harris mountains and the mountainous ridge of the Trotternish peninsula on Skye focal points;
- important ferry routes from Uig (Skye) to Tarbert (Harris) and Lochmaddy (North Uist).

Scale and Openness

A series of small to medium scale seascapes but from many areas open views of the sea are possible from elevated viewpoints. On clear days views of Skye from the Western Isles are important and the scale of turbines may interfere with the perceived scale of mountainous areas on Skye. Vice versa views of Harris mountains from Skye.

Form

In Harris and The Uists the form of the coastal areas and hinterland is complex. The coastline is for the most part heavily indented and fragmented with many inland water bodies giving a feeling of the sea permeating the land. In Harris the hinterland comprises the distinctive 'Knock and Lochan' rising to the Harris mountains. On Skye the coastline is far less intricate and larger scale with a series of strong headlands of the three

peninsulas Trotternish, Waternish and Duirinish between large bays or sealochs. Loch Seaforth in Lewis is a highly contained narrow stretch of water with steeply rising hills on either side giving a fjord effect. Generally turbines would not relate well to the complexity and distinctiveness of form.

Settlement
Sparse settlement with traditional crofting generally found in more sheltered bays and inlets. Larger settlements around ferry terminals eg Uig and Tarbert. There are large stretches of uninhabited coasts found throughout this seascape area. Sea traffic comprises mostly ferries and pleasure craft. Turbines would not relate to the scale and character of settlements.

Pattern/Foci
There are generally complex and intricate patterns of indented coastline fragmenting into islands and skerries or larger scale patterns of peninsulas, sounds and narrows. Foci tend to be settlements where they appear and strong landscape features such as distinctive mountains and headlands. The regimented patterns of turbines would not relate well to the irregular and highly natural seascape pattern and could interrupt views to and visually compete with key foci.

Lighting
Limited lighting from ferries, fish farms and lighthouses but generally a dark area. Windfarm development would be a major impact in this area.

Movement
Limited movement from settlements, roads and ferries but intermittent and there are areas which are very remote and no movement is discernible except that of wind and waves.

Aspect
Various. Views from Skye would be most affected by backlit turbines in the evening and lighting at dusk distracting from sunsets.

How Experienced
From coastal roads, settlements and ferries, mountains (Cuillins, Trotternish ridge, Clisham), coastal footpaths. There are two important ferry routes which cross the middle of this area and views to Harris and Skye are important. Development would cause a focus of a very different nature from ferry routes.

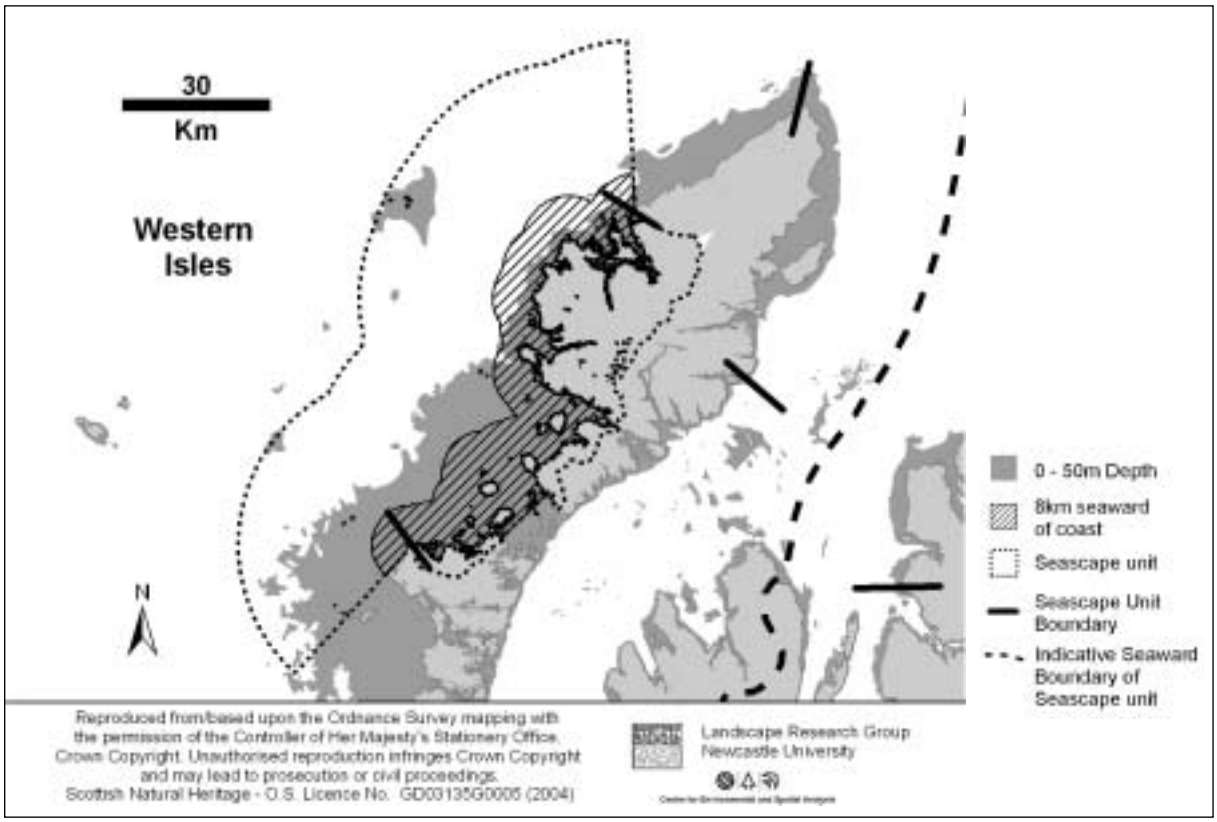
Modification/Remoteness/Sense of Naturalness
Traditional small settlements with natural elements and landscape and seascape experience dominating. Some aquaculture present. In uninhabited areas there is a high level of remoteness and naturalness with which turbines would conflict.

Degree of exposure
Not as exposed as some areas, indented coastlines provide many sheltered areas.

Sensitivity
High Sensitivity. Although this unit contains coastal and hinterland forms of different character and scale the overall complexity and naturalness of seascape form and pattern is distinctive and would be highly sensitive to the development scenario considered. The area is intervisible with important views back and forth from the Western Isles to Skye and a windfarm would create a focus of a very different character.

Forces for Change
Increased tourism and demand for built development including road improvements in the Uists. Onshore windfarm development proposals.

3.2.15 AREA 15: CARLOWAY TO GRIMINISH POINT



Seascape Character Types

Type 13 Low Rocky Island Coasts, Type 12 Deposition Coasts of Islands, Type 9 Sounds, Narrows and Islands.

Key Characteristics:

- contained views occur in the south from within a more fragmented coastline and mountainous hinterland;
- high mountainous areas in Harris, steeply rising from the sea in places;
- many uninhabited islands in the Sound of Harris provide focal points;
- on Harris some visual containment is provided by mountainous hinterland and rocky headlands creating a series of small to medium scale seascapes. Views are directed seaward due to landform limiting views inland;
- in the sounds islands create containment and frame areas of sea creating small to medium scale seascapes.

Scale and Openness

A high degree of containment occurs due to hilly hinterland and fragmented and indented coastline. This creates a series of smaller scale seascapes where limited stretches of the sea are viewed. There is a greater sensitivity to the scale of offshore development here. Where a limited stretch of sea is viewed the horizontal scale of development could dominate the sea horizon. However there are stretches of these coastlines which look directly west to the expanse of the Atlantic. More open views are had further south in the Sound and at Berneray.

Form

The coast is indented and complex, with skerries and larger islands. The changing views of sea, islands and

hinterland create a generally complex series of seascapes. The strongly linear and regimented forms of development would not relate to the complex and organic forms of this area.

Settlement
Settlement is sparse, 'traditional' and the roads generally quiet. There is a large area devoid of settlement and an isolated stretch of coastline. The scale and form of development would not relate to these small scale settlements.

Pattern/Foci
The pattern is complex and foci tend to be settlements as well as skerries and islands and hilly landforms. Development may detract from the appreciation of these complex forms and would disrupt the visual composition of existing focal points. Views of St Kilda are also possible from North Uist in the right conditions and as this is such a renowned and inaccessible group of islands the sighting of it from the coast is quite significant and development would interfere with the focus of these views.

Lighting
Very dark area – lighting of development would cause a major impact.

Movement
The movement is dominated by wind and waves with some traffic and ferry movement. When weather is calm, generally very quiet, still areas.

Aspect
Generally westerly although depends on orientation of bay etc.

How Experienced
The roads in Harris skirt the coast and provide good views of a sequence of scenic sandy bays with mountain backdrops. In Berneray and North Uist there are more open views of large stretches of machair. From the ferry across the sound of Harris there are more open views of sea but these are still framed by the dramatic landscapes of Harris and the smaller but distinctive hills on North Uist.

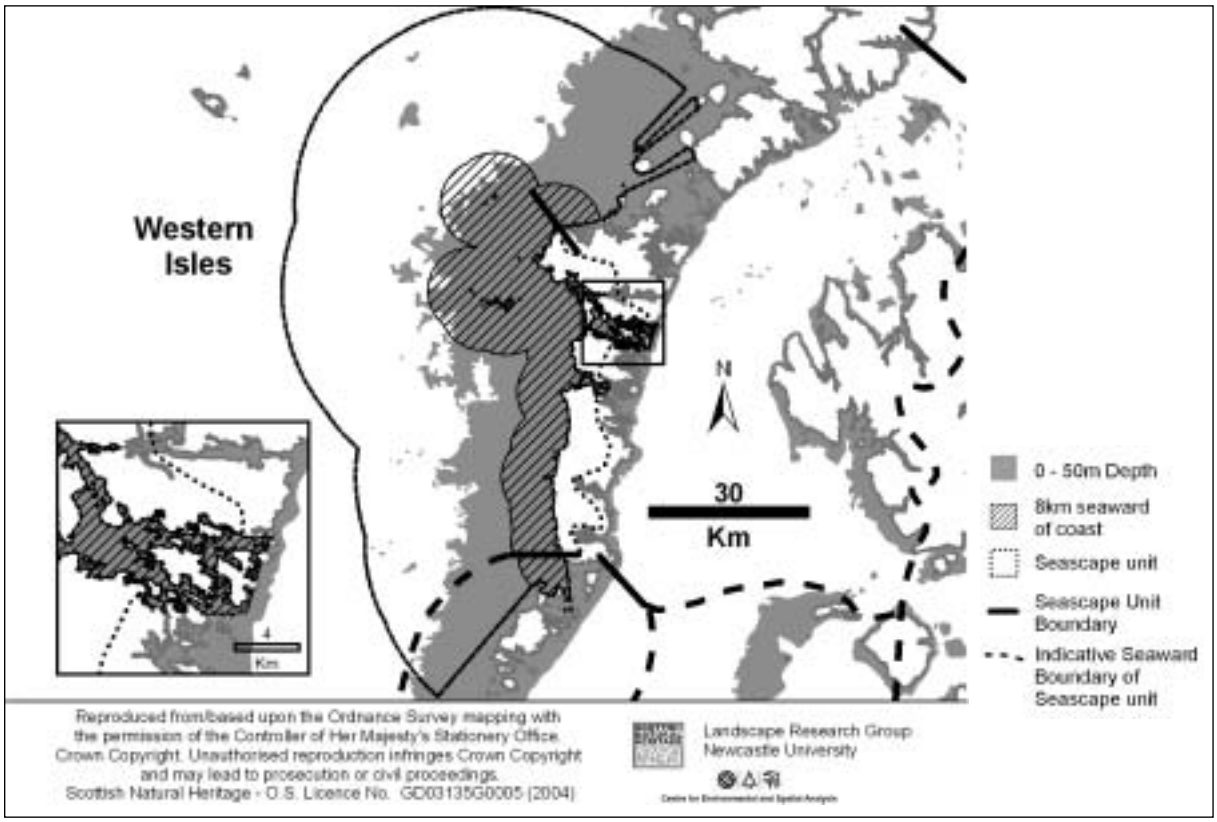
Modification/Remoteness/Sense of Naturalness
The whole area is little modified apart from the crofting and limited tourist facilities, golf course and hotel. The area feels highly natural and has elements of remoteness in many places.

Exposure
Can feel very exposed in places but many areas also feel sheltered due to containment by landform.

Sensitivity
High Sensitivity. This unit is generally small scale with complex form and patterns creating dynamic views. Turbines may dominate horizon within confined seascapes and the linear form and regimented pattern would not relate to the highly natural and complex pattern and form of the area. The introduction of built development of such a scale would impact on the high degree of naturalness of the area and conflict with the scale and character of settlements. Turbines would also be a competitive focus to offshore islands and distant mountains which form a series of key views when travelling particularly over the Sound of Harris.

Forces for Change
Climate change leading to erosion of machair coastline in certain areas. On shore wind development. Masts. Road improvements.

3.2.16 AREA 16: WEST UISTS



Seascape Character Type

Type 12 Deposition Coasts of Islands

Key Characteristics:

- large areas of machair, smaller scale to North in between headlands and spits but extensive linear stretches further south with flat crofting land and moorland behind;
- sparse, traditional crofting settlements with linear arrangement along roads;
- wide open views of land and sea giving expansive panoramas and large scale seascapes more contained to the North where extensive dune systems present;
- exposed feel and seascape dominates experience.

Scale and Openness

Large stretches of machair provide a linear large scale seascape with extensive views to open sea and to flat hinterland. This is more contained in North Uist where landform and extensive dune systems in places restrict views.

Form

A strikingly horizontal form for much of this area with views over open expanse of Atlantic. North Uist is slightly more complex due to dune systems and more hilly hinterland. The introduction of vertical forms in the sea would compromise this although the predominantly overall horizontal nature of the whole windfarm at a distance of 8km could relate to the overall form.

Settlement

Settlement is small scale and sparse. Buildings are often modern kit houses. Individual crofting dwellings are

often single storey and spaced out creating very little or no visual screening. Dwellings are dwarfed by the large scale and open seascapes and due to the lack of any mid scale elements this contrast is striking. The introduction of an industrial scale element would compromise this effect.

Pattern/Foci

There is a predominantly simple pattern made up of horizontal and linear elements. The flat treeless landscape and expanse of sea is bisected by a largely linear coastline and linear roads and settlement patterns. Due to this simplicity headlands eg Orasaigh and the few offshore islands (the Monach Islands) become key focal points. Development should not conflict with these.

Lighting

Dark areas, looking out at Atlantic development lighting would be a significant change. It would also be seen from very far due to the flat landscape.

Movement

There is little movement in these areas apart from that caused by the elements, wind and waves. Some traffic on the road but overall very quiet areas. Benbecula rocket range present although not in frequent operation.

Aspect

Westerly and development would interfere with the sunsets.

How Experienced

Due to the flatness and openness of these land and seascapes the sea is a dominant characteristic and its influence is constantly present. The machair beaches are popular for recreation and bird watching. From the hills on North Uist and Benbecula extensive panoramas can be had and a development would form a key focal point over an extensive area. Sense of vast scale, dominance of the power of the sea, feeling like 'there is nothing between you and America'.

Modification/Sense of Remoteness/Naturalness

MOD facilities at Benbecula and MOD testing ranges on South Uist beaches mean these beaches are closed at certain times and this affects perception of these areas as being highly natural. These areas are settled and worked with some extensive crofting lands but the natural elements dominate. The coast here is an important edge beyond which the Atlantic ocean is perceived as a vast and untamed area. Whilst not particularly remote due to the dotted settlements these seascapes have a definite sense of being 'out of the way' and at the very edge of Britain.

Exposure

Exposed but can feel sheltered in parts particularly the North Uist machair grasslands. Wind energy could relate to this creating rationale for siting in this area but would compromise the elemental nature of seascapes in places. There is a feeling of being at the edge of human influence and that the sea is untameable. Development would contradict this feeling.

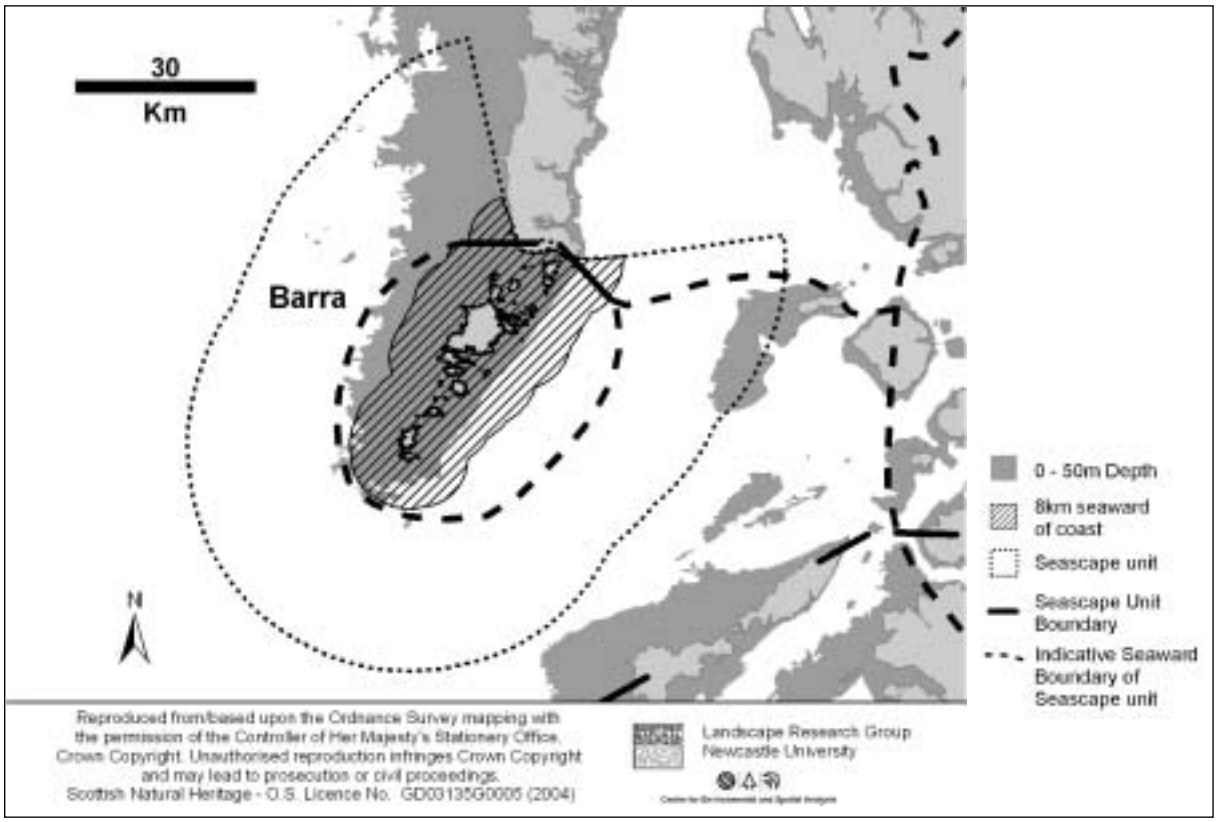
Sensitivity

Medium Sensitivity. Development could relate to the scale and general simplicity and linear nature of these seascapes but would detract from the perceptions of naturalness, remoteness and the strong sense of coastal edge that is present here.

Forces for Change

Climate change causing machair areas to reduce.

3.2.17 AREA 17: BARRA AND THE SOUNDS



Seascape Character Types

Largely Type 9 Sounds, Narrows and Islands, Type 12 Deposition Coasts of Islands and Type 13 Low Rocky Island Coasts

Key Characteristics:

- a sequence of small scale machair bays nestled in low lying rocky coastline;
- mountainous hinterland restricting views inland;
- Sheaval mountain on Barra is a focal point throughout this area and has an apparent vertical scale due to steepness rising from the sea;
- small isolated crofting settlements close to the coast, apart from main town of Castlebay which has the ferry terminal – ferries to Oban and Lochboisdale;
- open sound of Barra with Eriskay, Fuday and other islands in sound creating changing interplays of land and water and framing distant sea;
- series of uninhabited and fairly dramatic islands to the extreme south;
- scenic, isolated with qualities of exposure and remoteness.

Scale and openness

This is a series of small and medium scale seascapes, contained and framed by the rocky and heavily indented coastline, by the many small offshore islands of the sounds. Scale is larger at headlands and at elevations where more panoramic views can be had. The mountainous and hilly areas Barra and Mingulay, whilst not as high as the mountains on the mainland give the impression of large vertical scale due to the way landforms rise steeply from the sea. Development would introduce a scale comparison which may detract from this effect.

Form

Form is hilly, rocky and heavily fragmented with the sounds of Barra and smaller sounds between the islands

south of Vatersay creating seascapes with many changing views and compositions. The flat planes of water acting as a foil to the steeply rising landforms creates contrast in form and shape. The forms are complex, varied and rugged. Development would conflict with this.

Settlements
Large sections of this area are uninhabited. Where settlement exists it is small scale with a traditional crofting character. Settlements are located along a narrow coastal fringe at the base of mountainous areas. Turbines would not relate to the scale and character of these settlements.

Pattern/Foci
The sequential pattern of small sandy bays between rocky headlands creates a strong pattern and foci when travelling through the west of this area. This is a key feature. Views out to a windfarm may detract from the appreciation of this pattern by creating an alternative focus from certain viewpoints. There is a pattern of islands in the sounds creating changing views and these seascapes are dynamic and there are many foci. Development would create a diversion of a very different nature and pattern.

Lighting
This is a dark area, some lighting from main settlements and from ferry routes but otherwise lighting of turbines on such a scale would be a significant impact.

Movement
Generally limited and infrequent movement from settlement, roads and ferries and fishing boats. Although six ferry routes pass through this zone and this is quite significant. There is also the occasional plane. Natural movement caused by wind and waves would predominate as coasts are exposed.

Aspect
Views westwards to sunsets over the Atlantic may be compromised.

How Experienced
Generally from settlements, roads and ferries and from elevated viewpoints, including air – pleasure rides from Traigh Mhor. From the summit of Sheaval it is possible to have panoramic views of the whole chain of islands south of Barra. Some sailing and sea kayaking. Views from coastal roads provide contained views of seascapes in the main rather than open seascapes, although at elevations and from ferries these open stretches can be appreciated.

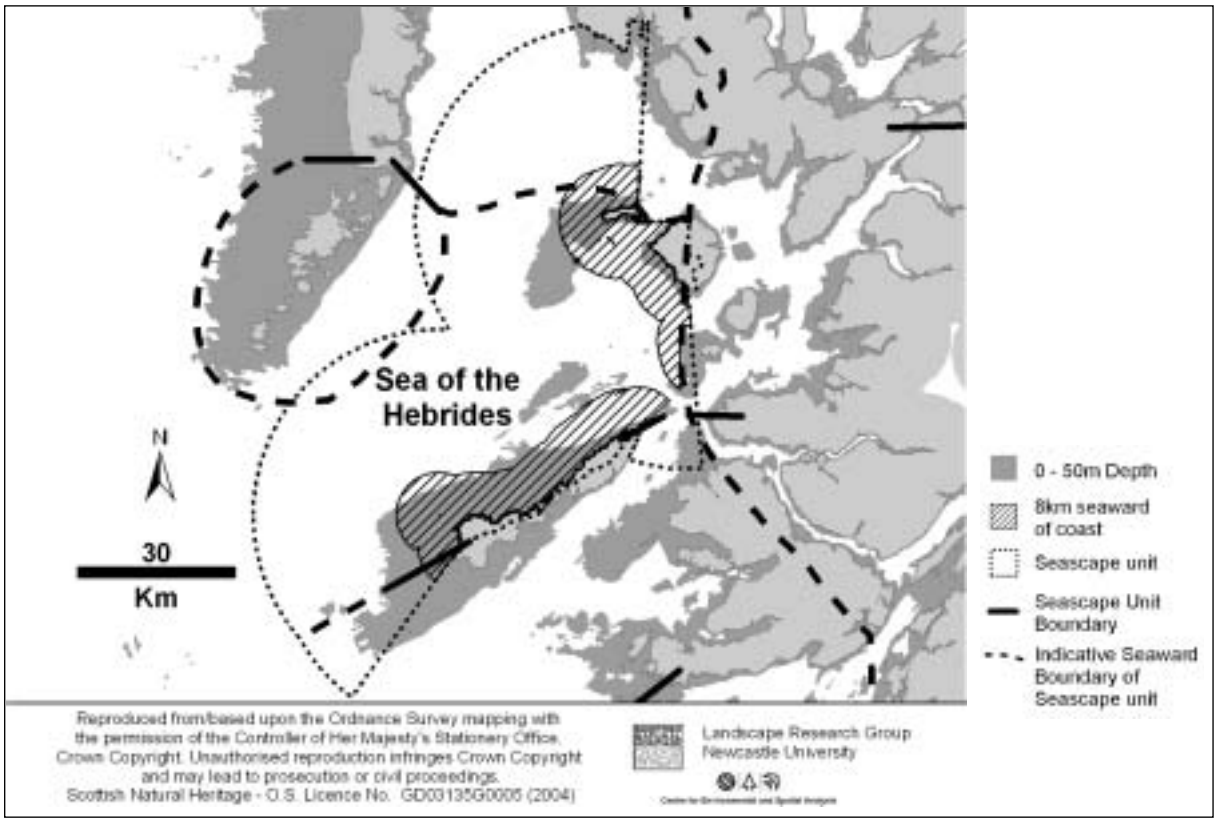
Modification/Remoteness/Sense of Naturalness
Little modification. The area has an overriding natural and remote feel particularly the uninhabited islands to the south. Where settlements occur they are small and create focal points rather than dominating views.

Exposure
These areas feel exposed on headlands and at elevations although some shelter is afforded by landform in places.

Sensitivity
High Sensitivity. Development would introduce a large scale element of industrial character in an area where such development is absent thereby causing a significant change of character. The scale may cause conflict with small scale seascapes and apparent scale of mountainous landscapes. Parts of this area are uninhabited and have a high sense of naturalness and remoteness which development would substantially alter.

Forces for Change
Nothing of significance has been identified.

3.2.18 AREA 18: WEST COLL AND TIREE, CANNA AND RUM



Seascape Character Types

Type 12 Deposition Coasts of Islands, Type 13 Low Rocky Island Coasts and Type 9 Sounds, Narrow and Islands.

Key Characteristics:

- areas of machair on Coll and Tiree with sequence of sandy beaches, low rolling profiles of hinterland and at slight elevations open seascapes;
- dramatic profile of the Cuillins of Rum offering key views within this area;
- small sparse settlements;
- well farmed character on Tiree, hinterland of Coll comprises moorland;
- very exposed, little shelter provided by landform;
- Tiree popular for water sports;
- sense of islandness, created by isolation, panoramic views and time of journey.

Scale and Openness

Predominantly flattish and open hinterland on Coll and Tiree, more vertical emphasis on Rum. The scale is relatively small at a local coastal level, resulting in a focus on foreground details, with many small to medium scale sheltered sandy bays. There are areas where large scale seascapes open up in flatter areas and the scale contrast of these large flat open areas with the small scale houses is striking (similar to the effect in the Uists). Introduction of a mid scale element would detract from this.

Form

The coasts of Coll, Tiree and Canna have a generally horizontal form with a softly rolling hinterland backing a low lying machair coastline. A sequence of small sandy bays are a feature of the coastline and turbines may conflict with the appreciation of these. Forms and textures are natural. Rum has a distinct profile and high peaks rising sharply. Turbines would conflict with views of this.

Settlement
Small and sparse. Traditional crofting and farming settlements. No significant industrial development.

Pattern/Foci
The sequence of sandy bays is a strong pattern when travelling through these areas; the curve and pale colour of these sands forming foci within these seascapes. Offshore islands are also key foci, although no one island is visually dominant as they all possess very distinctive profiles and landmark qualities. Pattern is generally weak within the hinterland with settlements being main foci. Views of the more dramatic profile of Rum are a foci northwards and turbines may conflict with this.

Lighting
Dark area.

Movement
Tiree is well settled and well used by wind surfers due to the Atlantic rollers and the presence of beaches to suit all wind directions. The smooth, mechanical and regular turning of turbines would conflict with this natural, powerful and crashing movement of the waves. It would detract from the sense of untamed power of the sea.

Aspect
Views of sunset from Coll and Tiree may be compromised.

How Experienced
Tiree is a key focus for wind surfing and a popular tourist destination. Views from coastal roads and beaches out to sea are important on both Coll and Tiree as are views from low hills providing a vantage point from where the whole island and coast can often be seen. The relative juxtaposition of offshore islands creates distinctive landmarks that help orientate the viewer whilst moving around these islands.

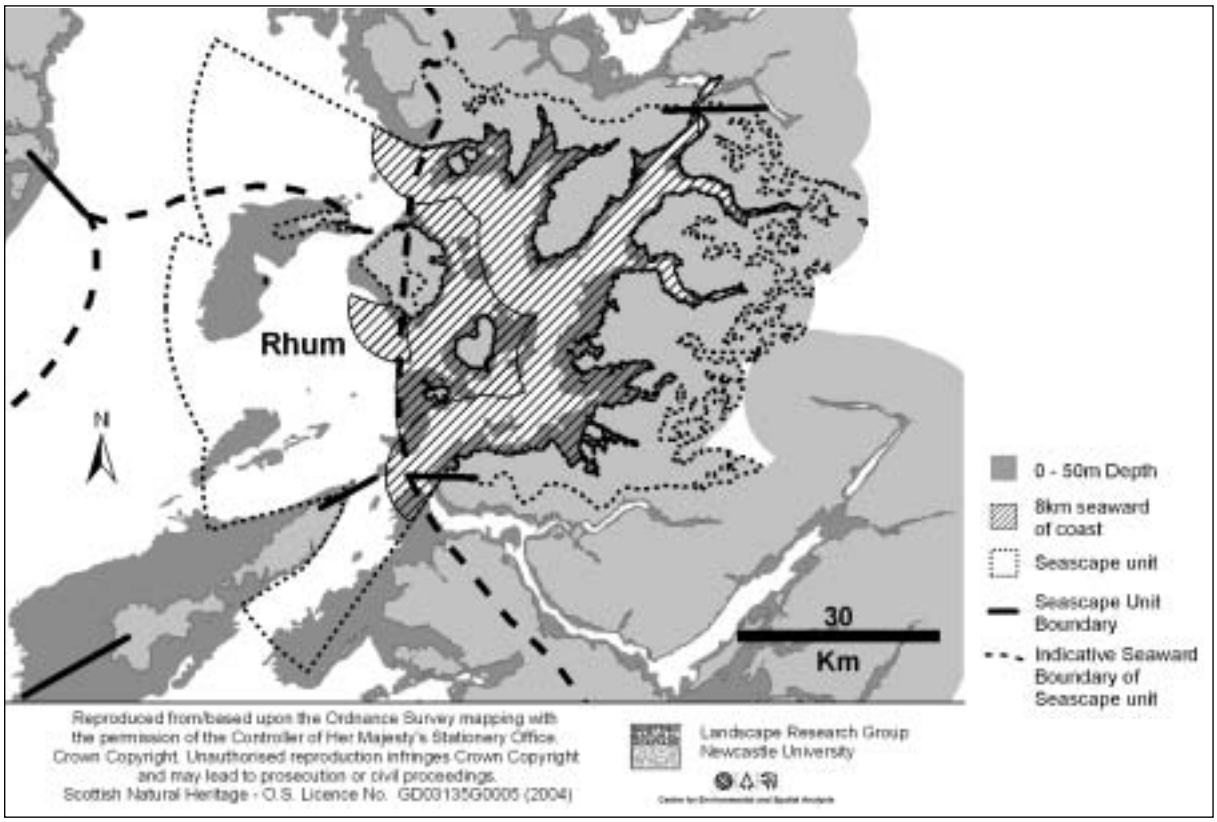
Modification/Remoteness/Sense of Naturalness
Some highly natural areas although Tiree has a well farmed character. Rum particularly has a rugged, remote and natural quality. Strong island feel due to difficulties of access and exposure to Atlantic. There is an occasional telecommunications mast.

Exposure
Tiree very exposed due to being small flat island in expanse of Atlantic. Coll exposed but less so, due to low hills of hinterland and orientation of curved bays. Little shelter. This exposure could relate to turbines but would have a detracting affect on the perception of it being wild and untamed.

Sensitivity
Medium – high. Turbines could relate to the predominantly large scale, flattish and open landforms of these seascapes. However, they would conflict with smaller scale seascapes and the limited views of the sea from smaller bays and inlets. They would also conflict with key views of Rum which has a more dramatic and vertical profile. Wind energy would relate to the feeling of windiness and exposure of these seascapes but may detract from their elemental nature. Turbines would conflict with the natural qualities of the area and the traditional small scale character of the settlements. Night lighting and interference with sunsets would also create significant impacts and change of character.

Forces for Change
Climate change may lead to the erosion of machair in the future. Renewable energy developments, construction of houses, tourist facilities and upgrading of transport infrastructure. Pressure for new homes and renovation of crofts to non-agricultural use as holiday homes may diminish sense of remoteness and wildness.

3.2.19 AREA 19: SOUND OF SLEAT – POINT OF ARDNAMURCHAN



Seascape Character Type

Type 9 Sounds, Narrows and Islands.

Key Characteristics:

- greatly indented, predominantly rocky coastline with some extensive sandy bays;
- strongly enclosed by islands and mainland;
- settlement mainly on the coast;
- hinterland comprises moorland and hills;
- views of Rum, Skye particularly where sound of Arisaig opens up;
- coastlines fairly similar in character, so distinctive peaks create important landmarks in the large scale, particularly Rum, Skye Cuillin and Knoydart.

Scale and Openness

Large vertical scale of the hinterland mountains, deep glens and sea lochs. Smaller scale areas at the coast where indentations create variable enclosure and sheltered bays and lochs. Containment is high in the hinterland due to high mountains and deep glens but views much more open at coast with a gentler landform and wide expanse of sea. Rum and Knoydart have strong vertical scale accentuated by steepness of mountains. The Sgurr of Eigg also gives the impression of greater vertical scale than its actual height would suggest. Development in this area would detract from this apparent scale and overwhelm the other small islands of Eigg and Muck.

Form

Varied forms creating changing scenery. Mountainous views to hinterland and striking serrated mountain profiles of Rum and Skye Cuillins. Open gently undulating landforms include craggy promontories and some

small cliffs eg Ardnamurchan Point near the coast rise to mountainous hinterland bisected with lochs. The sea is broken by many islands and views toward distant islands.

Settlement
Small scale settlements usually along coast. Harbours at Mallaig and Arisaig. Bridge to Skye and railway line following the road around the coast at Morar.

Pattern/Foci
Patterns of mountains and glens, sea and lochs combine to create dynamic but unified and highly scenic vistas and turbines would compete with these. At the coast islands and views of mountains and offshore islands form key foci; more locally settlements and small sandy bays are focal points.

Lighting
This is a dark area generally although small coastal settlements are lit.

Movement
The coast can be busy in tourist season as movement is restricted to distinct corridors; roads and railways, ferries and toll bridge to Skye.

Aspect
Depending on the orientation of views, generally sea is westward. Outlines of islands would be back-lit in sunsets from the mainland.

How Experienced
Travel within this seascape is often lengthy heightening the sense of remoteness/isolation. Access routes mainly follow the coast and views from these roads and rail routes are important as are those from beaches, ferries and coastal settlements. Views from mountain peaks reveal panoramic vistas although views of the coast are generally limited from less elevated parts of the hinterland.

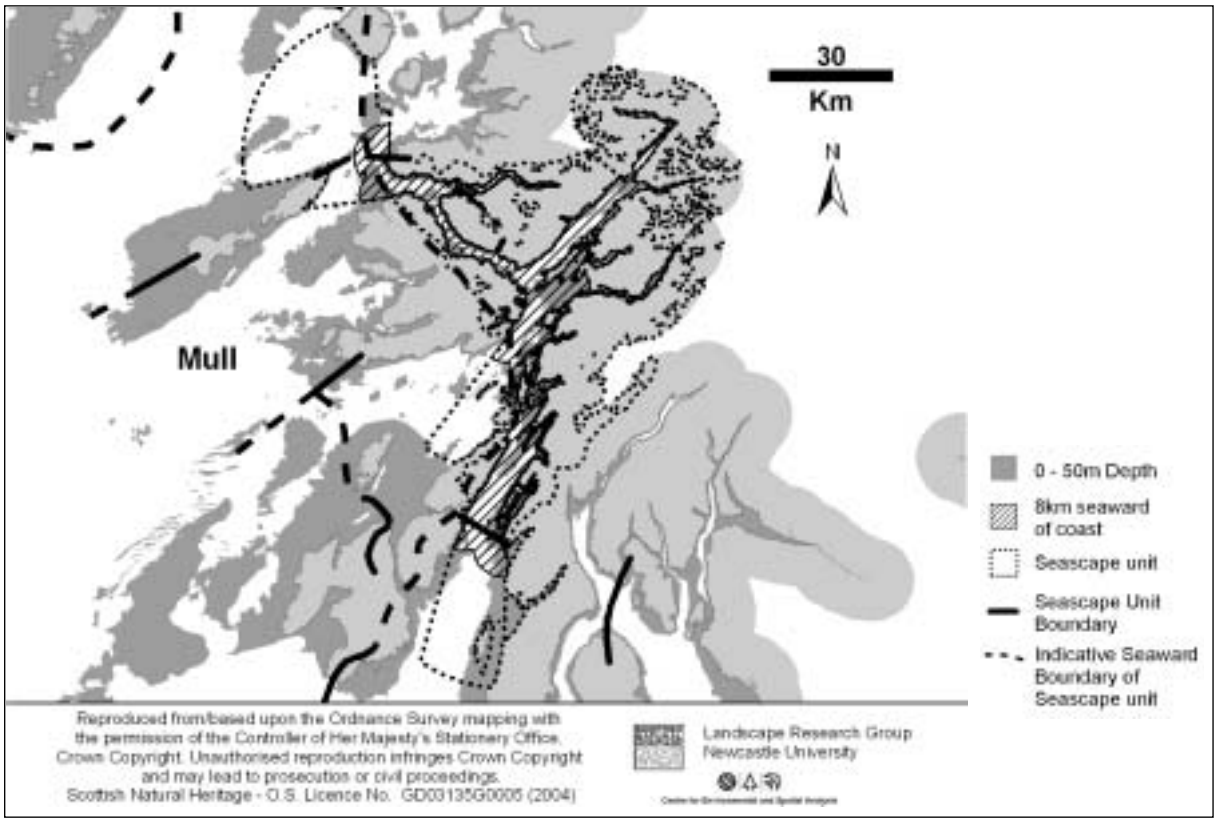
Modification/Remoteness/Sense of Naturalness
The hinterland is highly natural and remote, particularly in the South Morar to Knoydart area which is almost devoid of any development or infrastructure, possessing qualities of wildland. The coastal 'strip' is settled and accommodates well used access routes and from these it can appear that the area is more developed than it actually is. However, in distance views, the concentration of settlement on the coast can seem to emphasise the sense of wildness within the hills.

Exposure
This varies greatly between the mountains and the coast. The coast is exposed to wave action but with some shelter provided by the Outer Hebrides from the Atlantic swell, depending on the orientation of the beach. The mountain areas in contrast are highly exposed to westerly winds and the passage of the weather fronts, whilst the Atlantic oak woodlands and cnocan landscape offers intimate enclosure, shelter and thus a sense of refuge.

Sensitivity
High Sensitivity. Seascape pattern of interlocking mountains, islands and sea is a key characteristic which would be disrupted by development. Turbines would introduce a large scale modification into a highly natural area with some extremely remote hinterland creating a significant change in character. Landmarks views of high peaks and views of Small Isles, Skye and Morar would be compromised.

Forces for Change
Pressure for new housing and tourist facilities. Upgrading/construction of new infrastructure including roads, ferry terminals, powerlines and renewable energy developments.

3.2.20 AREA 20: SOUND OF MULL/FIRTH OF LORN/SOUND OF JURA



Seascape Character Types

Type 9 – Sounds, Narrows and Islands

Key Characteristics:

- narrow sounds, high containment;
- main settlement at Oban, with important ferry routes to the islands;
- main transport routes A85, A816;
- fragmented coastline and small islands including Slate Islands to south;
- slotted views out to open sea.

Scale and Openness

Small scale, contained seascapes. Narrow stretches of sea with small islands and fragmented coastline particularly in the Firth of Lorn. There is no point more than around 5km from shore due to the high level of containment by land form. The scale of development would totally dominate seascape.

Form

Sound of Mull is a narrow stretch of sea which creates a foil to rolling hills and plateaux with cliffs on both sides. There is a more mountainous hinterland on Mull and to the north on the mainland. The land around the Firth of Lorn is flatter especially to the south and fragmented with many small flattish islands such as Lismore, Kerrera and the Slate Islands further south. The straight rigid forms of turbines would conflict with the natural fragmentation of coastline but would not conflict heavily with the more gently undulating hinterland. They would also interrupt the smooth plane of the sound and lessen its contrast with the detail of the containing landform.

Settlement

Oban is one of the major towns on the west coast and has a busy harbour with important ferry routes to the islands. It has a very urban feel with some fine large buildings on the seafront. Other settlements are smaller scale and more traditional including the picturesque Tobermory on Mull. Development would conflict strongly with the nature and form of these settlements. Historic houses and designed landscapes may take advantage of the views and access via the sea.

Pattern/Foci

Settlements, forestry, islands, larger clusters of yacht moorings, and distant peaks form focal points in this landscape. The interlocking sea and land form varied patterns with changing forms.

Lighting

Although there is some lighting at night due to the main settlement at Oban, ferries etc a large windfarm would be heavily lit at night causing a change to the seascape in this area.

Movement

This area is fairly busy with the major settlement of Oban and much ferry traffic. Sailing and many marinas. Busy harbours and transport routes including rail.

Aspect

Varied – turbines would be so close to the land here that aspect is less of an issue. They would be seen from land all around with no one aspect dominating.

How Experienced

From ferries sailing from Oban and accessing the islands of the west and from other watercraft. This is a popular tourist area and views from coastal roads, settlements and visitor facilities will be important. Landform and forestry obscures views seawards on the A816.

Modification/Remoteness/Sense of Naturalness

Although this area has many natural characteristics it is generally accessible and relatively well settled.

Exposure

This area is fairly sheltered, more exposed toward the south in more open waters of the Firth of Lorn. A windfarm would not readily relate to this sense of shelter.

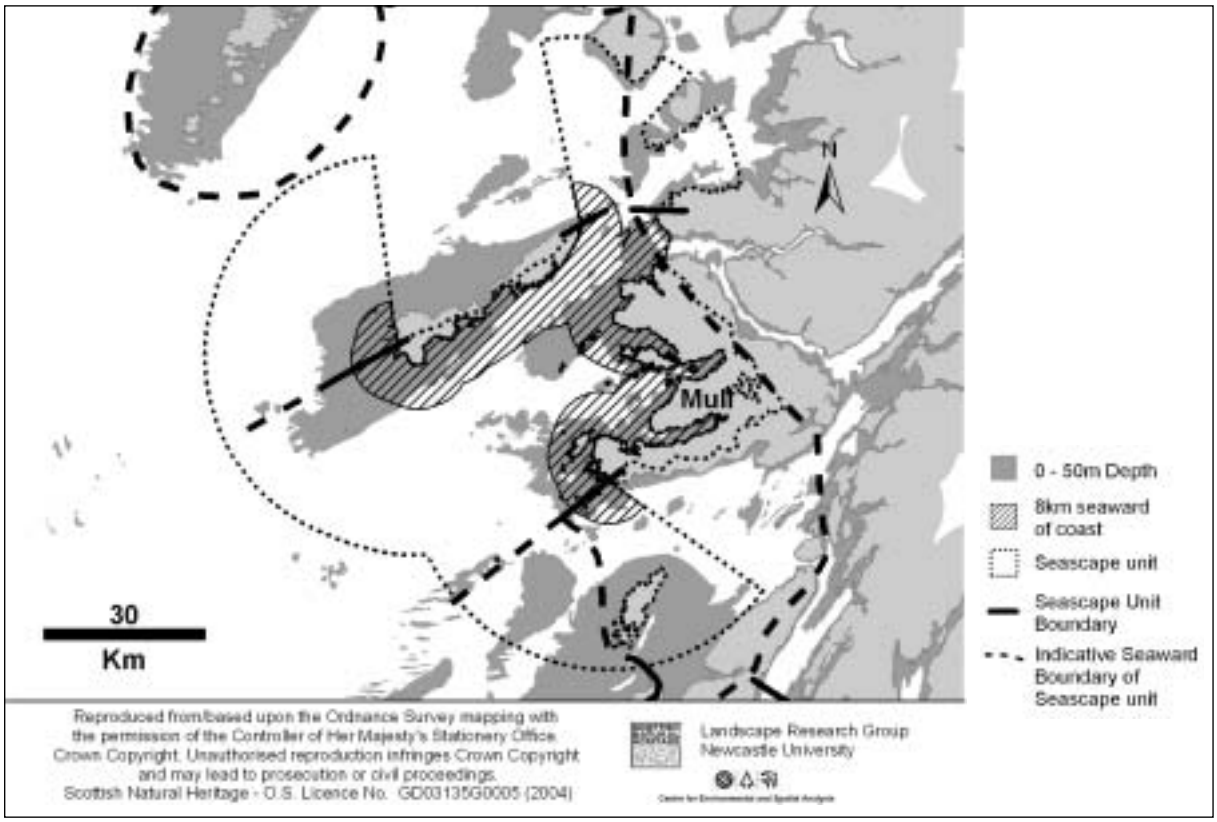
Sensitivity

High. It would be physically unfeasible to accommodate the development scenario within the narrow Sounds. Irrespective of the geographical limitations to development, the strong containment and scale of the small islands would be diminished by turbines.

Forces for Change

Pressure for ferry link between Jura and Keills in Knapdale may diminish wild coastline and associated road links. Aquaculture and construction of new water and shore based infrastructure such as marinas. New housing. Onshore wind farms.

3.2.21 AREA 21: WEST MULL/EAST TIREE AND COLL



Seascape Character Types

Predominantly Type 13 Low Rocky Island Coasts with small areas of Type 12 Deposition Coasts of Islands

Key Characteristics:

- low lying rocky coastline;
- generally low lying undulating and stepped moorland in hinterland;
- sparse small scale settlement with traditional crofting;
- conical mountains in central Mull forming focal points;
- wide bay like area in central Mull with indented coastline, islands, tall cliffs and stepped waterfalls forming focal points within this seascape;
- areas of machair on Coll, Tiree and Iona with sequence of sandy beaches, low rolling profiles of hinterland and at slight elevation open seascapes.

Scale and Openness

Varies from being more vertical scale and contained around Loch Scridain on Mull where cliffs and mountains rise steeply from the water on one side to larger horizontal scale and open in North Coll. Vertical scale is an issue where development may be viewed near the cliffs of Loch na Keal as the size of turbines may reduce apparent vertical scale of cliffs and therefore detract from their drama.

Form

Varied, generally rocky at coast with some areas of machair and sandy beaches. Coastline indented largely and fragmented around central Mull.

Settlement

Sparse traditional clustered settlement – crofting and holiday homes, with historic designed landscapes around Mull coast. Iona important spiritual community.

Pattern/Foci

Complex pattern particularly on Mull with mountainous and hilly areas in contrast to flat sea surface. Simpler on Coll and Tiree. Foci islands, peaks and headlands and settlements.

Lighting

Generally dark area may be some limited lighting at night from settlements and ferries and lighthouse.

Movement

Ferries, but generally quiet area. Coastal roads.

Aspect

Various. From Mull Headlands aspect is predominantly westerly and may affect the appreciation of sunsets. Views of sunrise over Mull seen from Coll and Tiree may be compromised.

How Experienced

From visitors to spiritual community on Mull. Boat trips to Fingals Cave and Staffa and whale watching. From ferries and roads (some looking down onto sea lochs) and within settlements. Experience depend on weather conditions which frequently vary.

Modification/Remoteness/Sense of Naturalness

Radar Tracking station at Hynish, ferry terminals, some forestry on Mull but overall highly natural areas.

Degree of Exposure

Fairly exposed.

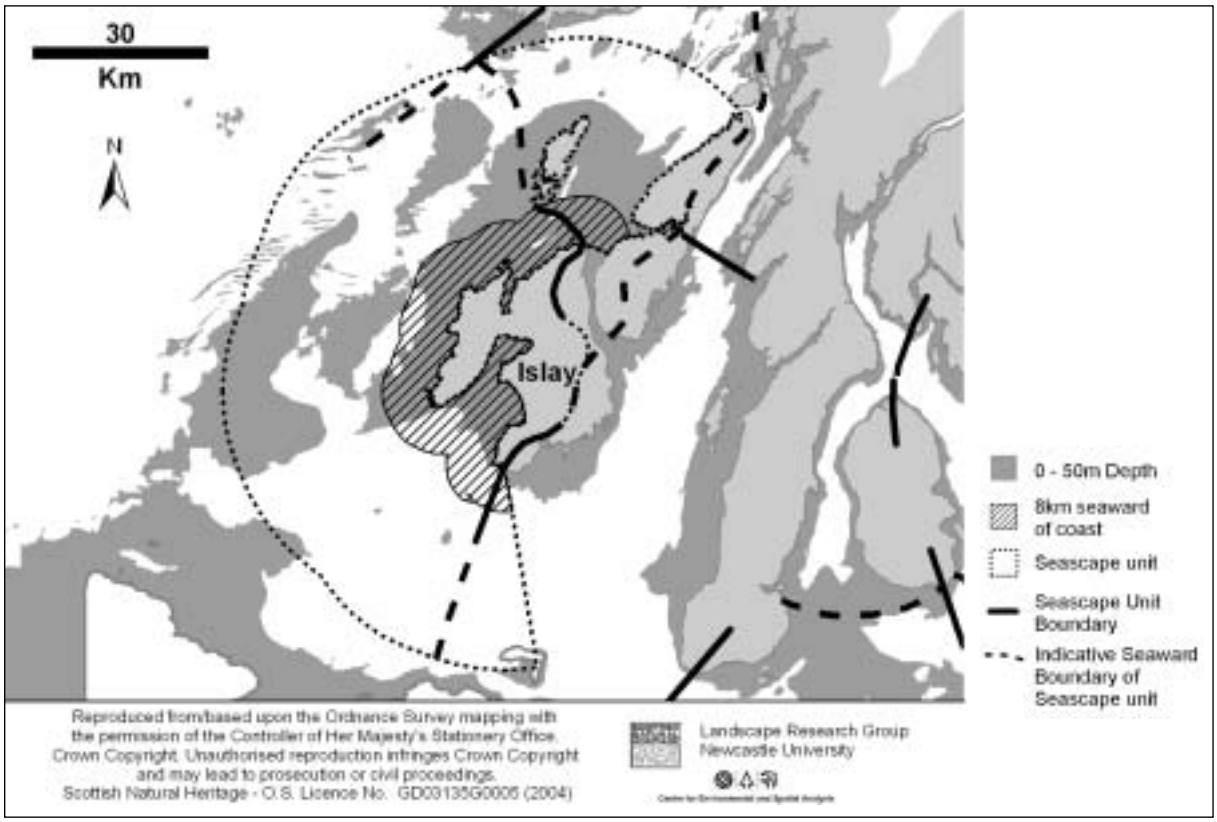
Sensitivity

High Sensitivity. Although there are larger scale horizontal seascapes in this area development would conflict with the apparent vertical scale of steep mountains rising from the sea around Mull. The form of development would not relate well to the highly natural and predominantly indented and fragmented coastline particularly around Mull. Turbines would conflict in scale and character with the sparse traditional settlements and detract from the spiritual associations of Iona.

Forces for Change

Climate change, erosion of machair. Renovation of crofts as holiday and retirement homes, and road improvements are reducing sense of remoteness.

3.2.22 AREA 22: WEST ISLAY



Seascape Character Types

Predominantly Type 13 – Low Rocky Island Coasts with areas of Type 12 – Deposition Coasts of Islands.

Key Characteristics:

- flattish rolling profile with elevated scenery at Mull of Oa and North Islay;
- mostly very sparsely populated excepting main settlement at Bowmore and at ferry port of Port Ellen where there is an urban feel. Elsewhere settlements are very small scale. Many distilleries are focal features;
- dramatic and rugged coastal scenery on North and West Islay with scenic sandy bays. Strong feelings of remoteness and naturalness in many areas;
- large tidal sealoch at Loch Gruinart important for birdwatching especially geese at dusk;
- much of the coastline only accessible on foot excepting area around Loch Indaal which is skirted by a coastal road.

Scale and Openness

Generally large scale seascapes with views of open sea. On the west there are many small bays and coves creating small, intimate seascapes. There are smaller scale seascapes around Loch Indaal on Islay where containment of landform reduces scale.

Form

Predominantly low undulating hinterland and rocky, fairly linear coastline with areas of greater intricacy in the extreme west with small scale rocky inlets and secluded coves and small bays. Small offshore islands create a fragmented coast in some areas. Larger bays and the sea lochs Gruinart and Indaal create headlands. Some rugged elevated coastline in places. Overall a varied seascape.

Settlement
Small scale traditional settlements. Bowmore is the main settlement with a more urban feel. There are many distilleries some of which look industrial and some which are attractive buildings and create focal points. Small harbours. Ferry terminal at Port Ellen. There are some parts which are unpopulated or sparsely populated. Turbines would not relate to scale and nature of these settlements.

Pattern/Foci
Fairly simple patterns of undulating moorland with settlements, small rises and sandy bays being focal points. On the west, a series of small bays and coves introduce complexity. Headlands are also focal points and include the Mull of Oa and Rhinns point and development should be sited so as not to conflict with these features.

Lighting
Generally a dark seascape with some discrete areas of lighting associated with settlements and light houses.

Movement
Predominantly quiet although Loch Indaal busier with harbours, settlement and roads. Movement associated with ferries and flights to the island.

Aspect
Varied. Sandy bays are predominantly west facing and experience of sunsets from these may be affected by backlit turbines.

How Experienced
From ferry routes into Port Ellen, settlements and roads. People must go off the beaten track to experience the open seascapes of the North and west and on the Mull of Oa and these areas have a quietness and seclusion. Bird watching popular at Loch Gruinart. Secluded coves are found on the western and Northern coasts although most are not accessible without walking over rough moorland and grazing land or climbing down steep slopes. Glimpsing a windfarm from these locations would detract from the very intimate and secluded experience. The world's first commercial wave power station (LIMPET) attracts international visitors.

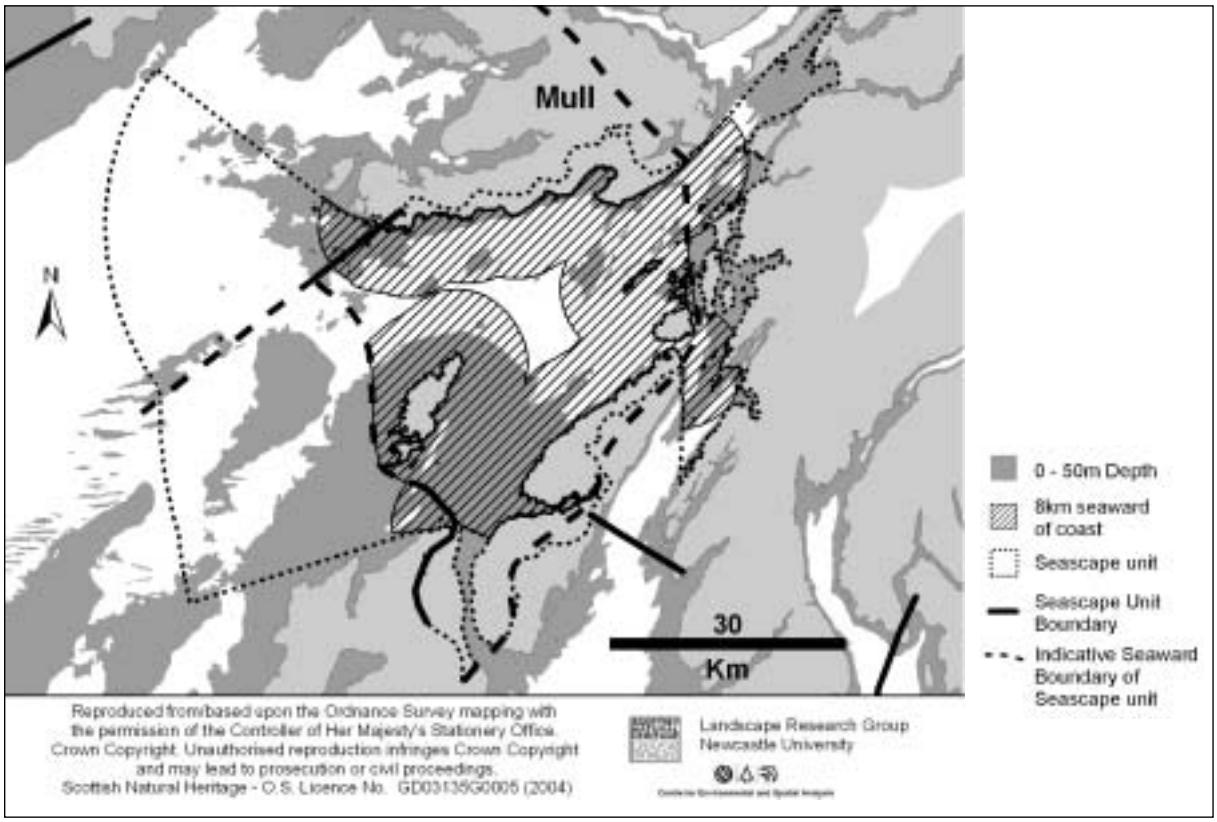
Modification/Remoteness/Sense of Naturalness
Agriculture (stock rearing) relatively intensive by island standards, presence of this and commercial forestry tends to increase sense of modification in some areas, although interspersed more natural landscapes such as peat bogs. Distilleries can seem quite large scale and industrial and there is localised noise from airport and wave power station.

Exposure
On the more rugged parts of the coastline and at headlands for instance the cliffs on Western Islay there is a real sense of exposure.

Sensitivity
Medium – High. Overall the seascapes are varied and development could relate to the generally larger scale, open seascapes and simpler hinterlands. However, there is a significant proportion of smaller scale, secluded, intricate and fragmented areas with limited sea views and more dramatic cliffs and coastline in places. Development may detract from the character of these elements. Development would conflict with the scale and character of the traditional fishing settlements. The natural qualities of this area would be compromised by this scale of development.

Forces for Change
There is a shoreline commercial wave power station at Islay (0.5MW). Pressure for development of new holiday homes and homes for local people. Masts and onshore windfarms.

3.2.23 AREA 23: SOUTH MULL/COLONSAY/WEST JURA/SOUND OF ISLAY



Seascape Character Types

Type 13 Low Rocky Island Coasts, Type 9 Sounds, Narrows and Islands.

Key Characteristics:

- rocky coastline rising to cliffs in places, caves, raised beaches;
- Paps of Jura and Mull mountains foci within this area;
- sparsely settled, very remote areas of strong wildland character;
- open views to sea from moorland plateau in hinterland;
- world famous Corryvreckan whirlpools at the northern tip of Jura – in full roar this can be heard almost 10 miles away.

Scale and Openness

Generally open and large scale rolling hinterland with open views to sea creating expansive seascapes. The Paps of Jura and Ben More on Mull are large vertical scale elements and turbines should not interfere with distant views of these where they may diminish sense of vertical scale. Development would dominate contained seascapes at Sound of Islay.

Form

Predominantly rocky coasts with undulating moorland hinterland creating a rolling hinterland with a horizontal emphasis. Form is complex locally but from a distance the coastal areas comprise a narrow strip between a simple hinterland and wide expanses of open sea. There are some dramatic cliffs on West Jura and Islay and some sandy beaches and sand dune complexes at Islay and Colonsay. Sound of Islay is a narrow stretch of sea which creates a smooth foil to hills and mountains on both sides. Turbines would interrupt the smooth plane of the sound and lessen it's contrast with the detail of the containing landform.

Settlement
Settlement is very sparse or absent for much of this area with occasional settlements on the south coast of Mull and the ferry port of Port Askaig on Islay.

Pattern/Foci
Fairly irregular landform patterns. Focal points are the Paps of Jura and Mountainous areas on Mull which are dominant in many of the seascapes in this area. The island of Colonsay is a focal point in views from Mull and Jura and Islay westwards. Settlements and occasional development such as distilleries are focal points as are patches of forestry.

Lighting
This is a predominantly dark area and the lighting of an offshore windfarm would cause a significant change to the nightscape.

Movement
Infrequent ferry crossing from Islay to Oban via Colonsay and small ferry shuttles between Islay and Jura. Daily ferry to Kennacraig. No major land transport routes with much of the area only accessible on foot or by boat.

Aspect
Depends on orientation of viewing point, however predominantly western aspect would result in backlit turbines at sunset.

Exposure
Feels very exposed due to treeless nature of much of this land and open moorland looking out onto open sea, contrasting with sheltered Sound of Islay.

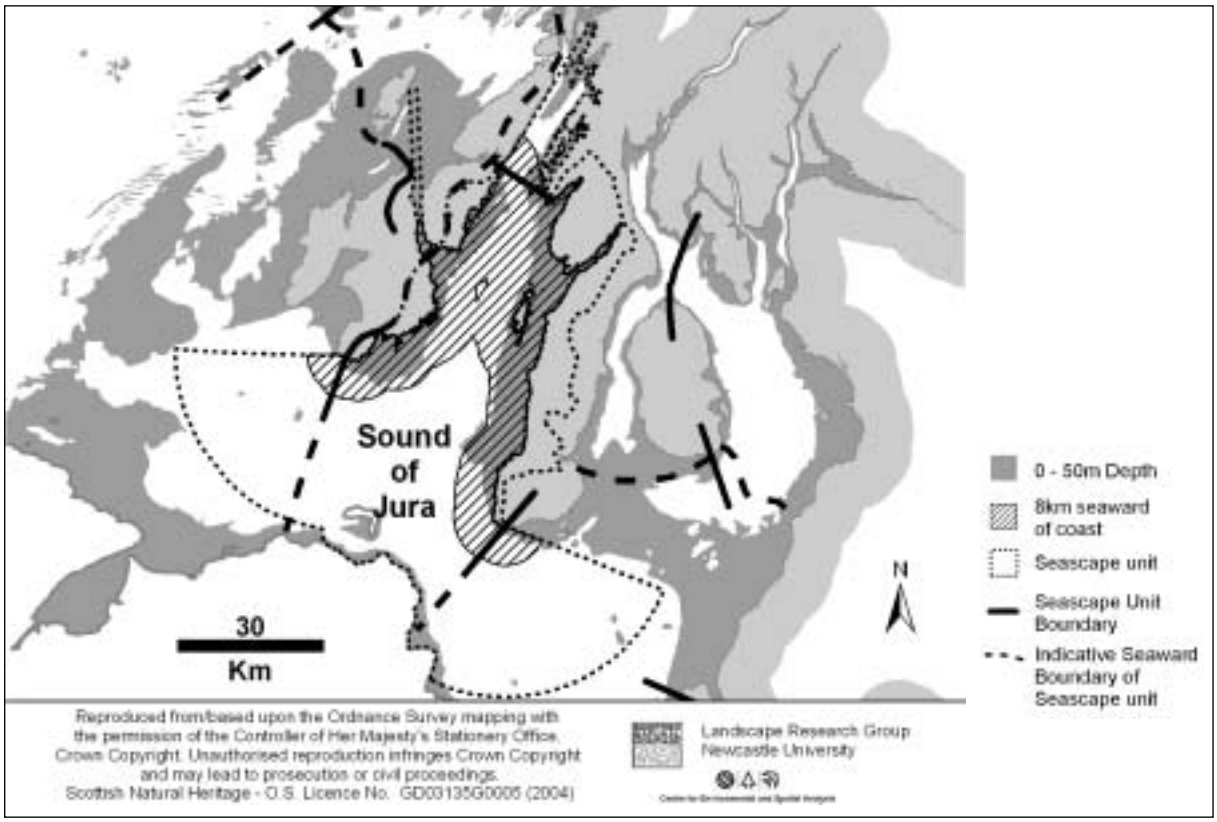
How Experienced
Much of this unit is remote and only accessible by foot or boat. Can view area from top of peaks and high land. From ferry to Colonsay and from ferry between Islay and Jura. Recreation very limited. Some visitors to Colonsay, Paps of Jura less well visited due to inaccessibility except for famous sailing/fell races. Some sailing. Overflown by Islay planes.

Modification/Remoteness/Sense of Naturalness
Sea gives a sense of remoteness which enhances the isolated stretches of land of much of this area. Remote and wild. Sparse settlement, some forestry and masts. Few patches of natural vegetation. The whirlpool at Corryvrecken is a highly natural and awesome feature of the sea in this area enhancing the perception of wild area qualities.

Sensitivity
High Sensitivity. This area is large scale and predominantly open and could accommodate the scale of development. However, development would cause a transformative change to the qualities of remoteness and naturalness in this area. Development is limited here, there are no major transport routes, most places are accessible only by boat or on foot. There are important natural features like the Corryvrecken whirlpool, raised beaches and caves on West Jura. Development would also compete with the focal points of the Paps which are key views throughout this area.

Forces for Change
Major improvements to ferry terminal at Port Askaig may urbanise local area. Onshore windfarm proposals.

3.2.24 AREA 24: WEST KINTYRE/SOUTH EAST JURA AND SOUTH EAST ISLAY



Seascape Character Types

Predominantly Type 9 – Sounds, Narrows and Islands with a small area of Type 1 – Remote High Cliffs

Key Characteristics:

- contained seascape created by the proximity of coasts of Jura, Islay and Kintyre forming a broad sound;
- even linear coastline of Argyll no distinct headlands but occasional shallow sandy bays resulting in Gigha and Paps of Jura being key focus of views from mainland;
- sheltered feel more exposed towards open sea at Mull of Kintyre;
- sparse settlement, farming and fishing communities. No large scale development. Houses painted white, some grander houses; some distilleries on Islay;
- moorland, farmland, forestry and some designed landscapes;
- Paps of Jura and headlands of Islay and Kintyre key focal points within this seascape;
- views to Ireland and Mull.

Scale and Openness

Medium scale seascapes, scale increasing at headlands eg Mull of Kintyre. Broad containment is created by the arrangement of Kintyre, Islay and Jura. Some areas are smaller scale where there are very narrow sounds or sealochs eg Sound of Islay, Framed and contained seascapes are also formed in places by small bays and inlets or by small offshore islands eg Small Isles Bay on Jura.

Form

On the whole form is varied. The Paps of Jura provide vertical accent and scale to this area with distinctive smooth rounded summits. The high cliffs of the Mull of Kintyre and the high hills of south east Islay add to the diverse and dramatic landforms. There is a predominantly linear form to the coastline with some sandy bays

and areas where fragmentation and offshore islands occur eg Gigha. However the form of the area is dominated by the Paps of Jura, particularly at sunset. Turbines would conflict with the distinctive forms of these.

Settlement
Small sparse settlement. Large areas of uninhabited land. Where settlement occurs it is small scale with some large, grander houses overlooking the sea in places.

Pattern/Foci
Pattern of long stretch of water enclosed by dramatic landforms. Principle foci Paps of Jura and a development would interfere with this.

Lighting
Dark areas although there may be some light from settlements, lighthouses. Lighting of windfarm would cause significant impact.

Movement
Quiet areas, main road on mainland, ferries going to and fro. Movement of turbines on Kintyre visible from ferry.

Aspect
Varied. From mainland views of Paps at sunset may be disturbed.

Exposure
Fairly sheltered feel more exposed towards open sea.

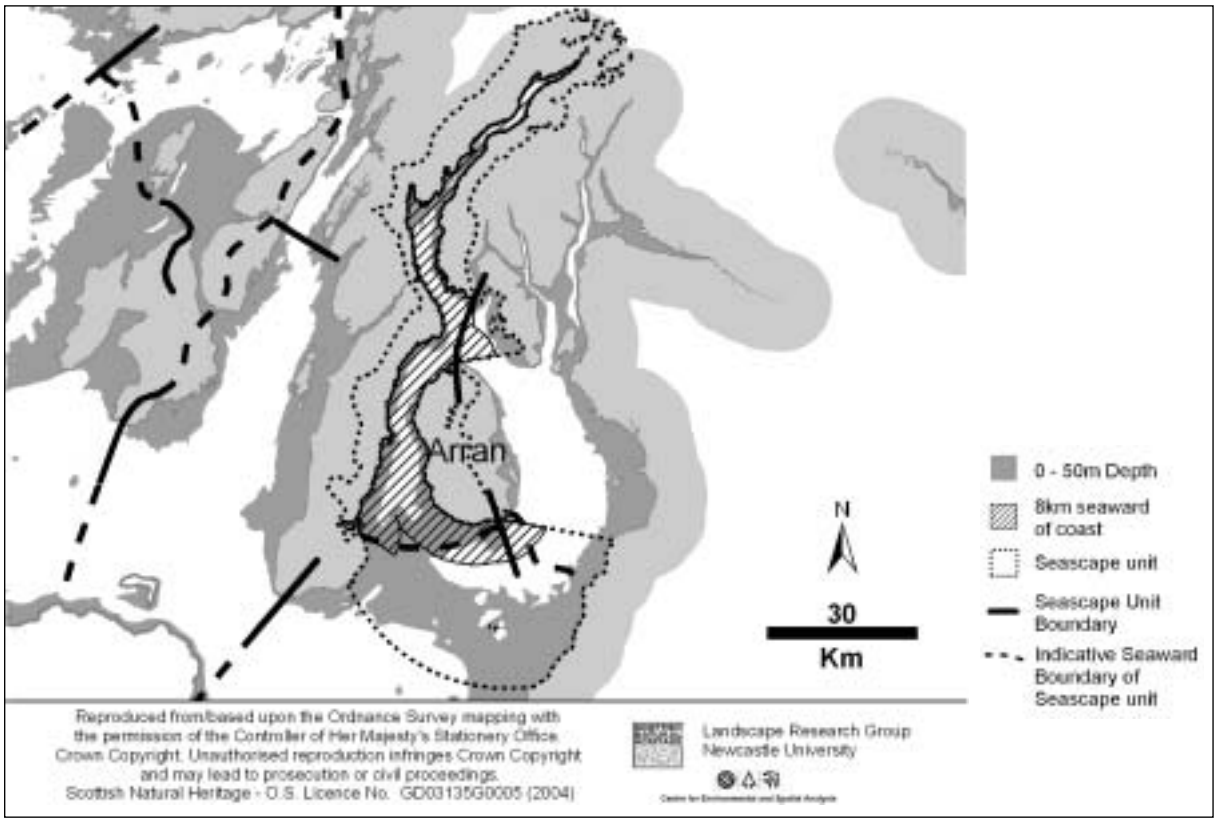
How Experienced
From ferries to Gigha and Islay, from A83 runs along the coastline on Kintyre, from quiet roads and sandy bays and elevated positions like top of Paps and from camp sites and caravan parks.

Modification/Remoteness/Sense of Naturalness
Some forestry, some distilleries. Very little modification on islands. Windfarms on Kintyre. On the whole highly natural area with very remote feel in places particularly on Jura.

Sensitivity
High Sensitivity. Development would conflict with the medium scale seascapes towards the north of this area but could possibly be accommodated in the larger scale areas further south where the area opens up. The area is a contained seascape with key views to the Paps of Jura which dominate this seascape and the Kintyre headland. Turbines would disrupt the appreciation of these strong focal points. There is a lack of development in this area, although the onshore windfarms on Argyll can be spotted in good weather. The scale of development is significantly different to the generally small scale, traditional or historic settlements and houses in this area.

Forces for Change
Landward wind energy development on Kintyre is a significant force for change which is changing the perception of the area. Whilst this has many benefits socially and economically for the area in seascape/landscape terms it is a major driver of change and will inevitably alter the character of the seascapes and landscapes here, particularly relating to the proximity of Jura which is perceived as a remote and 'wild' island. Cumulative effects are potentially significant. Community wind energy development on Gigha. Tourist facilities and caravan sites on Kintyre.

3.2.25 AREA 25: LOCH FYNE/KILBRANNAN SOUND



Seascape Character Type

Type 9 Sounds, Narrows and Islands.

Key Characteristics:

- extremely narrow stretches of sea particularly in Loch Fyne;
- forestry on mainland;
- some picturesque settlements eg Inveraray, one of the earliest and best preserved planned towns in Scotland;
- views of Arran Mountains dominate Kilbrannan Sound;
- roads following very close to coastal edge for much of this area;
- small scale settlements some urban eg Lochgilphead, Campbeltown.

Scale and Openness

Small scale seascapes highly contained narrow stretches of sea particularly Loch Fyne which has not the area to physically accommodate scale of development. Open views of sea rare. Development would completely dominate seascapes.

Form

Hilly hinterland with serrated mountain forms on Arran dominating Kilbrannan Sound. Narrow long stretches of water enclosed by raised beaches and hills. Narrow rocky shore fairly indented in places with very occasional sandy shore. Linear form to coastline in places along these sounds accentuated by the roads skirting the coastline.

Settlement
Small settlements occur along the edges of the shore, little or no settlement in hinterland. Settlements can have an urban feel eg Lochilphead and Campbeltown, and others are small harbours which can be quite picturesque eg Inverary, Tarbert and Carradale. The Crinan Canal is an important route for sailing. Campbeltown is semi industrial, shipping out timber and turbine towers from the fabrication plant at Machrihanish.

Pattern/Foci
Pattern of long narrow stretches of water with a sequence of small settlements creating foci. Landform is often elevated and occasionally dramatic especially around Arran. There is much forestry all through this area, less on Arran and this can lead to some artificial patterning.

Lighting
There will be some lighting from settlements and car headlights along the coast but this will be limited. The lighting of a windfarm of this scale would cause a major impact of lighting of a different nature and scale.

Movement
Roads skirt most of the shoreline of this area, it is also popular with sailing due to the Crinan Canal short cut to the Sound of Jura and the sheltered harbours. Ferry shuttles between Arran and Kintyre, fishing (scallops), navy hunter-seeker exercises.

Exposure
This area is sheltered and turbines would not relate to this in terms of the rationale for their presence.

Aspect
Aspect is varied as the unit is contained and sheltered so there are no particular sensitivities in this respect.

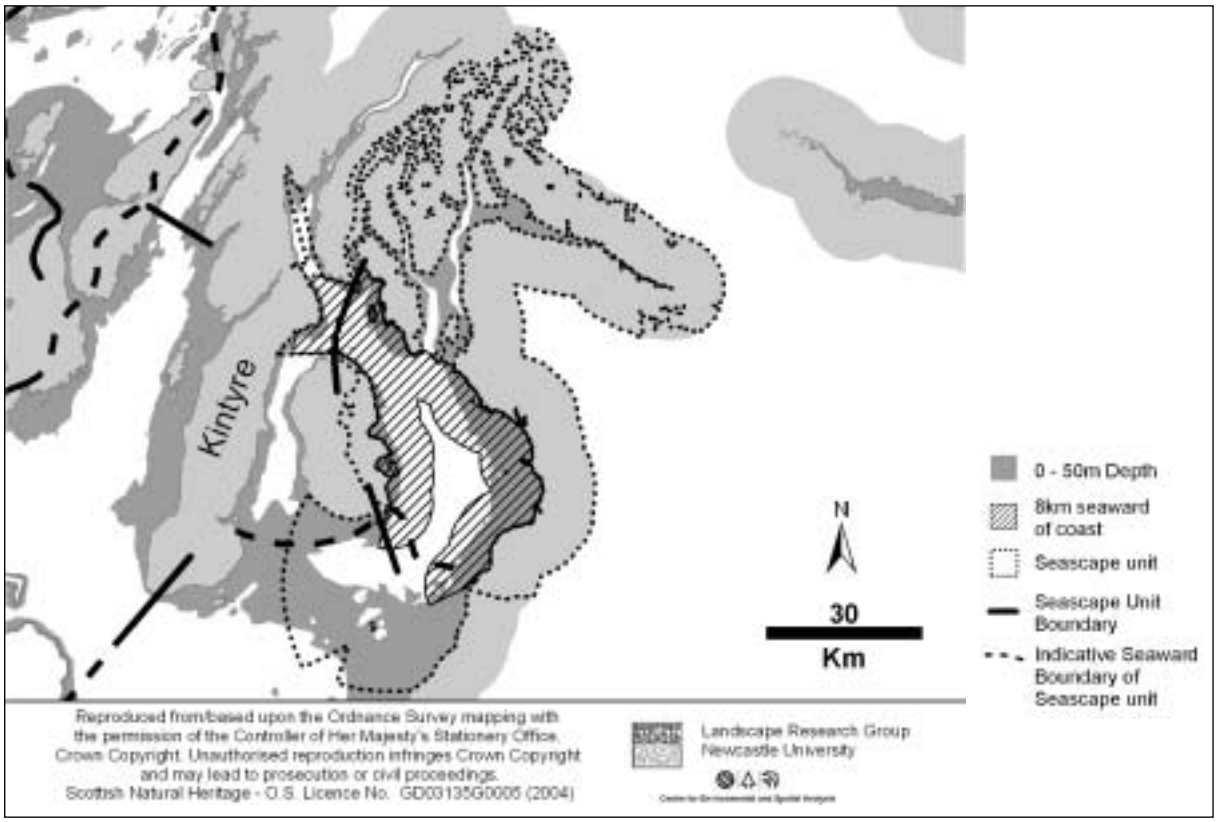
How Experienced
This unit is readily experienced from coastal roads and settlements, with views often being long, over and up and down the loch and sound, although forestry and landform provide visual containment in certain areas. Sailing is a popular activity and Tarbert hosts an International yacht race. There are ferries to Kintyre from Lochranza and Portavadie. Views from Goat Fell on Arran which is a popular climb for walkers. Views from Arran's best golf course (Shiskine) and Machrie Moor on west Arran (iconic group of standing stone circles).

Modification/Sense of Remoteness/Naturalness
The area is heavily forested and this can create a modified and managed feel in places. Although scenic, this unit is not highly natural in character (the exception being the uplands of north Arran). It is also relatively easily accessible due to presence of coast roads, although the long drive time to Kintyre can give a feeling of remoteness.

Sensitivity
High Sensitivity. This scenario would be physically unfeasible in this area. The highly contained nature of these seascapes would mean that this scenario of development would completely dominate. Open views of the sea are rare and development would usually be viewed within a landscape pattern of forestry and small settlements on the edges of lochs. Development would disrupt views to Arran. The area is sheltered and rationale for development would appear weak.

Forces for Change
Wind farms, masts, waste water treatment infrastructure, cod farming in deep water off Arran.

3.2.26 AREA 26: FIRTH OF CLYDE



Seascape Character Type

Type 10 – Outer Firth with Islands

Key Characteristics:

- broad sea basin formed by mainland and Arran, semi enclosed;
- Bute and Kyles of Bute appear to merge in many views;
- generally narrow coastal ledge with coastal hills restricting views inland;
- well settled along mainland coastal and island fringes;
- large scale industrial buildings –some of these with distinct vertical elements eg crane at Clydeport at Hunterston ore terminal;
- constructed windfarm at Ardrossan;
- the Firth and the intricacies of Kyles and islands are key elements;
- sheltered waters popular for sailing, many marinas, tourist facilities and links golf courses;
- forestry and policy landscapes are a feature, borrowing views from Arran;
- Goat Fell on Arran dominates views within this seascape area and views of mountains to north also possible.

Scale

Small scale seascapes in the very north of this type which would be unfeasible for development. In the broad basin south of Bute larger scale seascapes but still contained by views of Arran and Kintyre.

Form

Semi enclosed, broad sea basin. Coastline generally rocky and narrow with some sandy bays backed by scarp and coastal hills limiting views inland. Headland at Troon and Ardrossan limit views along the coast.

Curved beaches and dunes back Irvine Bay, extensive flats at harbour, with low-lying hinterland allowing long views inland. Serrated ridge of Goat Fell on Arran is a distinguishing landmark feature.

Settlement

There are a number of urban settlements eg Largs, Irvine around the coast as well as smaller scale settlements on Arran. There is a mix of settlement type and scale. Large industry and power stations on the North Ayrshire coast, paper mill at Irvine and ferry terminals at Ardrossan and Troon. Historic houses and designed landscapes may take advantage of the views and access via the sea.

Pattern/Foci

Settlements, links golf courses along railway, town church spires, five high flats in Irvine. Ardrossan turbines visibly turning from west coast of Arran, nearby houses emphasise scale, noticeable from Culzean 35km away.

Lighting

Some lighting at night from industrial development and settlements around the coast and ferries at night etc.

Movement

Sailing, ferries and shipping traffic, roads, trains and settlement and planes at Prestwick Airport. A moderately busy area.

Aspect

Aspect is varied.

How Experienced

From coastal roads and railway views are directed toward the sea due to containment inland except at Irvine Bay which is backed by a low lying basin. Views from ferries and sailing craft would be significant. The Clyde Muirshiel Regional Park covers much of the hinterland of this unit and, along with the coast and islands, is popular with day trippers from Glasgow and other conurbations. Open views to coast from hills and elevated roads within this hinterland. A number of internationally famous golf courses are located against the coast.

Modification/Remoteness/Sense of Naturalness

Although modified with urban settlements and occasional large scale industry, this unit is still of a high scenic quality. It is generally accessible and well settled.

Exposure

Very sheltered. Development would not relate to this aspect.

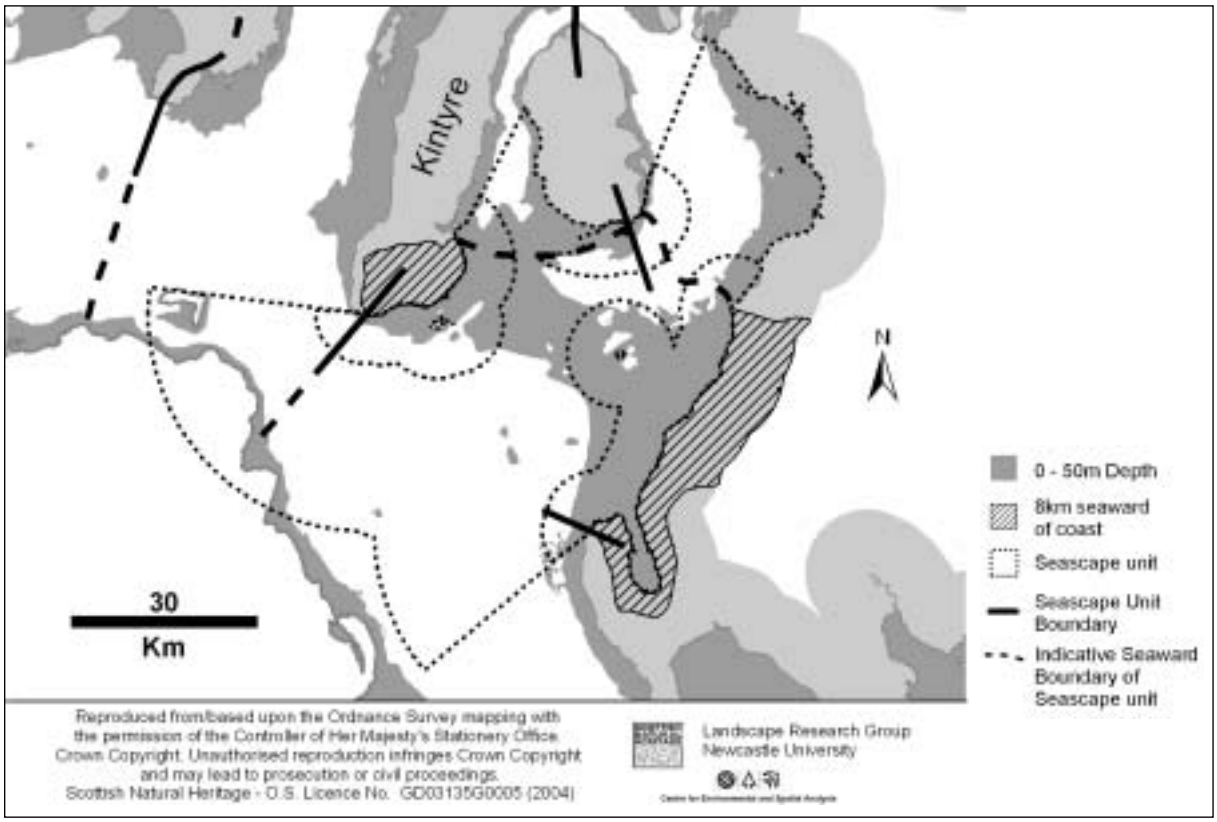
Sensitivity

Medium – High Sensitivity. Although sheltered and enclosed it is quite a large scale area with some industry present which turbines could relate to. However a large development would affect the focus of intricate fingers of land and sea that form striking views within this seascape over a large area and would compromise the sense of vertical scale of Goat Fell. In the narrower areas north of Farland Head this scale of development would be physically unfeasible.

Forces for Change

Onshore wind energy developments on mainland linking into capacity released by closure of Hunterston Nuclear power station. Major container development being sought for Hunterston and expansion of paper mill at Irvine. Ferry terminal redevelopments.

3.2.27 AREA 27: SOUTH ARRAN/SOUTH AYRSHIRE/SOUTH EAST KINTYRE



Seascape Character Types
Type 6 – Narrow Coastal Shelf, Type 1 – Remote High Cliffs and Type 9 – Sounds, Narrows and Islands at Loch Ryan.

Key Characteristics:
- very broad basin semi enclosed by Kintyre, South Ayrshire, South Arran, the Rhinns of Galloway and distant Northern Ireland (22km);
- rocky, fairly linear coastline with open views particularly South Ayrshire;
- coastal roads run through much of this area, A77 important route;
- although small, Ailsa Craig is important focal point as is the headland of Kintyre and mountainous areas of Arran;
- views directed over the sea and limited inland;
- urban areas at Girvan and Stranraer otherwise very small scale farming.

Scale and Openness
Medium to large scale seascapes with open sea views. Views are directed towards the sea due to containment of hinterland landform. At Loch Ryan seascape is small scale with fairly narrow channel to open sea containing views that focus on Ailsa Craig. Turbines could relate to the scale of these seascapes apart from around Loch Ryan where scale would dominate views to open sea. Vertical scale is an issue where development might be viewed near the cliffs of Kintyre as the size of turbines may reduce apparent vertical scale of cliffs and therefore detract from their drama.

Form
For the most part these coastlines are strongly linear with a strongly defined rocky edge. There are some sandy bays and small headlands in places. The coastal shelf on the Ayrshire coast is flat narrow strip rising to an undulating elevated hinterland. Turbines would relate to the linear form of the Ayrshire coast, less well to the more rugged and dramatic Kintyre headland.

Settlement
Stranraer and Girvan are both urban settlements, Stanraer is a busy port. Elsewhere the settlement is sparse mostly confined to the coastal shelf and with small harbour settlements. Turbines could relate to the more developed industrial settlements but would be out of character with small harbour settlements and the historic sites dotted around.

Pattern/Foci
Pattern is generally simple with the narrow coastal shelf creating a strong linear element. Kintyre is more rugged and complex with a vertical accent. There are patches of forestry in places. Dispersed settlements form a distinct pattern along the coast while the headland of Kintyre, mountains of Arran and island of Ailsa Craig are key foci.

Lighting
At present there will be a limited amount of lighting from the Ayrshire coast especially in the urban areas. Out at sea the lighthouse at Ailsa Craig is a night-time focus in an otherwise dark area. The ferries going in and out of Stranraer and Cairnryan.

Movement
Generally a quiet area, busier around the urban settlements and the main A77 route that skirts the Ayrshire coastline. Some maritime activity in and out of Stranraer and smaller harbours. Ferries to Northern Ireland from Troon and Stranraer pass through.

Aspect
Various aspects. Most sensitive is westerly aspect from Ayrshire coast and views north to Arran. Could interfere with appreciation of sunsets and appear more visible due to backlighting.

How Experienced
There is a main road A77 from which wide open views of the sea can be experienced for long stretches at a time. The hinterland provides visual containment further in land. Visitors to important historic sites may experience open views of the sea which provide a backdrop to castle and churches. Ferries to Northern Ireland pass through and turbines may conflict with views to landforms along the route.

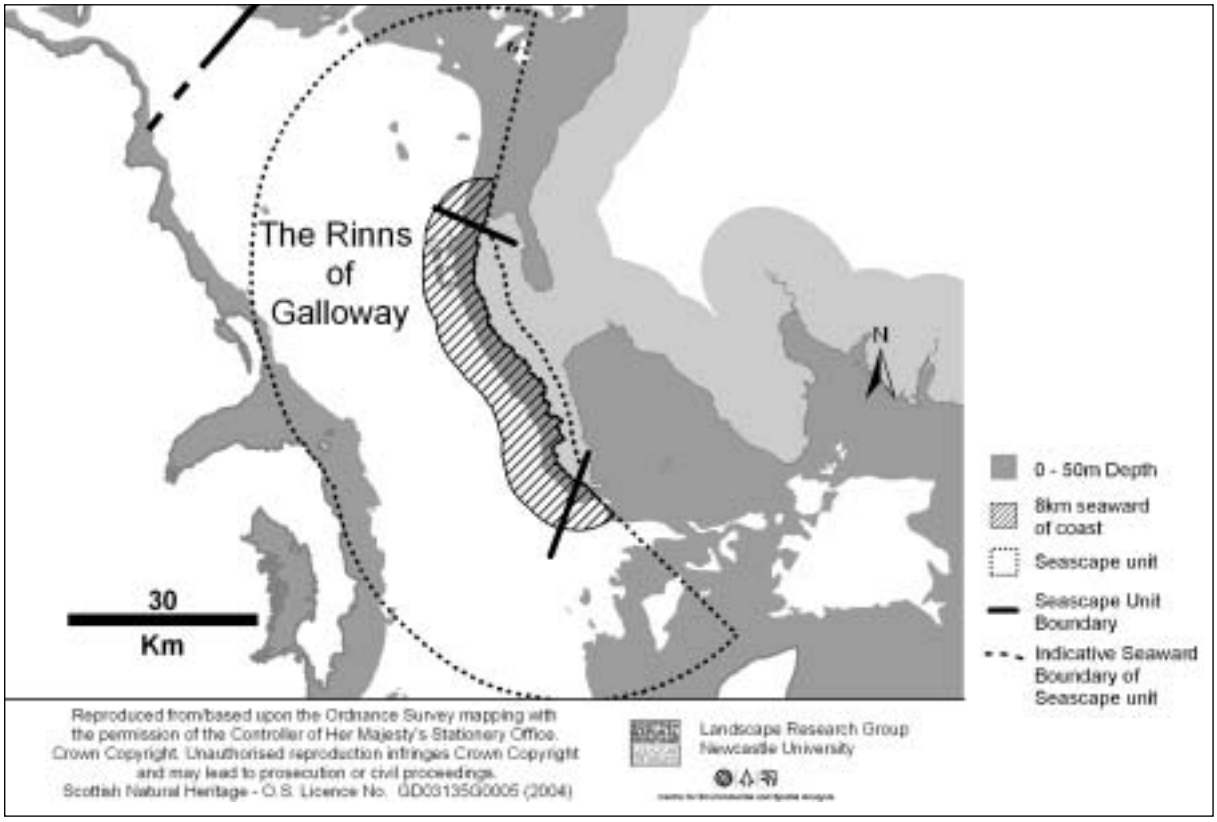
Modification/Remoteness/Sense of Naturalness
Whilst this area has strong elements of modification, farming, forestry, main transport routes and urban settlements which development would relate to, it retains in many places a rural, traditional and historic feel with a strong natural element. Overall not a strong sense of remoteness although some areas can feel fairly remote and isolated eg Kintyre. A large scale development would compromise these qualities.

Exposure
Can feel fairly exposed at headlands and on the open stretches of coastline. Turbines could relate well to this sense of exposure but may detract in more dramatic locations and at times when the sea appears particularly wild and elemental.

Sensitivity
Medium Sensitivity. Development would relate to the larger scale open seascapes in this area and to the linear coastlines and simple patterns of the Ayrshire coast. It would relate to the character of the more urban settlements and the more developed feel. Focal views of the Kintyre Headland and Ailsa Craig provide increased sensitivity as development may disrupt these and contrast with the more rugged and elemental nature of these particular areas. Development could disturb slot views to sea from within Loch Ryan.

Forces for Change
A77 roads improvements along exposed, rocky coast in south Ayrshire. Windfarm development to link into Scotland – Northern Ireland Electricity Interconnector which leaves the shore near Ballantrae.

3.2.28 AREA 28: CORSEWALL POINT – MULL OF GALLOWAY



Seascape Character Types

Type 1: Remote High Cliffs

Key Characteristics:

- high cliffs and rocky coastline;
- remote, exposed character at coast with settled rural character inland;
- access and views from hinterland restricted by undulating farmland;
- sheltered harbour at Portpatrick.

Scale and Openness

The undulating nature of The Rhins creates some containment inland. This contrasts with the expansive and open nature of the coastal stretches where there are wide views of open sea. Scale reduces where the coastline forms small sheltered inlets. Large scale seascape along stretches of the coast would have low sensitivity to large scale development but where scale reduces sensitivity would become high.

Form

Undulating rolling farmland with some deep 'folds' in the hinterland of the Rhins creating containment but generally fairly horizontal in nature. Drumlin fields create distinctive elements in places. At the coast high cliffs where horizontal forms create dramatic contrast in places. Overall generally simple contrast of horizontal and vertical forms at coast with more complex forms in places.

Settlement

Large dairy farms, many painted white, with fishing port and harbour at Portpatrick. The area has a rural and strongly maritime character.

Pattern/Foci
The landscape is open and fairly treeless, the main patterns coming from the landform, roads and boundaries. Generally small field patterns, divided by dykes and hedges. The foci can be low hills of the drumlin fields topped with gorse, lighthouses, cliffs. Although distant views of land can be seen the predominant nature of the marine element is a wide open expanse of sea with no real focal points.

Lighting
There are several lighthouses along the coastline but apart from this and the occasional ferry this would be a relatively dark area.

Movement
The area is quiet with more busy spots at Portpatrick harbour for example. Although the Rhins are fairly well networked with roads the area retains a quiet rural feel.

Aspect
Aspect is south/west facing and turbine would be back lit at sunset increasing distances of visibility.

How Experienced
Roads run parallel, a little way back from the coastline. Wide open views are available at the coast where accessible. Visibility in the hinterland can be limited by the undulating landform but this contrasts with the extensive views at the coast. The Mull of Galloway is noted for its panoramic views which can include Ireland, the Isle of Man and the Lake District. Southern Upland Way starts from Portpatrick but there are few smaller footpaths. The area is popular for sailing craft using Portpatrick harbour. Port Logan is very popular with wind surfers and attracts TV tourists (2000 Acres of Sky made locally). The Mull of Galloway has a visitor centre.

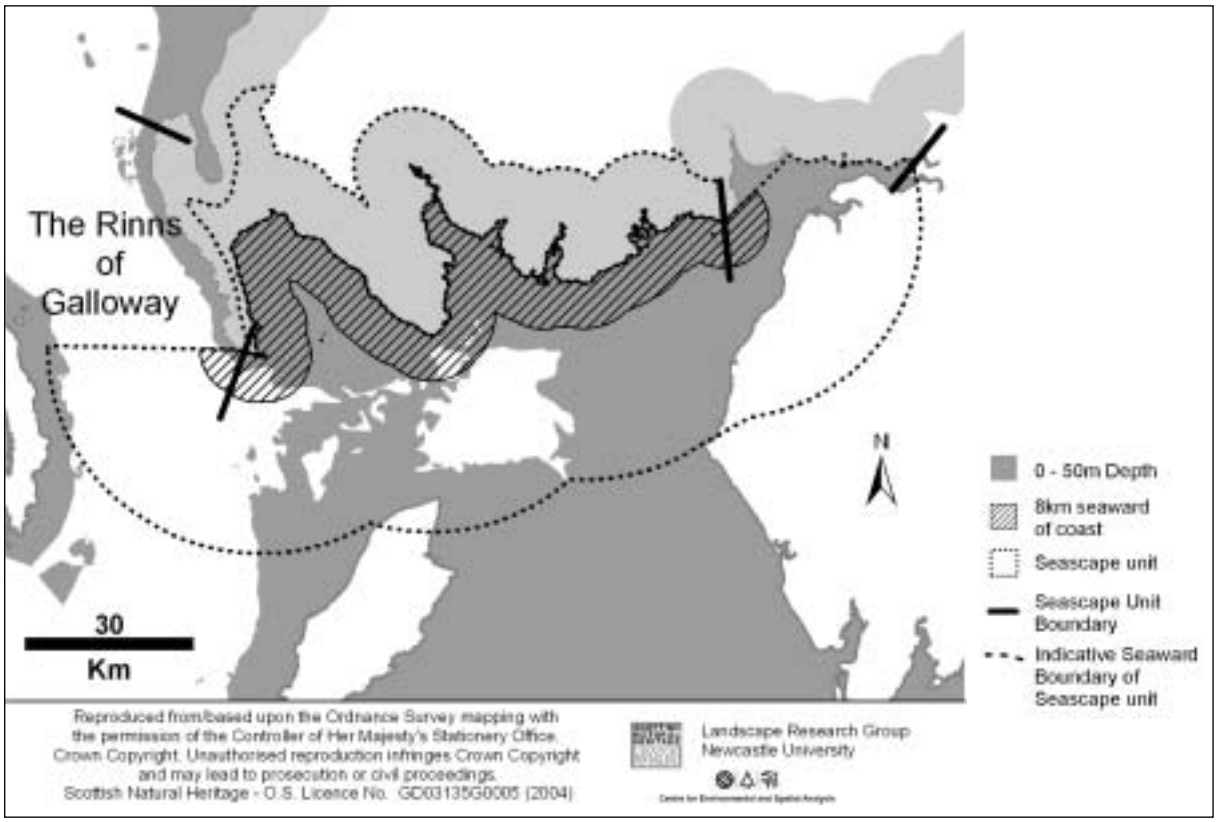
Modification/Remoteness/Sense of Naturalness
The wide horizons and expansive views at the coast combined with the dramatic nature of the coastal forms can create a feeling of remoteness. The coastal area feels highly natural and elemental. There are isolated developments, mainly the mast at Portpatrick, which detract from this experience. In the hinterland the area has a rural and traditional feel, with small settlements and farmsteads. There is a large designed landscape at Logan Botanic Garden where exotic trees contrast with the wider open landscape.

Degree of Exposure
Climate is mild and although the Clyde Sea area generally is sheltered and is not exposed to much wave action or tidal movement waves do crash onto this coastline and it experiences strong winter gales giving a sense of exposure.

Sensitivity
Medium Sensitivity. Development could relate to the large scale, expansive seascapes in this area, lack of seaward foci and generally horizontal hinterland. However, the Rhins provides some containment and in places there are distinctive natural landform patterns which act as foci which development would conflict with. The coastline also has a wild and elemental feel which large development would detract from. The area has a quiet rural character with a small scale landscape and settlement pattern and the character and scale of development would not relate well to this.

Forces for Change
Development along coasts increasing demand for tourist facilities, telecommunications masts and wind farms. Agricultural intensification leading to less diverse landscape, larger field sizes etc. Although subtle and gradual these changes have had an impact on the local distinctiveness of the area. There is a danger that the more developed and less diverse these areas become then this will bring about changes in future assessments leading to a perceived reduction in sensitivity to further development. For these reasons these combination of forces for change add a further sensitivity to this area.

3.2.29 AREA 29: OUTER SOLWAY (MULL OF GALLOWAY – SOUTHERNESS POINT)



Seascape Character Types

Type 1 – Remote High Cliffs, Type 3 – Mainland Deposition Coastline/Open Views, Type 4 Outer Firths.

Key Characteristics:

- varied coastline, cliffs, sandy bays, salt marsh, mud flats with channels changing at each tide, rocky inlets;
- improved grassland or moorland or forestry forms hinterland;
- settlements generally small with forestry and policy landscapes a feature;
- traditional, settled rural feel;
- remote character in places;
- wealthy in archaeological and historical features and designed landscapes;
- 'big sky' attracts artists and craftspeople.

Scale and Openness

Although there is some containment provided by Luce Bay and Wigtown Bay these bays are large and views are generally wide. At headlands scale will be increased. Depending on orientation the backdrop of the Lake District can be distinctive in the inner reaches and development may diminish the scale of distant mountains.

Form

Diverse form of inlets, cliffs and bays. Simpler form inland with gently undulating moorland and more distinct hills near Newton Stewart and at Criffel near Dumfries.

Settlement
Small scale locally distinctive settlements. Traditional in character. No large development. Main town Newton Stewart.

Pattern/Foci
Extensive road network. Foci include settlements and headlands and military infrastructure at Torrs Warren. Pattern not distinctive but varied. Stronger integral pattern within bays with focal point of headlands. Turbines should avoid areas of sea which are framed by headlands.

Movement
There are main transport routes such as the A75 which is very busy and exploits the former Carlisle to Stranraer railway route, train line from Ayr to Stranraer.

Lighting
Lights on Cumbrian coast do not detract at outer firth. This area is visited by English astrological societies because of its readily accessible dark night sky.

Aspect
This is generally southerly looking towards the Lake District and Isle of Man where views can be important, and looking across the bays and inner firths.

How Experienced
The sandy shores and the Southern Upland Way are the foci of recreational activity. Many people also visit the designed landscapes, castles and ancient monuments. The relatively unspoilt and uncrowded hinterland attracts walkers while the coast is busier with campsites and chalet parks. There is some yachting but away from the shifting sands of the coastal flats.

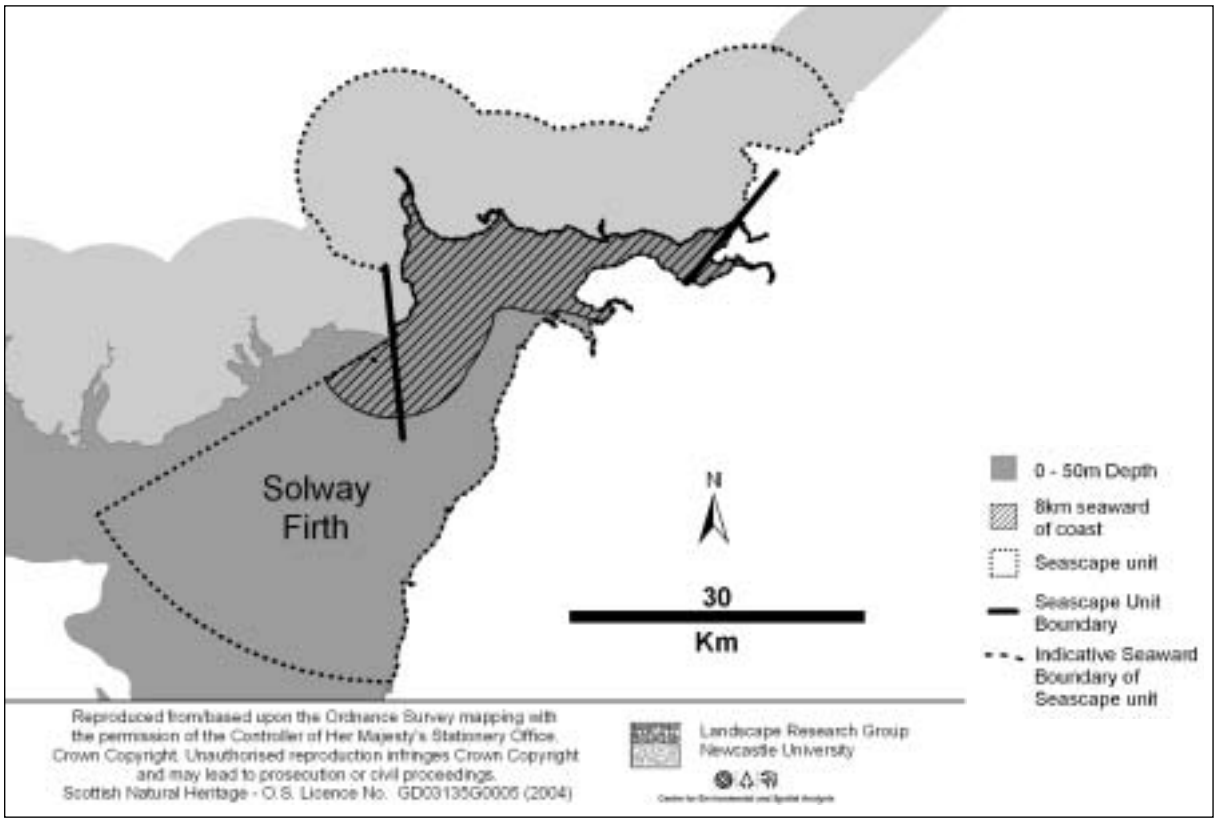
Modification/Remoteness/Sense of Naturalness
There is a lack of heavy industry and the area has a traditional, settled feel rather than a heavily developed one. The A75, other main roads and associated development which skirt the coast in places can dominate. There are some military bases along the coast which discourage access.

Exposure
Apart from on headlands this area is fairly sheltered.

Sensitivity
Medium – High Sensitivity. Turbines could relate to the medium to large scale but compromise open sweeping views across mud flats or shallow tidal waters where reflective effects are more likely. Settlements are small and traditional and this is predominantly a rural area with many historical and archaeological interests, the scale and form of a windfarm would conflict with these. Views out from small inlets are significant and development may detract from the focus of open sea views.

Forces for Change
Variety of subtle though cumulatively profound changes, onshore wind, masts, tourist developments etc. Large offshore at Robin Rigg major force for change. Area shows effects of foot and mouth disease when many farmers chose to leave agricultural practices have altered, resulting in subtle changes to landcover. Shellfish farming, expansive areas of mussel trestles.

3.2.30 AREA 30: INNER SOLWAY FIRTH



Seascape Character Type

Type 11 – Less Developed Inner Firths

Key Characteristics:

- narrow estuarine seascape with distinctive small scale inlets;
- tidal with long views over extensive saltmarsh and mud flats a key feature;
- key views of the Lake District Mountains, but dominated by landmark hill, Criffel;
- major communication routes with large town of Dumfries;
- gently undulating rough pasture or moorland in the hinterland;
- policy landscapes a feature;
- Chapelcross Nuclear Power Station cooling towers are a regional landmark and scale factor.

Scale and Openness

Small to medium scale seascapes particularly in inlets. However in places extensive views over mud flats and saltmarsh can give a sense of openness. Area of sea barely enough to take development of this size, development would completely dominate views over sea/flats (most of this area is tidal).

Form

Varied coastline with estuarine flats predominating giving large expanses of tidal flats and saltmarsh. Rocky inlets provide interest and some complexity of form and some uplands (Criffel and Boreland Hill) adjacent to the coast provide vertical accents in one small area. The rest of the coastal and landward element is predominantly rolling and flat. Whilst development could in theory relate to this predominantly horizontal form due to the tidal nature of most of this area turbines would look 'stranded' at low tide revealing foundations if located here and this would be a major impact and conflict with the smooth and extensive appearance of the flats.

Settlement
Settlement at the coast is infrequent however major communication routes run through this area close to the coast. Major power lines follow the main transport routes along the M74 corridor but have little visual impact on the coast. Urban settlements at Dumfries and Annan. Turbines would relate to the larger scale settlement and infrastructure.

Pattern/Foci
Pattern is predominantly simple. Rolling hinterland overlooking flat expanse of sea/flats with sequence of inlets. Key foci of Lake District mountains which development would dominate. Turbines on English coast visibly turning.

Lighting
Looking over to Cumbrian coast there will be some lighting from settlements. However the scale and proximity of windfarm lighting would be a major impact.

Movement
Major transport routes and some settlements but generally perceived as a still and quiet area. Movement of many birds on the mud flats and saltmarshes. Continuously moving development would constitute a significant change.

Aspect
Mainly southerly.

How Experienced
From main transport routes open views of this area can be experienced. Birdwatchers. Some caravan sites and tourist attractions around the coast.

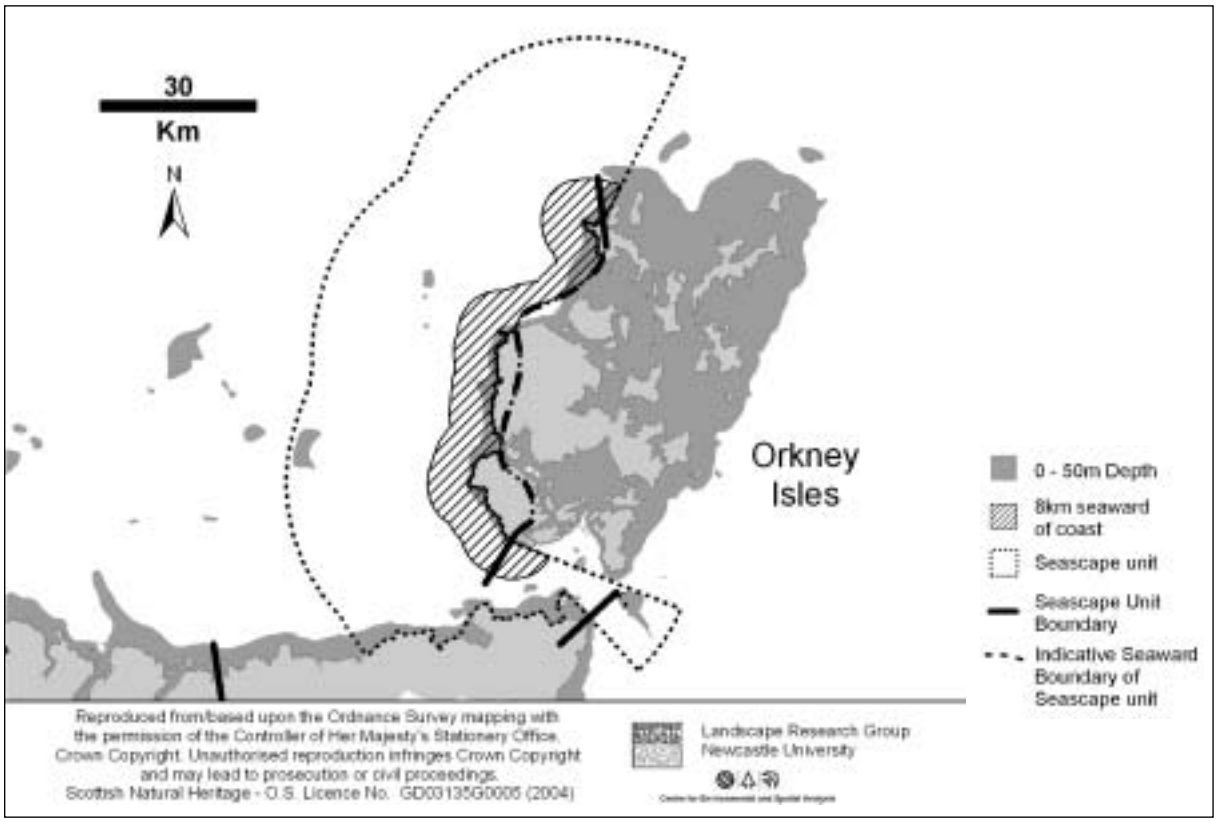
Modification/Remoteness/Sense of Naturalness
Transport routes, forestry, settlements. However in places can feel more natural in saltmarsh and flats where natural processes are evident.

Exposure
Headlands can have an exposed character but generally a sheltered feel. This would conflict with major windfarm development.

Sensitivity
High Sensitivity. It would be physically unfeasible to accommodate this scenario. Scale is the key factor in this rating as development would totally dominate this area, particularly the very small scale inlets and diminish appreciation of the smooth open expanse of mudflats and marsh. It would also intrude on key views to the mountains of the Lake District. It would introduce a major scale industrial development in a predominantly naturalistic and quiet area.

Forces for Change
Large offshore windfarm nearby at Robin Rigg has consent and is major force for change – turbines will be seen in association with much smaller turbines on English coastline which will be turning more quickly. Many windfarm applications within 30km inland, will be visible if consented and constructed. Chalet development and expansion.

3.2.31 AREA 31: WEST ORKNEY



Seascape Character Type(s)

Much of this unit comprises Type 1: Remote High Cliffs although some small areas of Type 12: Deposition Coasts of Islands, occur within bays and inlets.

Key Characteristics:

- the Orkney archipelago comprises around 70 islands; this area largely comprises the high and less fragmented Atlantic coasts of Hoy, West Mainland and Westray;
- high cliffs are the defining characteristic of this seascape and these are backed by sparsely settled coastal hills and heath;
- small bays and low lying coastal basins interrupt the continuity of high cliffs and these are a focus for settlement;
- a number of landmark features occur along the coast and include arches, geos, gloups and stacks, with the Old Man of Hoy being the most well known of these. Archaeological features are also present in this area and include Skara Brae and the Brough of Birsay.

Scale and Openness

This area generally has little enclosure due to the absence of significant indentations and off-shore islands along the coast (in contrast with East Orkney), although coastal hills often limit landward views in places. High cliffs have a huge vertical scale and allow expansive and unimpeded views of the Atlantic. Turbines could relate to the expansive scale of this seascape although could reduce the appreciation of the vertical scale of high cliffs and stacks if seen in conjunction with these features.

Form

The coastline is generally dramatic, forming sheer high cliffs and distinctive geos, gloups and stacks. Enclosed bays break the continuity of high cliffs in places but overall the coastline is elevated with a

hinterland of coastal hills. The vertical form of turbines could relate to the vertical form of coastal features but their uniformity and regularity would contrast with the complexity of natural geological features.

Settlement
This is a generally sparsely settled area. Small enclosed bays tend to be more settled and are a focus for visitors. Buildings tend to be small and low. There are no industrial features present. The sparsely settled character of this area would avoid conflicts of scale and pattern between turbines and buildings along most of the coastline.

Pattern/Foci
Coastal features such as stacks, caves and arches, the Old Man of Hoy being the most renown of these, form distinctive foci. Turbines may compete for attention and become dominant foci in some views. Archaeological features can often comprise key landscape elements. The prehistoric settlement of Skara Brae is set low within a bay, with the Atlantic being an essential component of its setting. Archaeological features within the Borough of Birsay similarly have a coastal setting. Turbines may impinge on the wider setting of archaeological features.

Lighting
Very low levels of lighting due to sparse settlement.

Movement
The exposure of this seascape gives rise to dynamic seas open to dramatic storms. There is movement of ferries on sea, and noise and movement associated with sea birds colonising cliffs.

Aspect
Generally west and south-west facing aspects.

How Experienced
Scrabster-Stromness ferry route passes close by Hoy. The Old Man of Hoy and other coastal features are a focus for visitors with cliff top paths providing access. Coastal archaeological features such as Skara Brae important destinations for visitors.

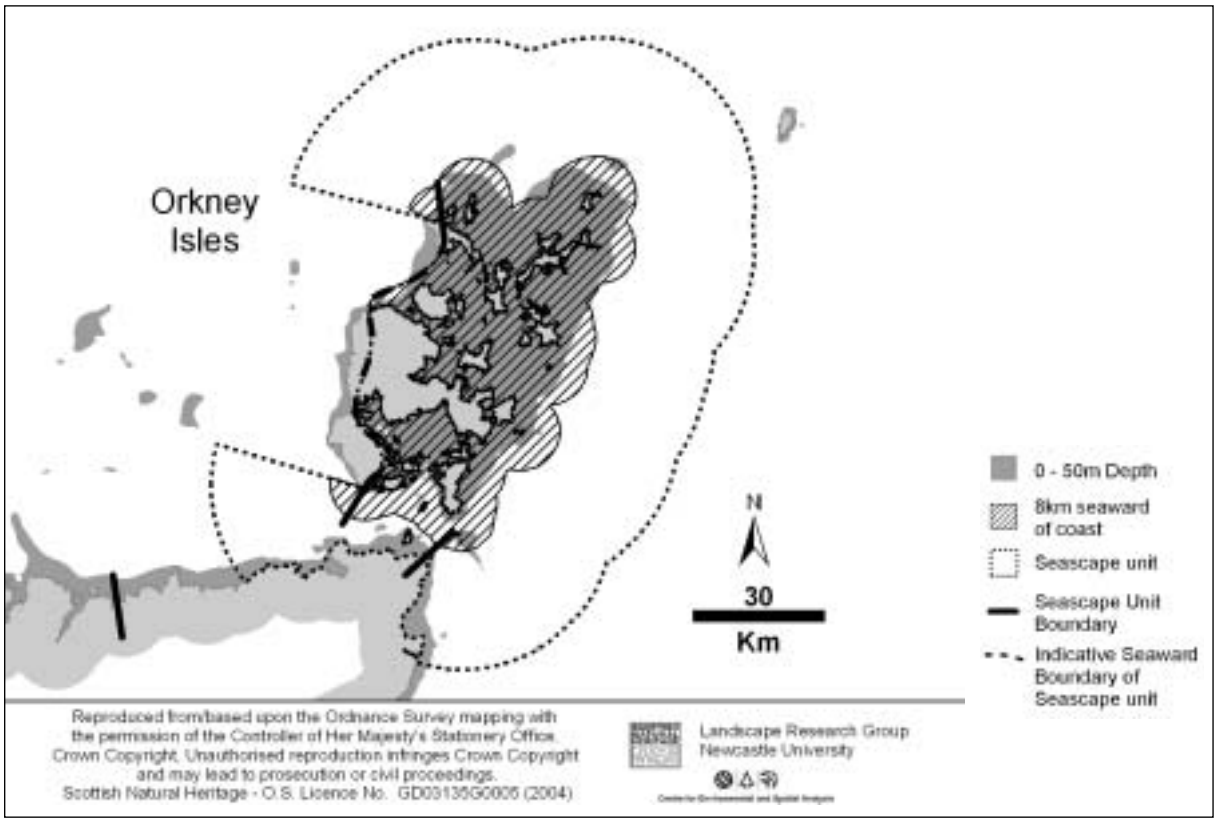
Modification/Remoteness/Sense of Naturalness
The elemental qualities of coastal features and sparsely settled character of this area, which is backed by moorland, gives a strong sense of naturalness and remoteness to much of West Orkney. The perception is of a generally unmodified seascape with a number of distinct natural and cultural features present on the coast making an important contribution to the sense of landscape, history and culture associated with Orkney.

Exposure
A very exposed seascape open to the Atlantic.

Sensitivity
High Sensitivity. While turbines would relate to the expansiveness and sparsely settled character of this seascape and could also be considered to reflect the vertical character of the coastline, they could, however, conflict with the distinctive form and scale of high cliffs and stacks which form foci within this dramatic coastline. Turbines may impinge on the wider setting of archaeological features such as Skara Brae which occur within this area and could also compromise the perception of remoteness and the generally unmodified character of West Orkney.

Forces for Change
Pressure for onshore wind energy development may increase sensitivity due to cumulative impacts.

3.2.32 AREA 32: EAST ORKNEY



Seascape Character Type(s)

This area comprises Type 12: Deposition Coasts of Islands.

Key Characteristics:

- Orkney archipelago comprises around 70 islands; causeways link a number of islands to the south of Mainland;
- generally low lying coasts backed by open flat pastures;
- bays, inlets and interplay of land and water give a diverse form and changing views as the viewer moves through the landscape.

Scale and Openness

This area has little containment with short distances to the sea and a low lying landform, devoid of woodland and intervening relief, resulting in a very open character with large horizontal scale, although closer to shore, scale is smaller as a degree of enclosure occurs between islands. It would be physically unfeasible to accommodate the development scenario within sea lochs and narrow stretches of sea between islands. However, in wider sounds where it would be technically feasible, turbines could conflict with the scale and enclosure formed between islands and sea although further away from land, this would be less of an issue with turbines relating more to the large scale character of the sea.

Form

Although few dramatic vertical landform features are present, the indented and highly complex form of inlets and bays, and islands/sea are an important feature. Overall, this area has a strongly horizontal form and the regularity and vertical form of turbines would strongly conflict with this character, creating a major focal point for a large stretch of sea where none other exists.

Settlement
Much of this area comprises productive farmland and there are many farmsteads and frequent villages. The main settlements of Stromness and Kirkwall are located on the coast. There are few industrial features with the Churchill Barriers (causeways linking the islands south of Mainland) and the Flotta Oil Terminal form isolated large scale built features. Turbines could detract from small scale buildings and generally undeveloped character of this seascape.

Pattern/Foci
Interplay of islands and sea creates a very diverse pattern. Although there are few distinct features present, fish farms can be minor foci in some sheltered sounds. The uniformity of turbines would conflict with the complex pattern of land and sea and would form dominant foci where there are none currently present. Conflict would be reduced the further out to open sea turbines are placed.

Lighting
Generally not well illuminated. Flotta Oil Terminal has a gas flare.

Movement
Many inter-island ferry routes, mainland ferries and cruise ships, particularly in summer, as well as fishing boats.

Aspect
Multitude of aspects – extremely varied due to diverse forms of islands

How Experienced
From settlements on the coast. The majority of roads take in sea views and the Churchill Barriers allow particularly close proximity to the sea. Inter-island flights provide low altitude views over the islands and sounds.

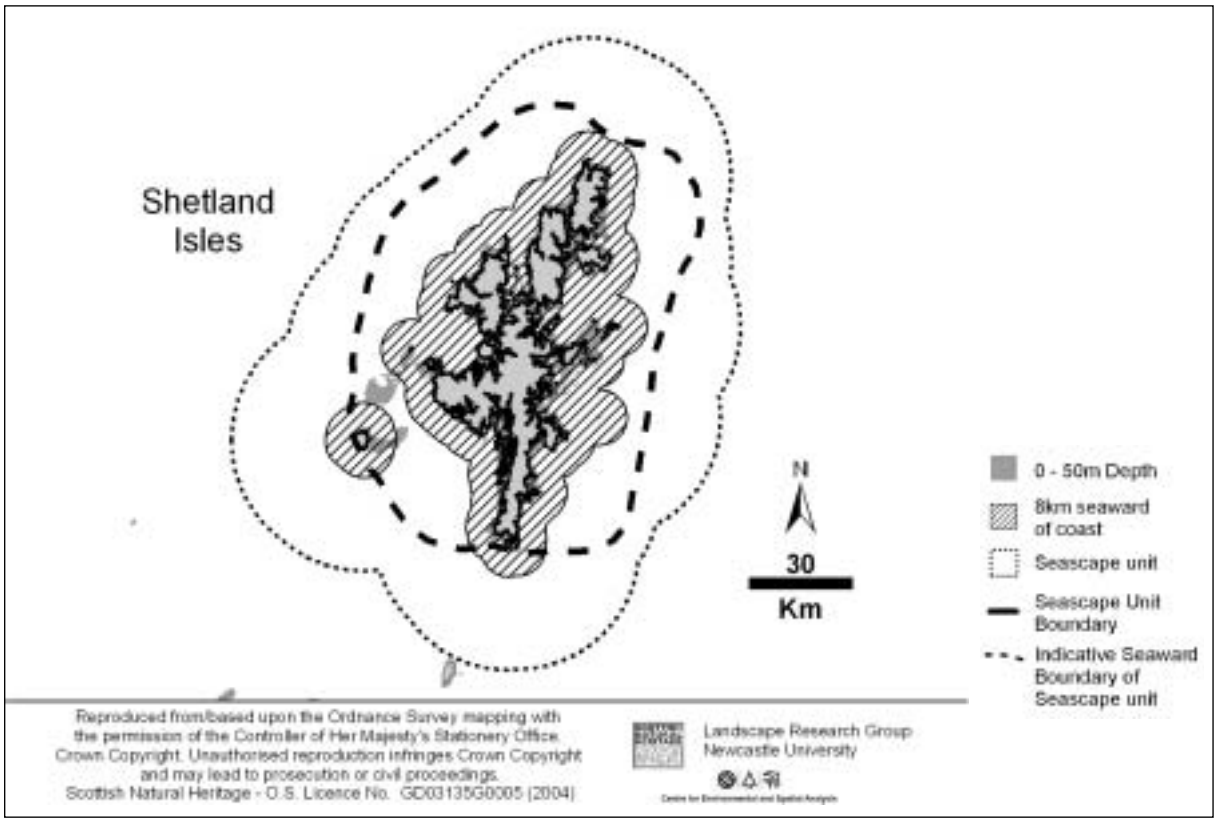
Modification/Remoteness/Sense of Naturalness
Although modified through agriculture there is a perception of farming methods being traditional and non-intensive in character. There is a sense of remoteness due to difficulties of access, particularly on outlying islands. General perception is of an area with a strong rural character and distinct sense of history and culture. Off shore wind energy development would introduce large scale industrial elements where none presently exist and may affect the perception of this area being strongly rural in character.

Exposure
The low lying character of land makes it exposed although some limited shelter within narrower sounds.

Sensitivity
Medium – High Sensitivity. It would be physically unfeasible to accommodate the development scenario within embayments and narrow stretches of sea between islands. Elsewhere, turbines would conflict with the strongly horizontal form and complex pattern of land and sea within the wider sounds and their industrial form and scale would dominate the small scale character of settlement. They could, however, relate to the more expansive seascapes if located well away from land where the diverse pattern of sea and land is less evident. Development may affect the perception of remoteness and undeveloped character of the Orkney Islands.

Forces for Change
Pressure for onshore wind energy development may increase sensitivity due to cumulative impacts. Aquaculture may increase in future with expansion of existing facilities. Installation of an offshore marine energy testing facility is imminent in the Stromness area. The European Marine Energy Centre, which provides testing births for prototype marine energy technologies, has been recently established.

3.2.33 AREA 33: SHETLAND



Seascape Character Type(s)

Much of this unit comprises Type 13 D: Islands, Sounds and Voes with small areas of Type 1: Remote High Cliffs.

Key Characteristics:

- indented coastline of fragmented islands, skerries, sounds and voes;
- generally low, often rocky, edge with landscape often appearing 'submerged' but with some high cliffs, over 200m, tall in places;
- voes and Sounds form sheltered narrow channels of coastal waters with open sloping hinterland of pasture, rough grazing and scattered crofting;
- views over small islands to open sea are a feature;
- a dramatic, exposed seascape.

Scale and Openness

Undulating landform can often contain views and the indented nature of the coastline reduces scale. Overall scale is large however outwith voes and sounds due to openness of landscape and close presence of sea. It would be physically unfeasible to accommodate the development scenario within many of the voes and sounds. Turbines could relate to the more expansive scale present outwith these areas.

Form

A very fragmented landform with numerous islands and deeply indented coastline of voes and headlands. Some dramatic high cliffs on exposed coasts. Landform is generally simple, with smooth broadly rounded low hills and often insignificant rocky coastline, and has some vertical emphasis, both key features that turbines could relate to. Turbines have potential however to disrupt views of islands closer to land.

Settlement
Generally sparsely settled, with the main settlement of Lerwick on the coast. Buildings tend to be small and low. Sullom Voe Oil Terminal only large scale industrial feature present. Aquaculture has a significant visual impact in many sheltered areas with most voes now containing some form of fish farm development. Turbines could detract from small scale buildings/crofting and generally undeveloped character of islands although could relate to other large scale development.

Pattern/Foci
Interrelationship of headlands, sounds and voes, smaller islands and sea create diverse pattern. Few foci, although some smaller islands, high headlands and Fair Isle have a distinctive form. Turbines may affect appreciation of intricate form and pattern of sea/land, although this issue is likely to diminish if development were to be sited further out to sea or where the landform is less intricate. Fish farm cages form foci in many sheltered voes and if turbines were also sited in these locations they would increase discordant elements and therefore clutter of elements contrasting with the characteristically simple form of these seascapes.

Lighting
Very low levels of lighting due to sparse settlement although the Sullom Voe oil terminal and commercial part of Lerwick harbour are illuminated.

Movement
Wild, exposed seas in places although landscape itself generally not busy in terms of human movement. There is some movement of ferries between islands and to mainland Scotland and Orkney.

Aspect
Multitude of aspects, extremely varied due to fragmented landform so no particular sensitivities.

How Experienced
Ferries between islands, roads where views of sea often constant due to openness of landscape and proximity to coast. Also experienced by air with planes travelling at low altitudes between islands.

Modification/Remoteness/Sense of Naturalness
Modified to some extent by small scale farming/crofting often in narrow strip along sheltered coasts. Keen sense of remoteness on many outlying islands and unsettled coasts. Perception is of a generally undeveloped area with a strong sense of history and distinctive culture although the oil industry is also associated with Shetland.

Degree of Exposure
An exposed seascape with little shelter from wind.

Sensitivity
Medium – High Sensitivity. It would be physically unfeasible to accommodate the development scenario within many of the voes and sounds. While turbines could relate to the expansive scale of more open seascapes and to the simple landform and coastline, they may affect the intricate land/sea relationship and views of outlying islands including Fair Isle and the appreciation of the vertical scale of high cliffs where these are present. The perception of remoteness and wildland qualities of some coastal areas and the highly natural character of the outlying islands may also be affected by development.

Forces for Change
Pressure for further aquaculture development in inshore sea areas. Sensitivity is likely to increase due to a potential accumulation of competing (and conflicting) elements in some locations.

3.2.34 ST KILDA

St Kilda is the collective name for a small but important group of islands approximately 40km from the north west coast of North Uist. These islands are designated as a World Heritage Site for both landscape and nature conservation interests and as an NSA. They have highly dramatic, rugged forms which rise very steeply from the sea and are visible from the Western Isles in good conditions.

For this strategic study we have not included St Kilda in the main methodology. It lies outwith the 35km study area of any of the strategic seascape units. In addition its sensitivity was considered far higher than the rest of the coastline due to its uniqueness and designation. It is also unfeasible for this scenario (and for offshore in general) being so far from the main land masses and situated in deep water. It was considered that to include St Kilda within the overall sensitivity ratings would be to introduce an element which would make comparative assessment difficult. It does not sit easily within the strategic nature of this study and is considered an exceptional element.

St Kilda is important in this study primarily in terms of key views to it from the Western Isles and how these may be compromised by offshore development. We have assessed this in the relevant seascape sensitivity descriptions.

3.2.35 FAIR ISLE

Fair Isle is a small island between Orkney and Shetland with the nearest point 40km south-west of Sumburgh Head, Shetland. It is 5km long and 3km wide and surrounded by impressive cliffs rising to over 200m in some places on the heavily indented west coast. It is owned by the National Trust for Scotland and there is a small community of around 70 people engaged mostly in traditional crofting and fishing occupations.

We have not addressed this island in the main methodology for similar reasons to St Kilda but have considered key views to it from Shetland in the relevant section.

3.3 Overview of visibility

3.3.1 Introduction

Visibility maps were generated showing visibility of sea from land and land from sea (Figures 23 and 24). Figure 25 shows the visibility of land from sea with the seascape units added. This visibility assessment was based purely on landform and does not take into account population or numbers of viewers affected.

The analysis also included assessment of visibility from key ferry routes and from nationally designated landscapes (Figures 26 and 27). These are not included in the comparative index but are stand alone pieces of work to illustrate the other sorts of visual analysis possible and how this may have an influence on the final outcome. The visibility index we have used to give a comparative visibility rating for each seascape unit is an objective measurement based on landform. It takes no account of how many people are likely to view the seascape or in what context. Analyses like the visibility from ferry routes show a different visibility pattern (Figure 26). It was decided that to include these analyses into an overall index would be to bias results in terms of island landscapes. It was decided early on that visibility assessments from the road

network, Munro peaks, important footpaths and tourist hotspots were unfeasible within the limitations of the study. This sort of detailed study would inform a regional or local study.

3.3.2 Visibility analysis results

A visibility assessment was carried out for each seascape unit (using the parameters set out in Section 2.9 and further explained in Appendix F) to arrive at a series of comparative visibility ratings (or visibility index) which could then be used in determining this aspect of capacity for the scenario proposed, ie a relative measure of how visible the scenario will be in a seascape unit. A full table of results is included in Appendix G and the extrapolated ratings are shown below. The effect of the 50m sea depth limitation should be noted as this means that some visibility results look counter intuitive but are an accurate measure of visibility relating to this scenario and water depth. A further explanation of why these parameters have been used is set out in Appendix F.

In order to arrive at a five-category rating scale, broadly similar to the scale used to assess physical and perceptual sensitivity, the detailed visibility indices have been divided equally into 5 ratings of visibility from 'high' to 'low' which have then been applied in the analysis of each seascape unit.

Figure 23 Visibility of the sea from land at 150m turbine height

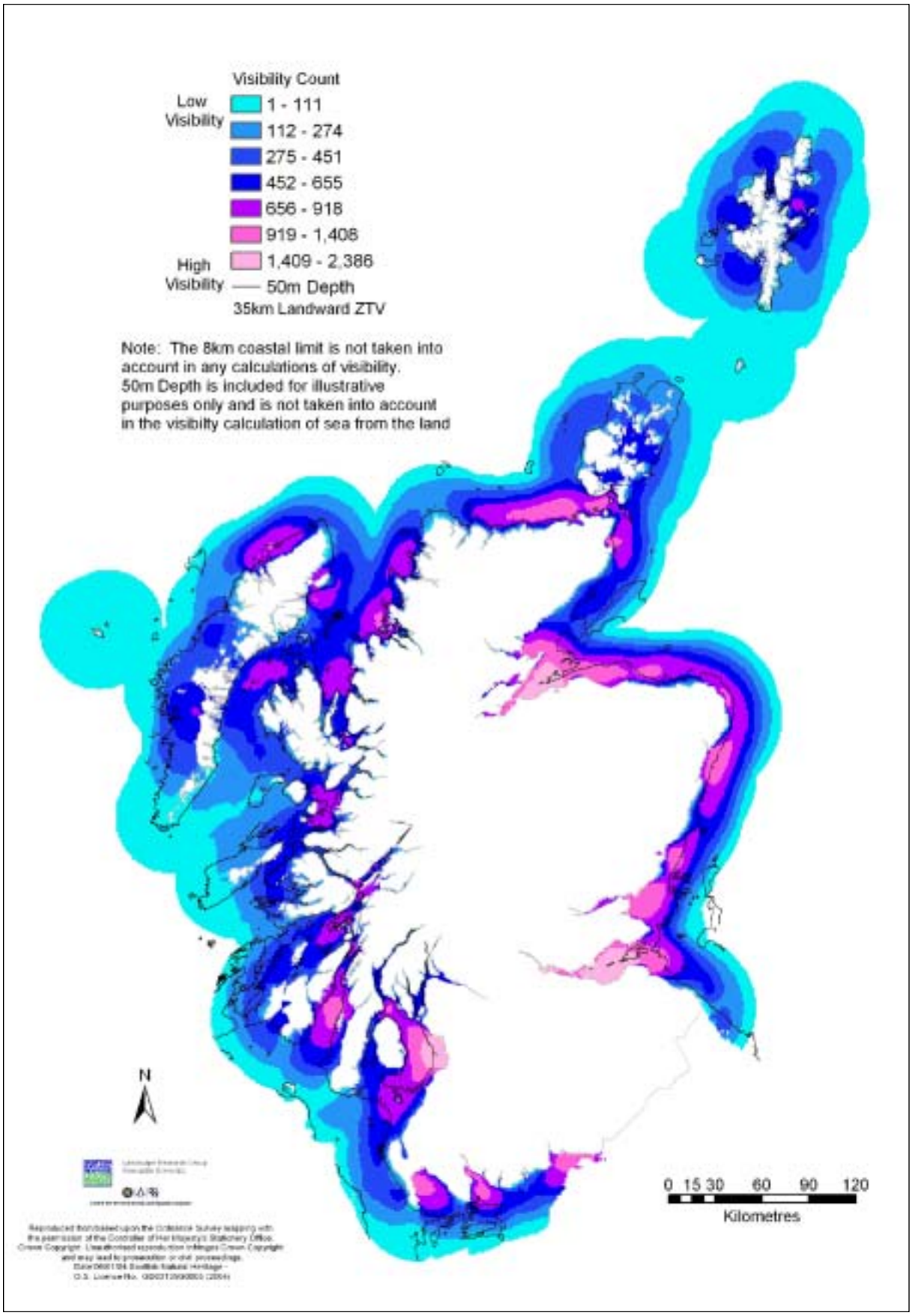


Figure 24 Variations in visibility of land from a 150m turbine height above areas of sea which are 50m depth or less and within 25km of the coastline. Visibility from areas of sea greater than 50m depth is excluded from the analysis. The visibility is based on landform and does not take account of variations in the number of viewers.

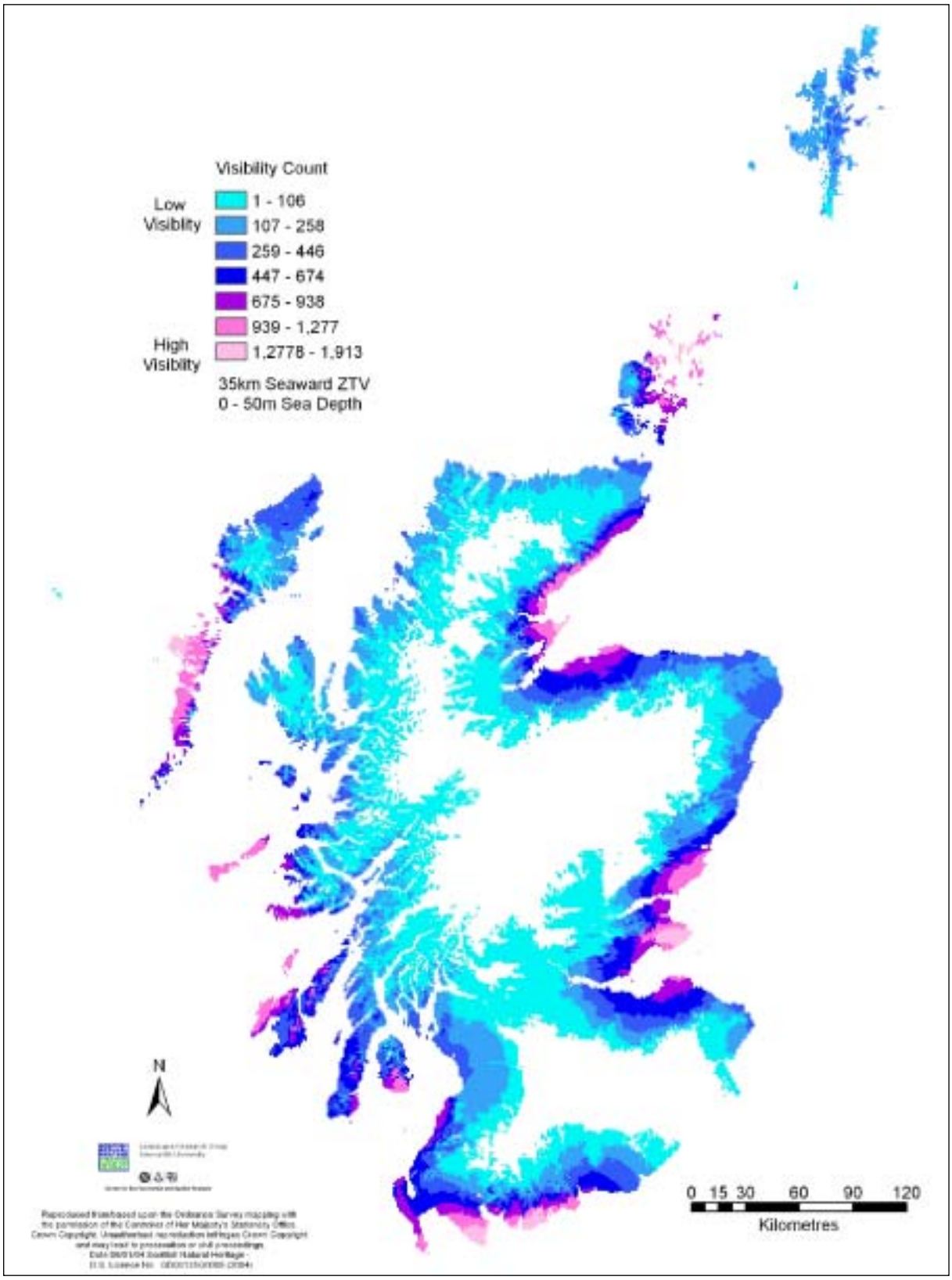


Figure 25 Variations in visibility of land from a 150m turbine height above areas of sea which are 50m depth or less and within 25km of the coastline, with seascape units shown. Visibility from areas of sea greater than 50m depth is excluded from the analysis. The visibility is based on landform and does not take account of variations in the number of viewers.

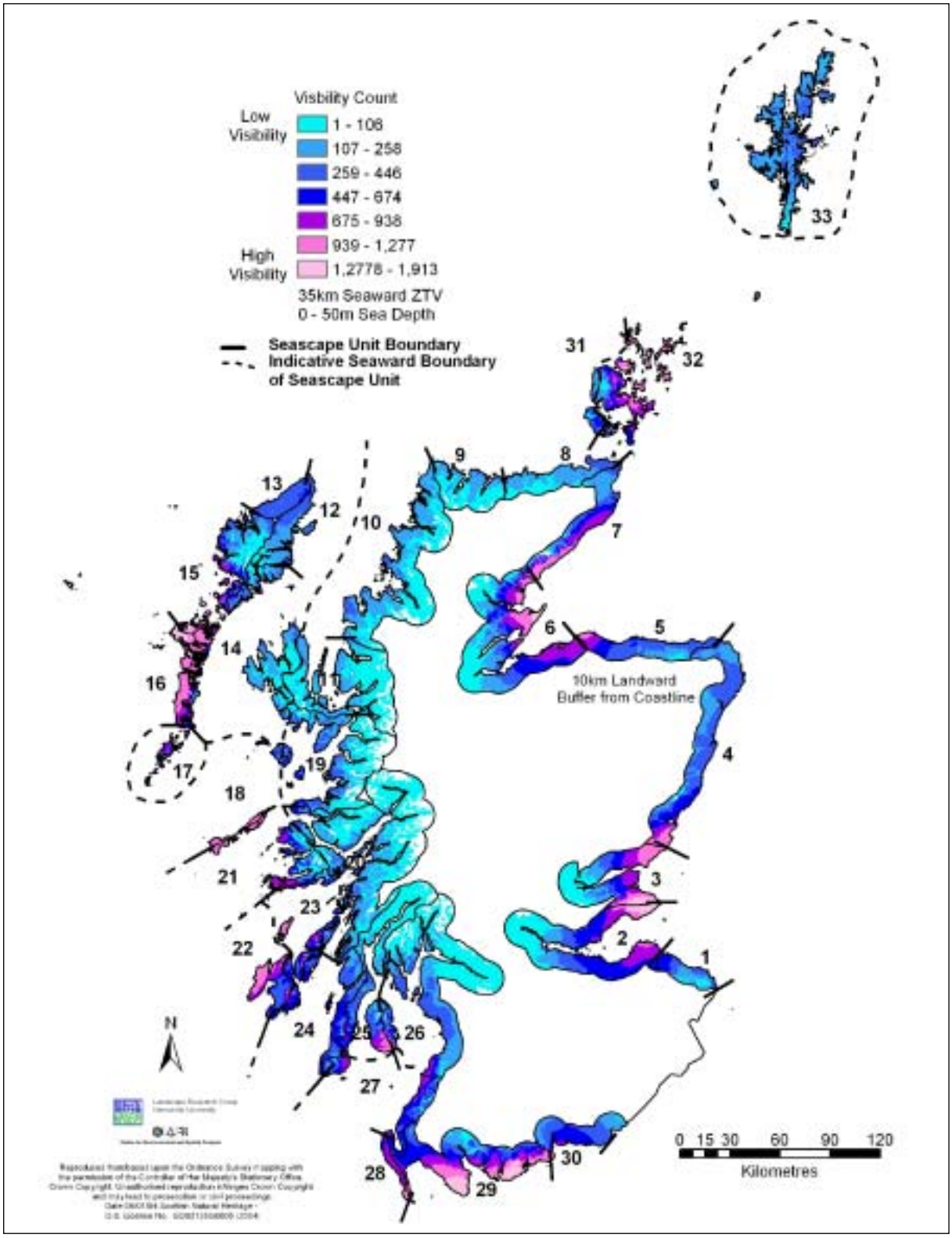


Figure 26 Variations in visibility of the sea and land from ferry routes. This data did not contribute to the visibility ratings in Figure 30. It may be used to assess the visual impact of specific proposals.

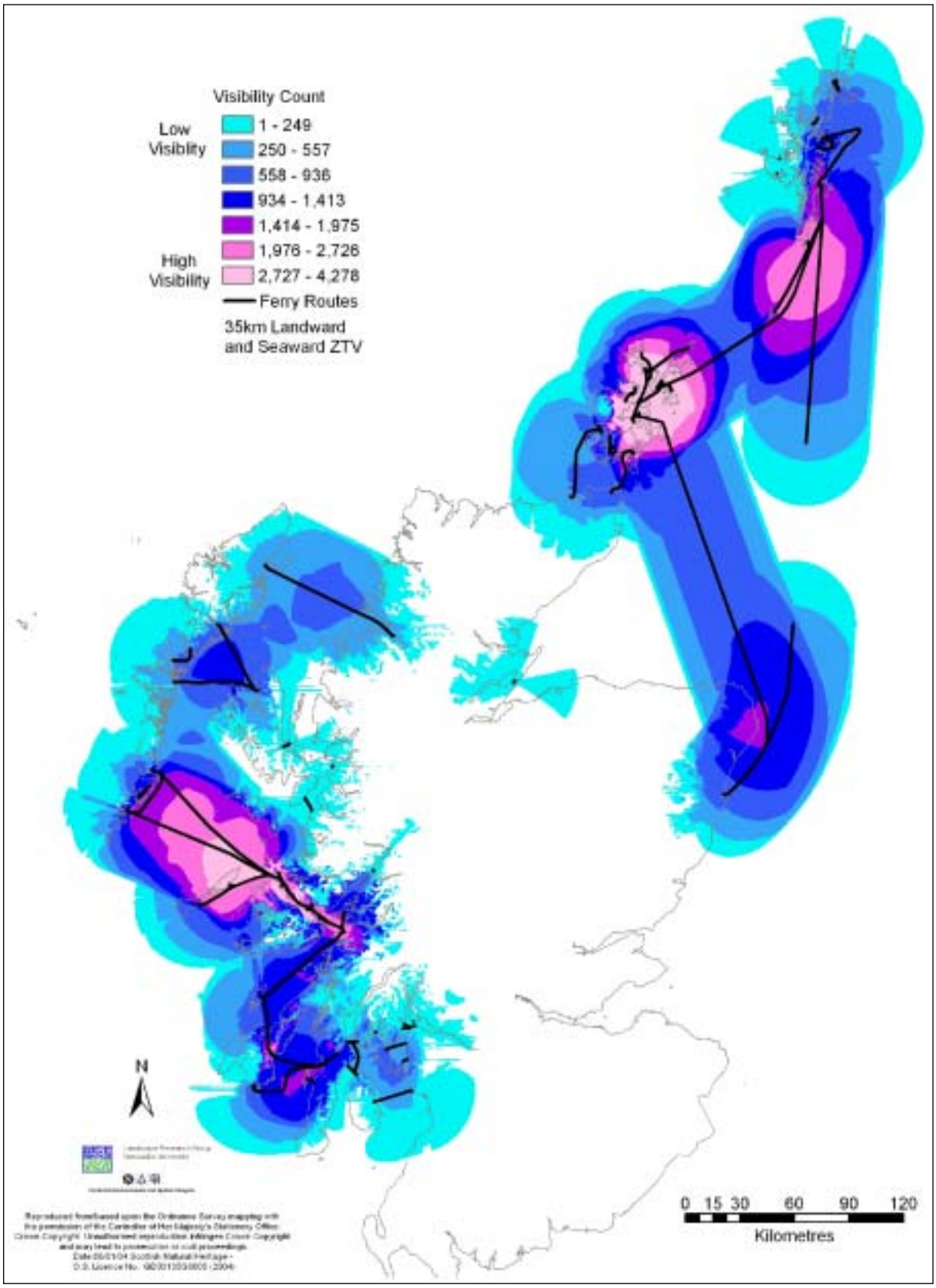


Figure 27 Variations in visibility of the sea and land from nationally designated landscapes. This data did not contribute to the visibility ratings in Figure 30. It may be used to assess the visual impact of specific proposals.

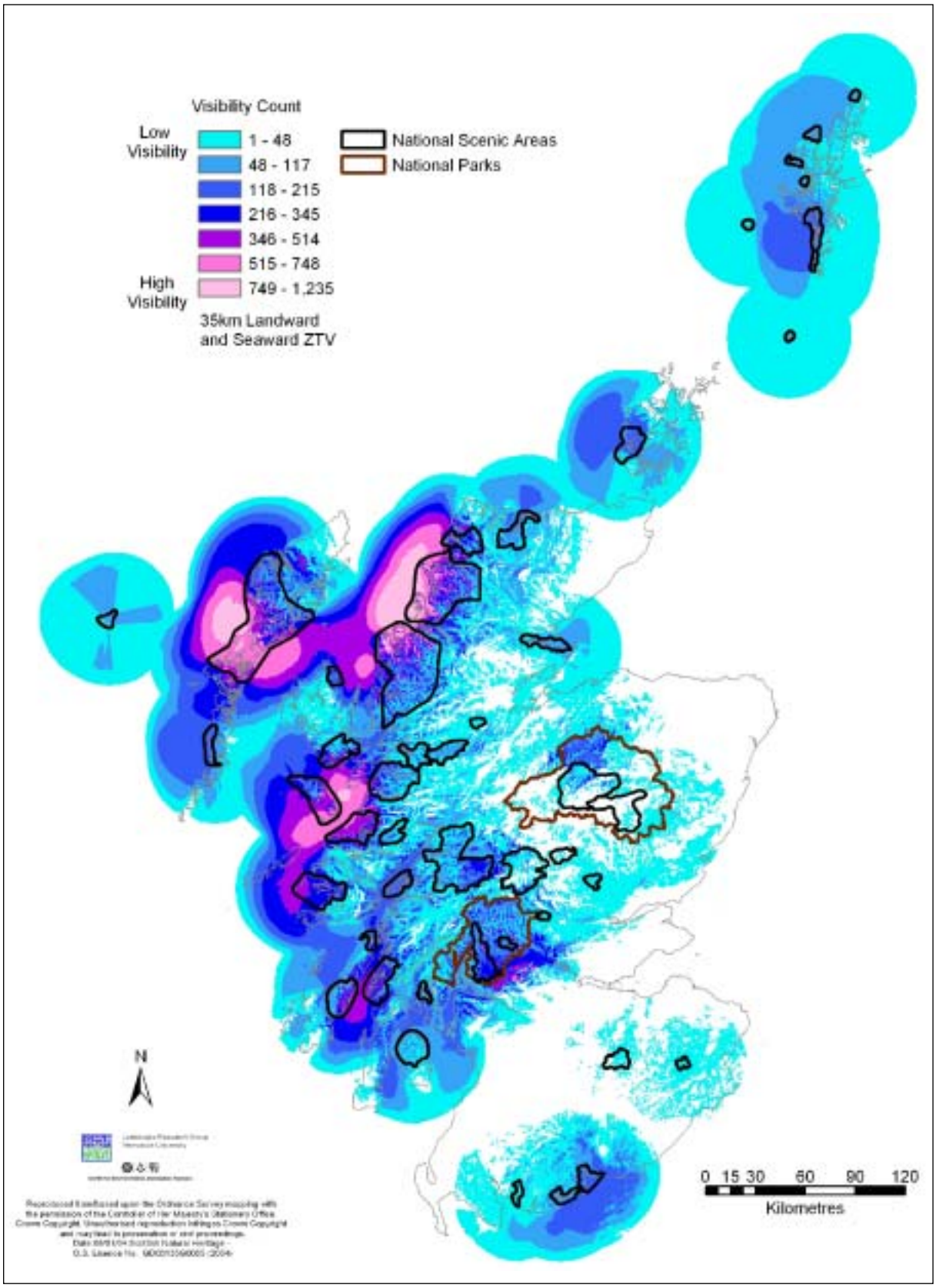


Table 5 Comparative visibility analysis of each seascape unit

Seascape Unit	Relative visibility for 10km landward/35km seaward/50m depth parameters
1 Berwick Upon Tweed	LOW
2 Firth of Forth	LOW-MEDIUM
3 East Fife/Firth of Tay	LOW-MEDIUM
4 North East Coast	LOW-MEDIUM
5 North Aberdeenshire/Morayshire Coast	LOW-MEDIUM
6 Moray Firth	LOW-MEDIUM
7 East Caithness and Sutherland	MEDIUM
8 North Caithness/Pentland Firth	LOW
9 Kyles and Sea Lochs	LOW
10 Cape Wrath – Loch Torridon	LOW
11 Inner Sound/Sound of Raasay	LOW
12 North East Lewis	LOW
13 Butt of Lewis – Carloway	LOW-MEDIUM
14 The Little Minch	LOW
15 Carloway to Griminish Point	LOW-MEDIUM
16 West Uists	HIGH
17 Barra and the Sounds	MEDIUM
18 West Coll and Tiree, Canna and Rum	MEDIUM-HIGH
19 Sound of Sleat – Point of Ardnamurchan	MEDIUM-HIGH
20 Sound of Mull/Firth of Lorn/Sound of Jura	LOW
21 West Mull/East Tiree and Coll	LOW-MEDIUM
22 West Islay	MEDIUM-HIGH
23 South Mull/Colonsay/West Jura/Sound of Islay	MEDIUM
24 West Kintyre/South East Jura and South East Islay	LOW-MEDIUM
25 Loch Fyne/Kilbrannan Sound	LOW
26 Firth of Clyde	LOW
27 South Arran/South Ayrshire/South East Kintyre	MEDIUM
28 Corsewall Point – Mull of Galloway	MEDIUM-HIGH
29 Outer Solway (Mull of Galloway - Southerness Point)	MEDIUM-HIGH
30 Inner Solway Firth	LOW-MEDIUM
31 West Orkney	LOW-MEDIUM
32 East Orkney	MEDIUM-HIGH
33 Shetland	LOW

These results offer an objective measurement of comparative visibility (see Figure 30) using the same parameters for each seascape unit and assume equal conditions. However, the results indicate some aspects of visibility but not absolute visibility due to the 50m depth limitation. They also do not consider the relationship between the level of visibility and number of viewers.

A range of factors can affect visibility and these can vary across Scotland. It was outside the scope of this study to look in detail at patterns of weather conditions and visibility but below are some findings from preliminary research carried out by the consultants. It must be stressed that meteorological information can only be very tentatively interpreted by non-meteorologists and applied in a very general way when discussing comparative patterns of visibility for different regions of Scotland. Key findings are as follows:

- the seasonal and diurnal patterns of visibility for coastal environments are significantly different to landward areas and generally visibility is higher compared with landward sites;
- highest values of coastal visibility tend to occur in the afternoon whilst poor visibility builds up during the night. This means that views of turbines at sunset are more likely than views at sunrise making seascapes with westerly aspects slightly more sensitive in this respect;
- castal areas near centres of population may experience lower levels of visibility due to reduced air quality;
- less fog occurs on the west coast of Scotland where temperature differentials between sea and air are reduced by the Gulf Stream. The most foggy areas with about 40 days or more per year of fog (visibility less than 1km) at some time of the day are in the lowland areas of Scotland from the Clyde basin to the Firth of Forth. The least foggy areas are the extreme northern areas of Scotland with fewer than 10 foggy days per year;
- windows of exceptional visibility exist just after rain and before evaporation occurs. Due to the regularity of rainfall in the North and West of Scotland and other factors, these 'windows' are likely to occur more frequently;
- in Britain excellent visibility is associated with unstable polar airstreams, particularly if these come directly from more northern latitudes and across sea tracks rather than urban areas. Thus Scotland, particularly the north west, when other meteorological conditions are right, has some of the highest visibility globally.

Appendix B provides more detailed information on factors affecting visibility.

3.4 Seascape values

National and regional landscape designations, Wildland Search Areas and Inventory of Gardens and Designed Landscapes are shown on Figure 28. The percentage area of land covered by a valued landscape within a standard 10km landward limit has been assessed for each seascape unit. Where NSAs are concerned this includes the area of any sea designated to a limit of 35km/50m sea depth. Sea areas have been included in this calculation as this study is concerned with seascapes and views over, to and from the sea and it was decided that including the sea areas would give a better reflection of the importance of the sea within these NSAs.

It was outside the resources of this study to mutually exclude all designated areas from each other and therefore some areas overlap eg a wildland search area will overlap in many areas with an NSA. In order to try to reduce the effect of double counting weightings have been applied which reflect the relative national importance of the designation.

The following scores have been assigned to each of these value categories:

Score 1: AGLV, Regional Park, wildland search area, Gardens and Designed Landscapes (reflecting lowest value)
Score 2: National Park
Score 3: National Scenic Area (reflecting highest value)

This score was then multiplied by the percentage (%) of each seascape unit occupied by each value category, to produce a values index. For example (see Table 2 below):

Seascape Unit 25 has 6.32% of its area designated as an NSA, therefore this figure has been multiplied by 3 to give the NSA a weighting of three times that of, say, an AGLV. Similarly the 0.74% of National Park has been multiplied by 2 to reflect the double weighting of that designation. Therefore the overall numerical value is calculated thus:

$$9.46 + (0.74 \times 2) + (6.32 \times 3) + 0.14 + 2.11 + 0.77 = 32.92 .$$

The index ranges from 102.53 (most valued) (Unit 19) to 0 (least valued) (Unit 13). The index range has then been divided into five equal segments (to mirror the procedure adopted for calculating the visibility index), to arrive at a values index category ranging from 1 (lowest values) to 5 (highest values). The results are also shown in map form in Figure 31.

Table 6 Seascapes values index and rating

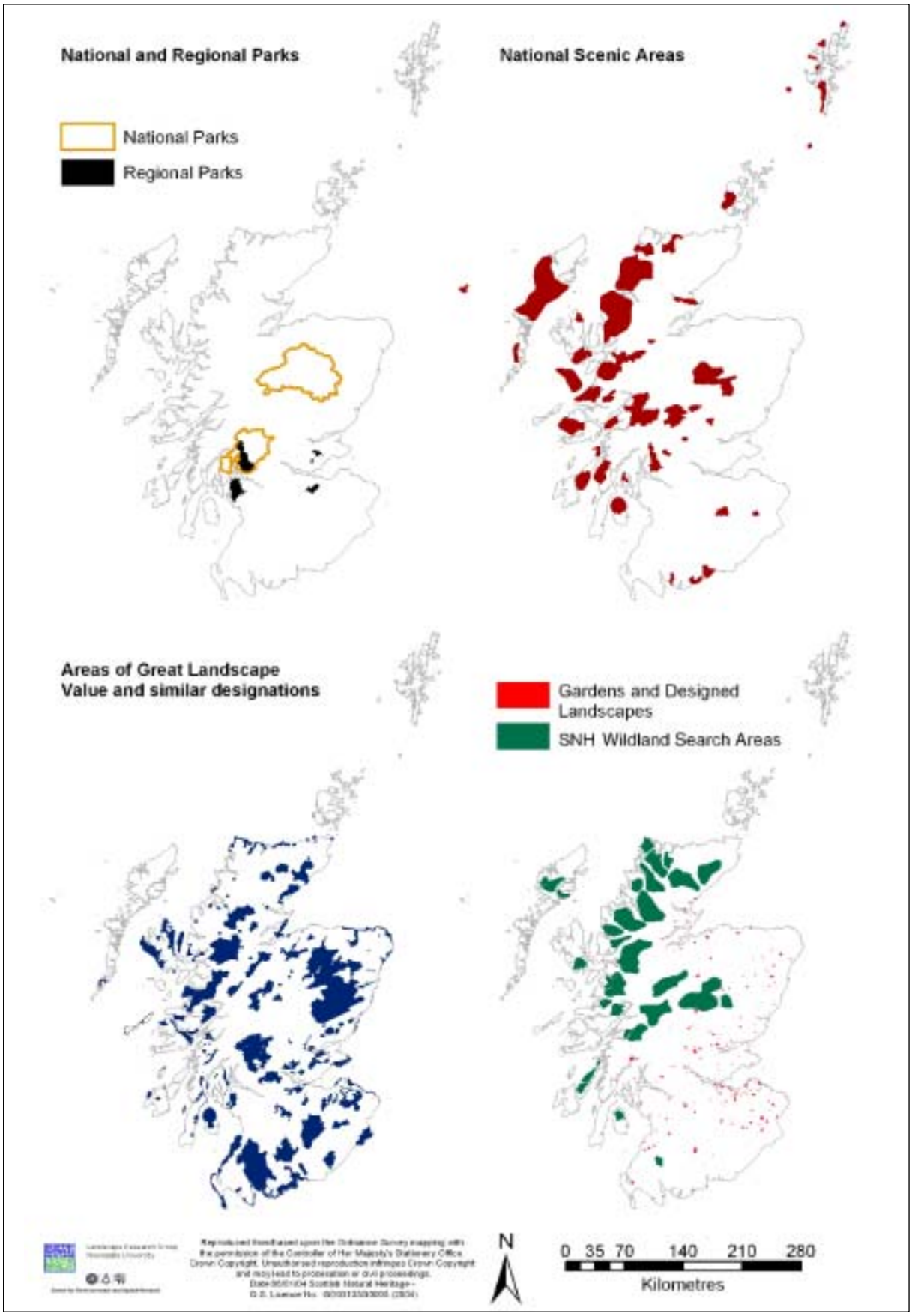
Seascape Unit	**% of total Seascape Unit area covered by each designation**						**Final Value index**	**Final value rating**
	AGLV	Nat. Pk	NSA	Reg.Pk	wildland	GDL		
1	3.31	0.00	0.00	0.00	0.00	0.21	3.52	1
2	8.92	0.00	0.00	0.26	0.00	1.94	11.12	1
3	5.73	0.00	0.00	0.13	0.00	0.73	6.59	1
4	2.11	0.00	0.00	0.00	0.00	0.12	2.23	1
5	2.73	0.00	0.00	0.00	0.00	0.25	2.98	1
6	4.60	0.00	3.01	0.00	0.00	1.24	14.87	1
7	4.96	0.00	0.67	0.00	1.55	0.02	8.54	1
8	2.57	0.00	1.75	0.00	0.00	0.00	7.82	1
9	4.31	0.00	6.42	0.00	8.10	0.02	31.69	2
10	3.11	0.00	22.36	0.00	10.55	0.01	80.75	4
11	14.22	0.00	19.55	0.00	11.36	0.09	84.32	5
12	0.09	0.00	0.13	0.00	0.61	0.05	1.14	1
13	0.00	0.00	0.00	0.00	0.00	0.00	0	1
14	5.93	0.00	10.52	0.00	1.08	0.01	38.58	2
15	0.00	0.00	21.41	0.00	4.38	0.00	68.61	4
16	0.00	0.00	4.24	0.00	0.00	0.00	12.72	1
17	2.09	0.00	9.01	0.00	0.02	0.01	29.15	2
18	1.28	0.00	3.16	0.00	0.00	0.00	10.76	1

Table 6 *(continued)*

Seascape Unit	% of total Seascape Unit area covered by each designation						Final Value index	Final value rating
19	8.63	0.00	28.16	0.00	9.38	0.04	102.53	5
20	9.91	0.00	14.17	0.00	5.62	0.05	58.1	3
21	0.95	0.00	9.81	0.00	0.00	0.00	30.38	2
22	0.93	0.00	0.48	0.00	0.05	0.00	2.24	1
23	0.43	0.00	7.80	0.00	5.25	0.00	29.08	2
24	0.91	0.00	5.61	0.00	0.29	0.00	18.03	1
25	9.46	0.74	6.32	0.14	2.11	0.77	32.92	2
26	7.93	8.76	5.26	8.31	0.55	0.67	50.76	3
27	3.58	0.00	0.08	0.00	0.00	0.25	4.07	1
28	1.98	0.00	0.00	0.00	0.00	0.08	2.06	1
29	8.62	0.00	2.09	0.00	0.00	0.25	15.14	1
30	11.68	0.00	7.46	0.00	0.00	0.35	45.74	3
31	0.64	0.00	2.34	0.00	0.00	0.00	7.66	1
32	0.23	0.00	1.17	0.00	0.00	0.02	3.76	1
33	0.00	0.00	2.14	0.00	0.00	0.01	6.43	1

Note: these values are not mutually exclusive so the same area of land may be counted for its designation as an NSA, as a National Park and as a wildland search area for example. There is an issue here of double counting but rating the values as we have done goes some significant way to addressing this. To calculate the value index by mutually excluding all areas from each other would have been time consuming and outwith the resources for this study. It would be far simpler and more appropriate to do this on a case by case basis. These values are relative to each other and are not an absolute measure of value.

Figure 28 Designated landscapes and other 'valued' landscapes



3.5 Seascape capacity

3.5.1 Relative seascape capacity

Ratings of relative seascape capacity for the scenario proposed (shown in Table 7 and in map form in Figure 32) has been calculated by adding together the sensitivity, visibility and value ratings. The seascape units with the lowest score have the highest capacity (in general terms, sensitivity, visibility and values are lower) whilst the units with the highest score have the lowest capacity (in general terms sensitivity, visibility and values are higher).

Table 7 Seascape capacity calculation

Seascape Unit	Sensitivity	Visibility	Value	Capacity Index by adding results	Capacity rating
1 Berwick Upon Tweed	2	1	1	4	Higher
8 North Caithness/Pentland Firth	3	1	1	5	Higher
4 North East Coast	2	2	1	5	Higher
5 North Aberdeenshire/Morayshire Coast	2	2	1	5	Higher
12 North East Lewis	4	1	1	6	Med-higher
33 Shetland	4	1	1	6	Med-higher
2 Firth of Forth	3	2	1	6	Med-higher
3 East Fife/Firth of Tay	3	2	1	6	Med-higher
6 Moray Firth	3	2	1	6	Med-higher
7 East Caithness and Sutherland	2	3	1	6	Med-higher
13 Butt of Lewis – Carloway	3	2	1	6	Med-higher
9 Kyles and Sea Lochs	4	1	2	7	Med-higher
27 South Arran/South Ayrshire/South East Kintyre	3	3	1	7	Med-higher
25 Loch Fyne/Kilbrannan Sound	5	1	2	8	Med
14 The Little Minch	5	1	2	8	Med
24 West Kintyre	5	2	1	8	Med
31 West Orkney	5	2	1	8	Med
26 Firth of Clyde	4	1	3	8	Med
28 Corsewall Point/Mull of Galloway	3	4	1	8	Med
16 West Uists	3	5	1	9	Med
20 Sound of Mull/Firth of Lorn/Sound of Jura	5	1	3	9	Med
18 West Coll and Tiree, Canna and Rum	4	4	1	9	Med
22 West Islay	4	4	1	9	Med
29 Outer Solway (Mull of Galloway – Southerness Point)	4	4	1	9	Med
32 East Orkney	4	4	1	9	Med
21 West Mull/East Tiree and Coll	5	2	2	9	Med
10 Cape Wrath – Loch Torridon	5	1	4	10	Med-lower
30 Inner Solway Firth	5	2	3	10	Med-lower
17 Barra and the Sounds	5	3	2	10	Med-lower
23 South Mull/Colonsay/West Jura/Sound of Islay	5	3	2	10	Med-lower
11 Inner Sound/Sound of Raasay	5	1	5	11	Med-lower
15 Carloway – Griminish Point	5	2	4	11	Med-lower
19 Sound of Sleat – Point of Ardnamurchan	5	4	5	14	Lower

Notes to Table: each index (sensitivity, visibility and values) is on a comparable 5-point scale (1= least sensitivity; 1= least visible; 1= least valuable). The Capacity Index is obtained by adding the three values together: lower index number = higher capacity; higher index number = lower capacity.

3.5.2 Recreational use

Recreational use has not been separately factored into the capacity assessment but has been considered in the criteria 'how the seascape is experienced' in the sensitivity ratings. Recreational value is too complex with too many variables to make any assessment meaningful for a strategic study. Impact on receptor depends on the receptor, the activity and the context they are within. For example many people may see a development from a popular crowded beach but its impact on them may be slight as they are there to enjoy social and beach activities within a busy environment. In contrast the impact on solitary hill walkers stopping to enjoy a view outwith tourist hotspots may be far greater. This needs to be more accurately assessed on a case by case basis.

Figure 29 Sensitivity ratings of seascape units

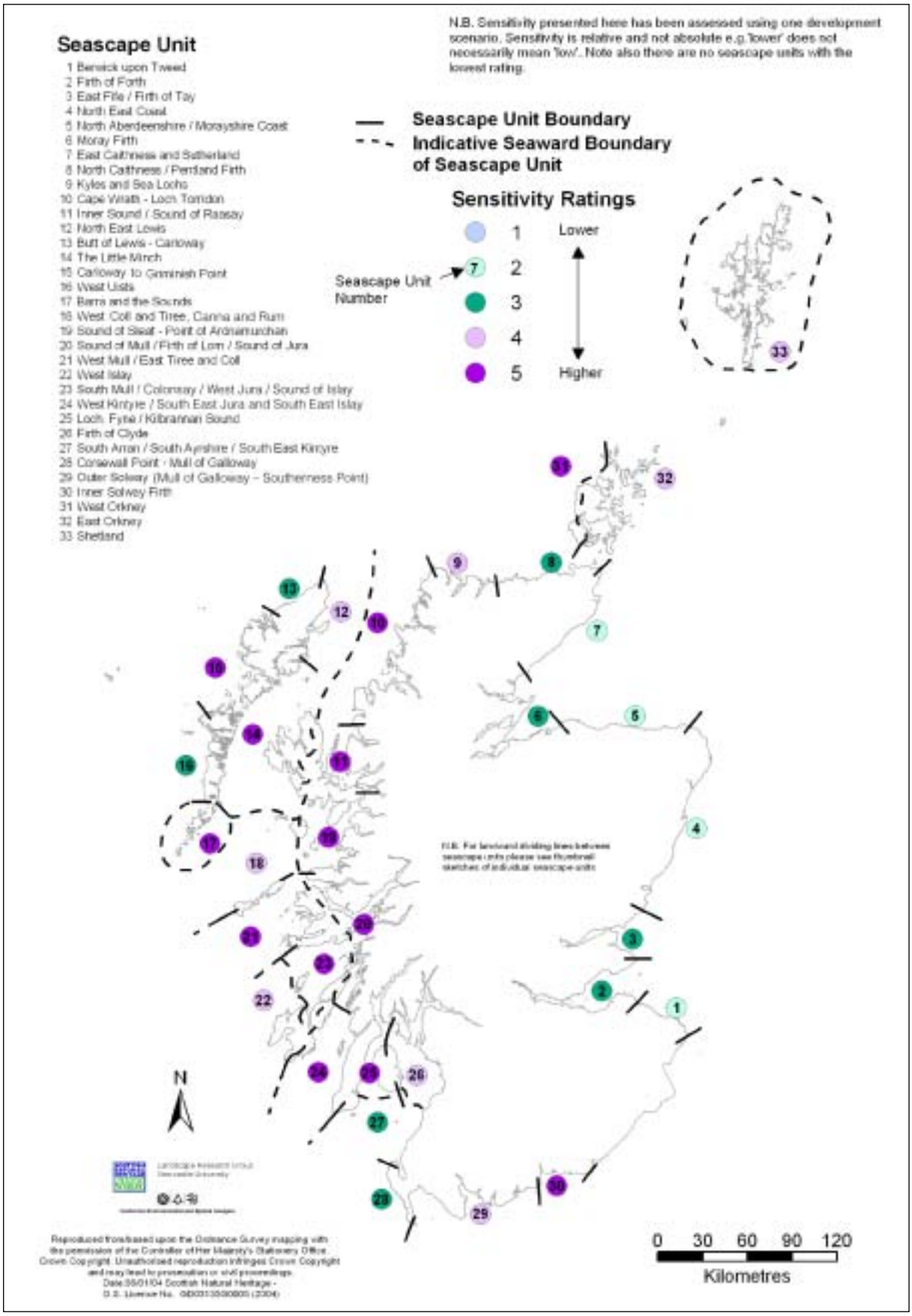


Figure 30 Visibility ratings of seascape units

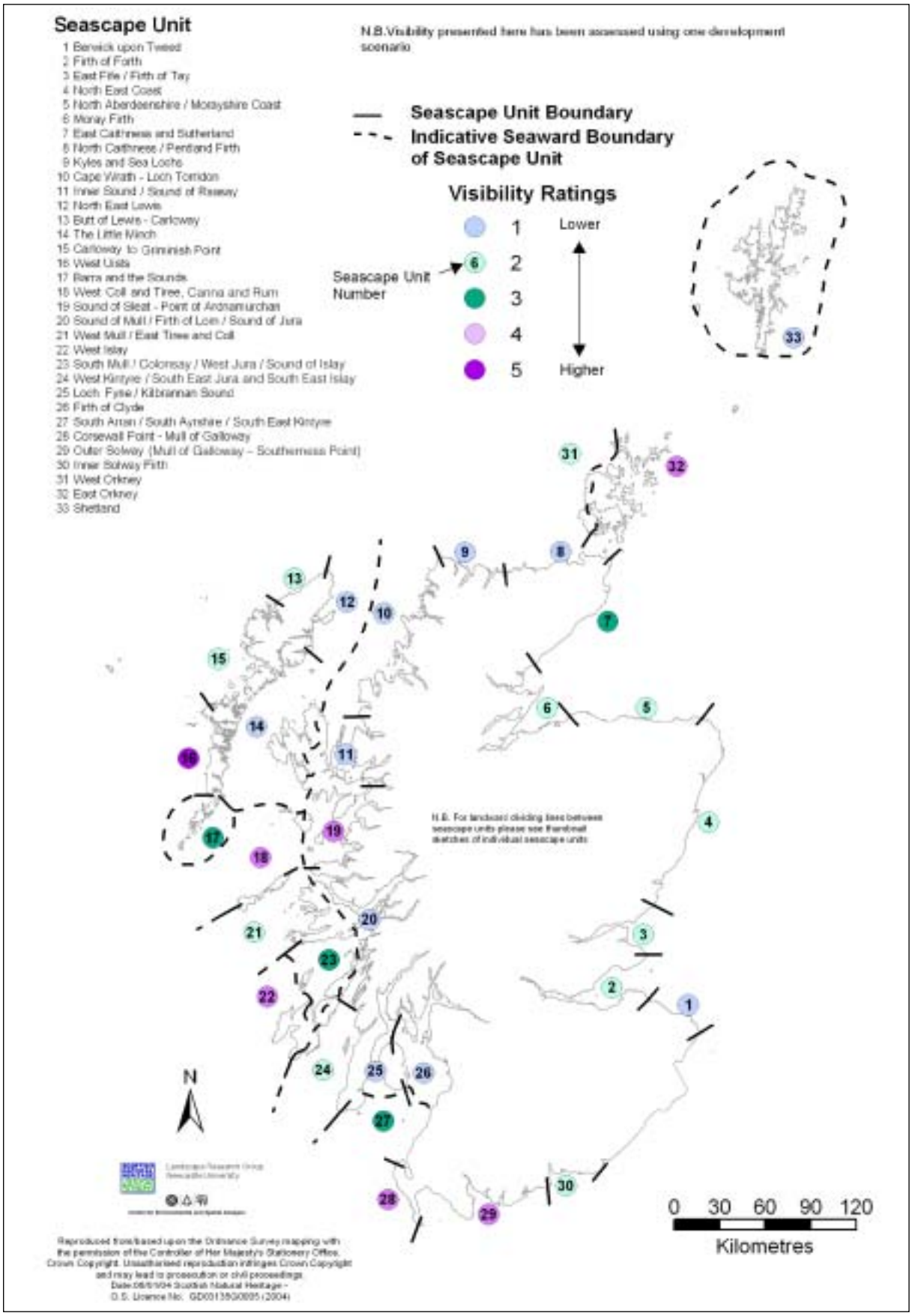


Figure 31 Value ratings of seascape units

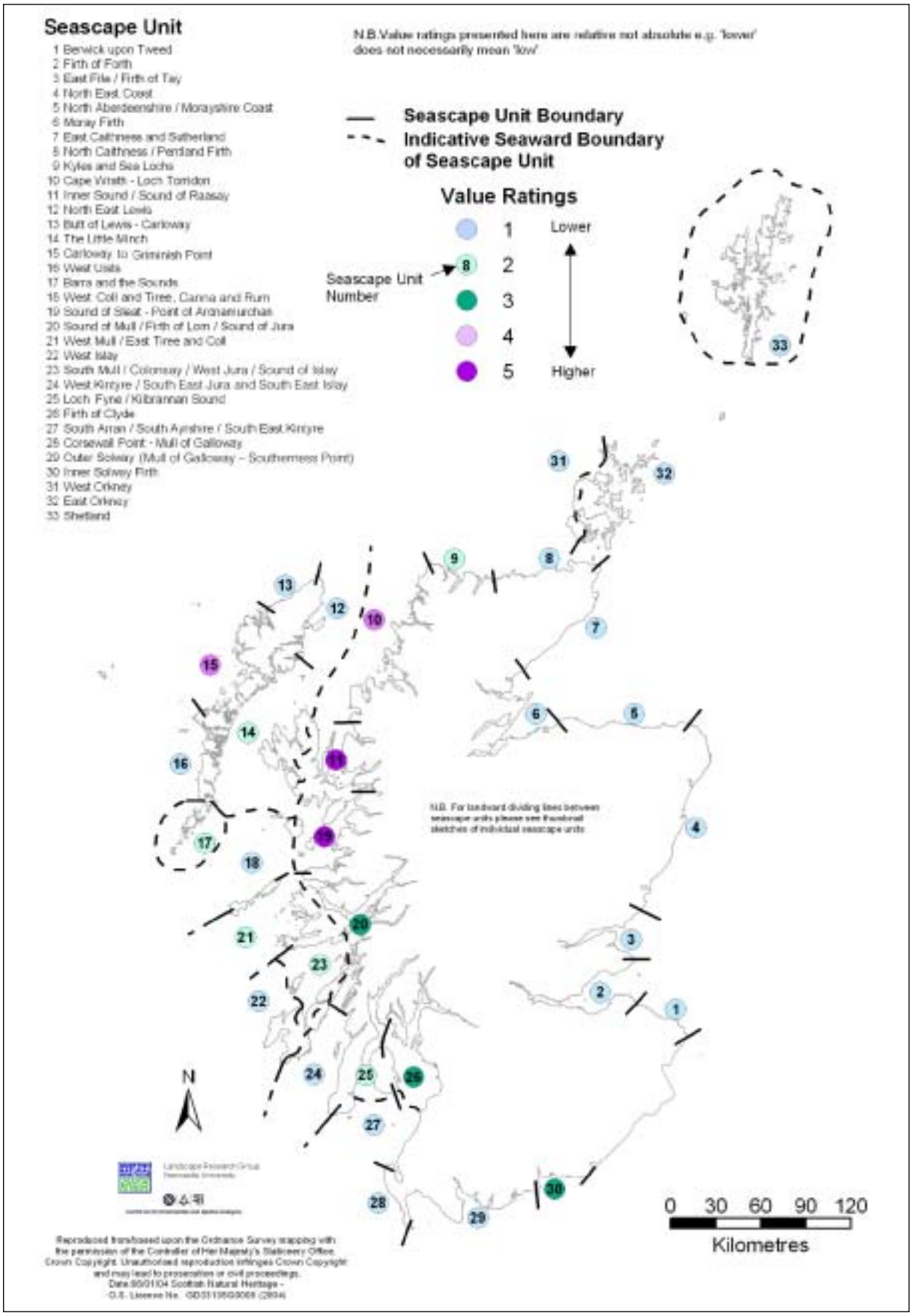
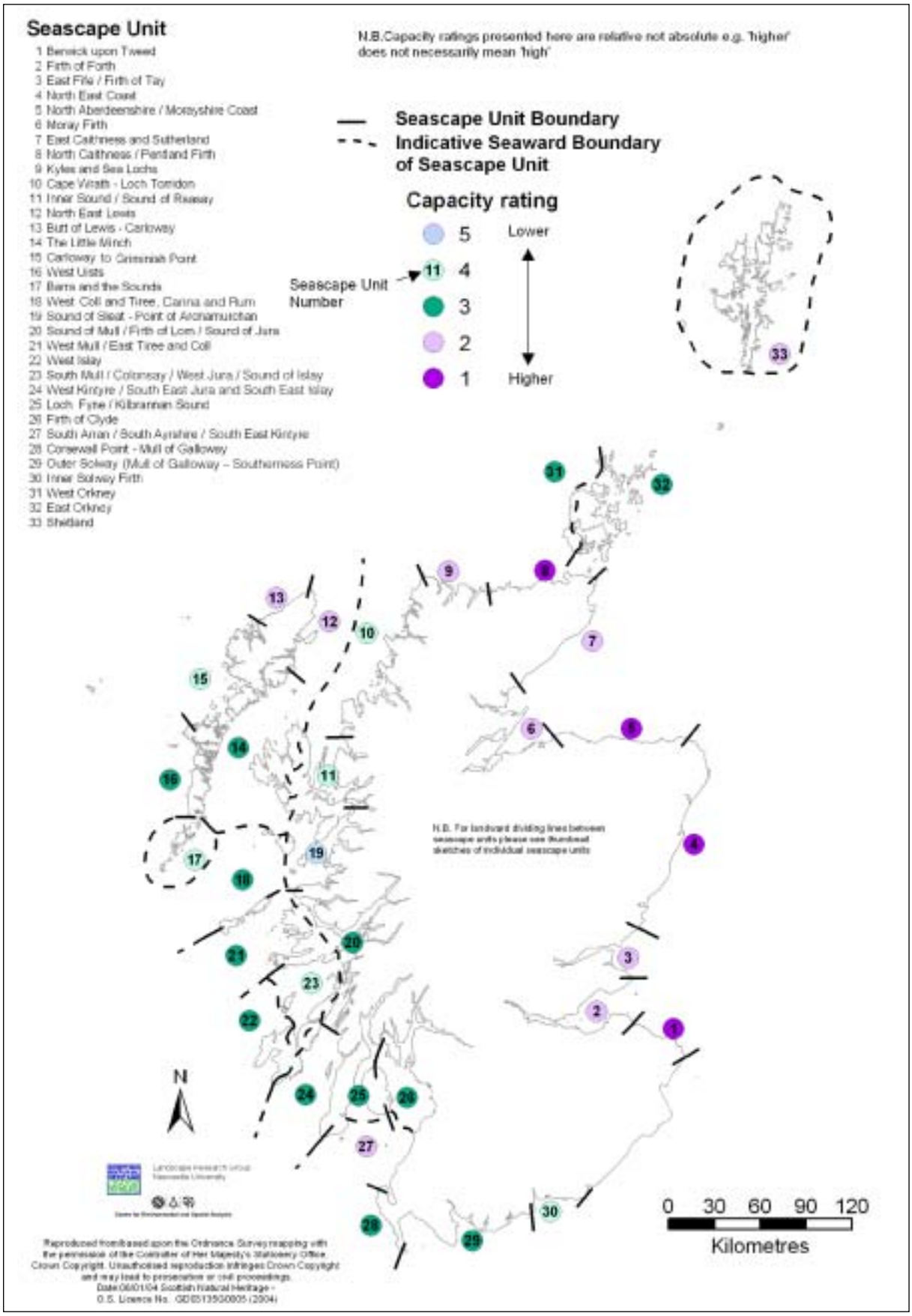


Figure 32 Capacity ratings of seascape units



3.6 Cumulative issues

3.6.1 Introduction

The term cumulative refers to the accumulation of human-induced changes over time and across space in an additive manner. When cumulative effects (CE) are being considered as part of a project or site specific environmental impact assessment (EIA), the term Cumulative Assessment (CA) or Cumulative Impact Assessment (CIA) is used. When cumulative effects are being considered as part of a strategic environmental assessment (SEA), the term Strategic Cumulative Assessment (SCA) or Strategic Cumulative Impact Assessment (SCIA) is used. In the current study, the issues discussed are mainly in the context of SEA and the effects referred to are always landscape or visual, although the principles of CA or SCA would embrace a wider range of social, economic and environmental resources.

Cumulation can be an issue for consideration in several different respects.

(a) The cumulative effect(s) of several similar but small changes, each of which is not in itself judged to be significant, but which when added together have the potential to produce significant effects.

(b) The cumulative effect(s) of several similar projects, each of which may be significant, and which when added together have the potential to produce not only additive significant effects, but may produce significant effects greater than their sum.

(c) The cumulative effect(s) of several projects of different types and sizes which have the potential through cumulation or by interactions between them to produce significant effects either greater than their sum or even completely unanticipated effects.

Type (a) cumulation is a recurring issue in debates about project EIA, but in general such small individual projects fall below the thresholds devised for discretionary assessment of EIA Schedule 2 projects. A new EU Directive on Strategic Environmental Assessment (SEA)(EU Directive 2001/42/EC) requires that from 2004 a range of plans will have to be subject to SEA as an integral part of plan preparation, which would draw the assessment of a wide range of environmental and related issues into the process. It is probable that issues of cumulation will need to be addressed.

Type (b) and type (c) cumulation require to be treated under the recent amendment to the EU Directive on EIA (Directive 97/11/EC), although this was only implemented from 1999 and so experience of assessing cumulative effects is so far relatively limited (Cooper and Sheate, 2002).

3.6.2 Research and guidance on Cumulative Assessment

There is a growing literature on the general principles of CA (eg Canter, 1999). Piper (2001) analysed three cases of the cumulative effects of two or more projects, including windfarms in Holderness (Yorkshire) and Kintyre. MosArt Associates (2000) prepared an analysis of landscape character and sensitivity to windfarm development for Cork County Council. This was an area based study akin to the current capacity study. With regard to cumulative effects, it recommends the use of overlapping ZVI and, pending a further study, that the outer limit of cumulative effect is set at 10km separation, with any larger separation not considered as having a cumulative effect (for individual applications, it recommends a basic ZVI of 20 x 20km and, for larger turbines (a height of more than 60 m), a ZVI of 30 x 30km). SNH guidelines (SNH, 2003a) suggest a

60km radius scoping of all other proposals but also suggests it would be helpful to also have a 30km radius too for comparison. Burbo ES uses a 30km radius.

A recent study, *Cumulative Effects of Wind Turbines*, commissioned by the Department of Trade and Industry through ETSU, has produced four reports addressing the issue. Volume 1 (ETSU, 2000a) is a report on a consensus-building exercise designed to produce a planning tool, Volume 2 (ETSU, 2000b) is a report on research into public attitudes in mid-Wales, Volume 3 (ETSU, 2000c) is a report on effects on birds, whilst the Main Report (ETSU, 2000d) is a guide to the assessment of cumulative effects. In general this guidance focuses on processes and procedures and contains few or no qualitative or quantitative specifications, distances, numbers or similar data that can be used for precise assessment or evaluation in the current study.

3.6.3 Cumulative effects of wind energy development

Cumulation needs to be considered separately in terms of cumulative effects on seascape and cumulative effects on visibility. Both onshore and offshore wind energy developments have potential to impact on seascapes and visibility.

3.6.4 Cumulative effects on seascape

Cumulative effects can cause both the physical character and the perceptual character of the seascape to change. In some cases, the cumulative effects may be gradual and additive. However, it is intuitively reasonable to think that there may be thresholds that might be defined, beyond which the sensitivity of a landscape character type would be exceeded and where the character which had been assessed would switch to a new type. We have not been able to discover any research, experience or practices that would inform such assessments in a precise and quantified way. Whilst our professional judgements could be made and declared, they would remain just that and would be hard to justify or defend in any robust manner.

Two turbines or two windfarm sites might not be intervisible and in that sense it can be argued that one does not affect the other in terms of their specific locations in those specific seascape areas. The lack of intervisibility might be due to visual containment, or it might be due to the large distance between them. For the tallest turbines considered (150m), the separation distance would need to be from 30–60km, depending on location and judgements of significance. We say more on separation distances below. We therefore have no overall strategic or quantifiable *findings* regarding cumulative effects on landscape and as such a case by case approach is required.

3.6.5 Cumulative effects on visibility

Two turbines or two windfarm sites might be *intervisible*, one from the other. Also, although they may not be intervisible, they might be *simultaneously visible* from a viewpoint or a road or a ferry route. Finally, they might be *sequentially visible* as the observer moves through the landscape or across the sea.

The distance limits for intervisibility depend on the height of the turbine but are also modified in complex and locationally specific ways by many factors, including the weather, human perception, and the intervening topography and landscape features. A discussion of this complex area can be found in Benson *et al.* (2002).

For the purposes of defining the limits for calculating a Zone of Theoretical Visibility (ZTV), that study made the recommendations shown in the table below (Benson *et al.*, 2002).

Height of turbines (total including rotors)(m)	**Recommended ZTV distance (km)**
50	15
70	20
85	25
100	30

These recommendations have been adapted for use in the present study in the GIS analyses (Sections 2.3 and 4), using a 35km ZTV for a 150m turbine. However, it should be noted that these are theoretical limits based on worst-case calculations. For the consideration of cumulation, we suggest the following broad zones for the tallest turbines assessed (150m), whilst proportionately shorter distances would apply to shorter turbines.

- Zone 1: (>30km): Essentially invisible and not intervisible.
- Zone 2: (30–20km): Theoretically intervisible, but unlikely to be significant except in very sensitive circumstances.
- Zone 3: (19–6km): Intervisible, with potential significance dependent on a range of local and perceptual factors.
- Zone 4: (5–0km): Intervisible, and potentially significant in many or most circumstances.

These bands can therefore be used in project scoping to identify potentially significant cumulative effects.

When *simultaneous visibility* occurs, there is also the possibility of *visual coalescence*. In this case, the viewer does not see two separate windfarms or clusters, but instead observes one single array. Such coalescence could also occur where different character types are juxtaposed. Whether coalescence occurs depends on the viewer's location and altitude, the character of seascapes, and the locations of the separate windfarms and their relative heights and distances from the viewer. These factors can only be assessed on a project basis as part of a cumulative assessment.

Sequential visibility could occur as the observer moves through the landscape or across the sea. Such sequential visibility will be more pronounced if the distance(s) between windfarms are short. A key factor is the time between sightings, so that a car driver will experience the sequential effect over longer distances than a walker on the same route. Frequent or repeated sequential visibility can then lead to the perception of a wind energy seascape, where the wind turbines become the defining characteristic of that seascape. We have no evidence on which to base any recommendation on separation distances needed to avoid the sequential effect, which will be a matter for professional judgement. It has also been suggested (ETSU, 2002d) that the sequential effect will be more pronounced if the two windfarms occur within the same landscape character area or zone, although we know of no evidence to justify or support such a claim.

The strategic visual assessments produced in the current project can be used in broad terms to identify those areas or zones where such effects are more or less likely to occur. However, intervisibility, simultaneous

visibility and sequential visibility must be assessed on a project by project basis in order to provide detailed locational guidance and for site-search purposes.

3.6.6 Existing and proposed offshore windfarms potentially visible from Scottish seascapes (Information correct at the time of publication)

Robin Rigg – Solway Firth
This off-shore development consented under Round 1 of the permissions policy actually comprises two 30 turbine farms which are being developed as one 60 turbine farm in the Solway Firth.

Beatrice Oilfield – Moray Firth
Talisman Energy UK and Scottish and Southern Energy are considering the feasibility of developing proposals for two prototype turbines to be installed in the Beatrice oilfield in the Moray Firth in waters depths of around 40m. If successful there are plans for a large windfarm of 200 turbines to follow. The development would be 24km from the Caithness shore.

Aberdeen Bay
There are tentative plans for a small demonstration project in Aberdeen Bay allied to the Aberdeen Energy Centre. As these proposals are in the early stages little is yet known but a development in the order of 10 turbines 1km from shore has been publicised.

Tunes Plateau – Northern Ireland
This proposed development by a consortium (B9 Energy Offshore Renewables Ltd, Powergen Renewables Development Ltd. and Renewable Energy Systems Ltd) comprises 50–85 turbines and extends from 5km–10km off the coast of Northern Ireland. This proposal lies just outside the 35km (from the Scottish coastline) visual analysis boundary of our study area. As such it is peripheral to this study but may possibly have some bearing on views towards Ireland.

Significant onshore windfarms

Barvas Moor – Isle of Lewis
A proposal for what has been described as the largest windfarm in Europe is under development by British Energy Renewables & AMEC. Although this is an onshore proposal it is a significant development which may have potential cumulative effects with any offshore developments in the region. The Lewis Wind Farm, as it has been called, would involve the construction of 300 or more turbines (installed capacity 600MW plus) on Barvas Moor, North Lewis on a predominantly flat landscape of moorland in central Lewis. It would also involve the development of a sub-sea cable and significant infrastructure on the mainland to allow energy transmission to the national grid.

Significant accumulations of smaller developments of onshore windfarms could contribute to cumulative effects where these are visible in coastal locations. For example clusters of existing and proposed windfarms at Argyll and Ayrshire.

4 SUMMARY OF FINDINGS, POLICY REVIEW AND GUIDANCE

4.1 Introduction

This section of the report provides a summary of the key findings from the capacity study and outlines the potential uses of the study. In accordance with the brief (see Appendix A), it also describes the review of policy that has been undertaken to inform recommendations for any new guidance that may be necessary for offshore wind energy development.

4.2 Overview of seascape capacities

The study identified 33 Seascape Units. The character of these Seascape Units was described and their sensitivity to a single specific development scenario assessed against a number of key criteria. Each unit was rated from low to high sensitivity on a five point relative scale. See Figure 29.

A visibility assessment was carried out using GIS to produce a comparative scale of visibility for the seascape units based on landform, excluding areas of sea greater than 50m deep. Each unit was rated from low visibility to high on a five point scale (see Figure 30).

Seascape values included consideration of NSAs, National Parks, AGLVs (and other similar designations), Gardens and Designed Landscapes and Wildland Search Areas within a10km landward buffer from the coast. Seascape values were assessed using a weighting system based on the relative national, regional or local importance of the defined area to reduce the problem of double counting. GIS was used to calculate the amount of each category of designated land within each seascape unit and each unit was then rated from low to high value on a five point scale. See Figure 31.

An overall capacity index was calculated by combining seascape sensitivities, visibility and landscape values for each unit, with an equal weighting being given to each of these factors. Table 6 in Section 3.5 provides an overview of seascape capacity (see Figure 32).

Main patterns of capacity are low generally along the west coast largely due to values and seascape sensitivity. There is a higher relative capacity generally present on east mainland coasts, Shetland and North Lewis where seascape sensitivities and visibility ratings are generally lower and fewer designated landscapes are present.

4.3 Using the seascape capacity assessments

The study provides a range of information on baseline character and sensitivity of seascapes, seascape visibility and seascape values. This information can be assembled in a layered and integrated way to allow their use in a wide range of contexts and applications and to address a wide range of issues. These include their use in guiding:

- statutory and non-statutory plans, including written policies, areas of search, criteria-based policies, locational policies and supplementary planning guidance;

- strategic environmental assessment during plan preparation;
- locational and design guidance and guidelines;
- searches for locations and sites for windfarms;
- assessment of potential cumulative effects, including intervisibility, simultaneous visibility and sequential visibility;
- preliminary stages in environmental impact assessment, especially screening and scooping;
- wider renewable energy strategy development and planning which may include target setting and scenario building;
- consultation responses to any of the above by statutory and non-statutory organisations and individuals.

4.3.1 Consideration of different development scenarios

A single specific development scenario was considered in the capacity study. This development scenario was influenced by geographical and technical limitations with a zone for potential development defined 8km from the coast and up to 50m sea depth. A windfarm scenario of 100 turbines at 150m height occupying a 25km^2 area was adopted. This development scenario provides no opportunity for development within narrow west coast sounds and sea lochs and within inner east coast firths.

The findings of the capacity study could be applied to different scenarios, although it is considered that the technical limitations prohibiting development beyond sea depths of 50m should remain as a constant. It is presumed that it would not be economically viable to construct turbines below 100m in view of the current trend for increasing turbine heights for onshore development. The potential effects of the following scenarios are considered in terms of seascape sensitivity:

- smaller windfarm typology (30–50 turbines @100m height) sited 5km from shore;
- same windfarm typology (100 turbines @150m height) sited 20km distance from shore.

Any of these scenarios may occur in combination, although it is likely that as distances from shore increased, it would be an economic necessity to construct larger windfarms.

4.3.2 Smaller windfarm typology, 5km from shore

Windfarms located closer to land will generally have greater potential for significant effects. However, if the development typology is of a smaller scale the effects associated with closer proximity to shore may be reduced.

Development sited in closer proximity to the shore may affect seascapes where offshore islands, coastal and hinterland features are distinctive and where the coast is more indented. In these units, turbines may interrupt the focus of distinctive landform profiles and dominate the scale of landward features and the scale of the sea area bounded by land. This may potentially affect the following seascape units with a resultant increase in sensitivity:

- the indented coastline of sea lochs, sounds and islands off the west coast (where there is scope to accommodate this development scenario) 21 (West Mull/East Tiree and Coll), 10 (Cape Wrath – Loch Torridon);
- in seascapes where high cliffs and other geological features are prominent eg 31 (West Orkney) and parts of seascape units 1, 8,9,10, 28 and 29;
- in seascape units with fragmented and/or distinctively shaped islands eg 15 (Carloway – Grimininsh Point), 17 (Barra and the Sounds), 23 (South Mull/West Jura) 19 (Sound of Sleat – Point of Ardnamurchan), 26 (Firth of Clyde) and 32 (East Orkney).

Where broader bays are enclosed by more flattened land profiles, for example, Seascape Units 2 (Firth of Forth), 3 (East Fife/Firth of Tay), 6 (Moray Firth), 27 (South Arran/South Ayrshire/South East Kintyre) and 29 (Outer Solway), this scenario would not create such pronounced contrasts of scale and impinge on views of distinctive land features and the sensitivity index is likely to be unaffected, providing other criteria are met, for example, siting to avoid intrusion on distinct focal islands and other isolated features.

Similarly there would be no change to the sensitivity of Seascape Units 1, 4, 5,7 and 8 where the coastline has a less distinctive form and where the seascape character is generally open and expansive. However, the study has excluded consideration of factors such as population and recreation and these are likely to affect visual sensitivity when more detailed analyses are carried, for example for an Environmental Impact Assessment for a proposed windfarm.

4.3.3 Same windfarm typology, 20km from shore

Opportunities for windfarm development located 20km from shore, yet within the 50m sea depth limit are relatively limited but could potentially affect Seascape Units 1, 2, 3, 5, 6, 7, 15, 16, 17,18, 21, 22, 27,29 and 32.

The following effects may occur:

- in Seascape Units located around the shallow east coast firths (1,2,3,6 and 7) landform variations are generally less pronounced than in other parts of Scotland (for example the west coast) and development would be unlikely to interfere with views of any isolated focal features eg offshore islands and feature hills due to the distance from land. These units lose the enclosure associated with the firth and at 20km the seascape character is more expansive and open. The sensitivity of these seascape units to this particular development scenario would therefore be reduced;
- in seascape units 32 (East Orkney), 15 (Carloway – Griminish Point), 16 (West Uists) and 17 (Barra and the Sounds) while significance would be reduced by the increase in distance and turbines would be unlikely to visually conflict with the small scale complex pattern of islands closer to shore, the introduction of development into what are generally perceived to be remote and unmodified seascapes would remain as a key factor influencing sensitivity;
- in Seascape Unit 18 (West Tiree), sensitivity would remain (ie Medium – High) the same due to potential effects on the distinctive landform of Rum;
- within Units 21(West Mull/East Tiree and Coll), 22 (West Islay) and 27 (South Arran/South Ayrshire/South East Kintyre) this development scenario would relate to the character of more open sea

and would be unlikely in the main to conflict with the more flattened island profiles with a resultant reduction in sensitivity. It should however be noted that the perception of remoteness and undeveloped character may still be affected and would remain as a key influence on sensitivity;

- within Seascape Unit 29 (Outer Solway Firth), sensitivity would be slightly reduced as development becomes less visually dominant, thus diminishing potential effects on the traditional farmland, high cliffs, designed landscapes and historic features on land. Views across open sea and to the distant Lake District hills may however be affected.

4.3.4 Summary of general principles which apply to all scenarios

- turbines have greater potential to create significant effects the closer to shore although smaller size of turbines could reduce these effects;
- although at greater distance scale contrasts would reduce, impacts could still be considerable particularly when siting development into previously undeveloped or remote areas;
- development closer to shore would have higher potential to be visually associated with coastal features in more views;
- turbines should be sited to avoid being visually linked with distinctive natural features such as cliffs, stacks, offshore islands and intricate coastlines or significant cultural heritage features such as castles;
- turbines should be sited to avoid interrupting important key views eg towards St Kilda or the Paps of Jura;
- turbines should be sited to avoid interrupting important 'slot' (or framed) views out to open sea from within sounds or inlets eg from within the Kyles on the north coast or Loch Seaforth on Lewis.

4.4 Review of current policy and guidance relating to wind energy development

4.4.1 Introduction

The brief required a review of SNH policies in order to sit this study within the context of current guidance and to make recommendations for the seascape dimension of SNH locational guidance for offshore windfarms. The review focussed on the following documents identified in the brief:

- Renewable Energy (SNH Policy Statement 01/02, 2000);
- Strategic Locational Guidance for Onshore Windfarms in Respect of the Natural Heritage (SNH Policy Statement 02/02, 2002);
- Marine Renewable Energy and the Natural Heritage (SNH Policy Statement 04/01, 2004) ;
- Wildness in Scotland's Countryside (SNH Policy Statement 02/03, 2003b);
- Maritime Aquaculture and the Natural Heritage (SNH Policy Statement 01/01, 2001);
- Policy Guidance: Oil and Gas Exploration and the Natural Heritage (00/02, 2002).

The brief also required that recommendations for offshore wind energy developments should, wherever possible, complement the locational guidance for onshore developments and where this was not the case to explain potential conflicts in policy.

A detailed review of these documents is contained in Appendix H. Discussion of potential conflicts and identification of any areas needing further investigation, analysis or research in relation to the current study, is outlined below.

4.4.2 Policy on Renewable Energy – Policy Statement No. 01/02

The policy generally supports the development of renewable energy sources as a replacement for energy produced from fossil fuels. The policy seeks a strategic approach in which development is guided towards the locations and technologies most easily accommodated within Scotland's landscape and habitats without adverse impact, and which safeguard elements of the natural heritage which are nationally and internationally important.

The exploration of the natural heritage impacts of offshore renewables is encouraged. The policy considers the impacts of offshore renewable developments outwith areas of high scenic or marine wildlife value may be lower than for land-based renewables. If located some distance from shore, it is noted that visual and landscape effects are less likely to be significant.

The north and west coasts of Scotland are identified in the document as offering opportunities to harness natural resources and bring about potential economic benefits within these remote areas. The policy however, stresses the importance of safeguarding valued elements of the natural heritage including wildland and highlights the potential effects of development on tourism. There is a clear preference in the policy to siting onshore development near centres of population and in more modified landscapes.

Key issues

- Wildness analyses have been done purely on land based data (see 4.5.4 below).
- Potentially there appears to be some conflict between realising opportunities on the north and west coasts of Scotland while safeguarding wildland and minimising the effects of development on tourism.
- It is not clear how the policy of siting development near centres of population and in more modified landscapes could translate to guiding offshore development.
- There appears to be an assumption in the policy that if development is offshore it is more likely to be accommodated in more remote areas due to the distance from shore reducing landscape and visual impacts.
- Issues of cumulative impact with other types of large development are not addressed in the policy.

4.4.3 Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage – SNH Policy Statement No. 02/02

This guidance considers landscape, biodiversity and earth science interests and adopts a value led approach, comprising a sieve analysis of recognised areas of value. While it does not consider landscape

character it does reference the strategic regional capacity studies carried out for the Western Isles, Argyll and East Highland and Moray.

Key issues

- This guidance considers landscape, biodiversity and earth science interests, whereas this capacity study assesses only seascape issues.
- No visibility analysis has been undertaken to inform the guidance and it is possible that the identification of areas of low visibility within this capacity study may conflict with areas of high sensitivity and vice versa, providing different results.
- In terms of landscape designations, NSAs are categorised as being of highest sensitivity while National Parks are considered secondary with only core areas included in zone 3, pending review of detailed park plans once these are in drafted.
- The maps contained in the guidance give a good indication of the coastal area sensitivity in terms of designations. The western and parts of the northern seaboards come out as very highly sensitive with combinations of NSAs and wildland. The eastern coastal areas are far less sensitive with a limited number of AGLVs being the only constraint with the exception of the Dornoch Firth NSA.

4.4.4 Marine Renewable Energy and the Natural Heritage: An Overview and Policy Statement, SNH 04/01, 2004

This policy document supports offshore renewables as it considers that potential impacts may be less than onshore technologies. However it does not seem to address the difference in likely scale of future offshore schemes in comparison to onshore schemes. Offshore windfarms are likely to be significantly larger in size of turbine, number of turbines and area taken up. It outlines potential impacts and mitigation measures and suggests that of all the offshore renewables wave and tidal stream generators have the potential for the least impact. It strongly recommends a strategic approach to planning for renewables and this current study sits well within that policy.

Key issue

- No consideration of scale disparities between onshore and offshore wind when assuming lesser impact of offshore.

4.4.5 Wildness in Scotland's Countryside – Policy statement No. 02/03

The existing search areas set out in this policy statement comprise tracts of land that include coastline. The wildland analysis undertaken to inform the policy statement has been purely land based with the marine element, including uninhabited islands, omitted from the baseline information considered.

Key issues

- The omission of the marine element in identifying search areas for wildland.

4.4.6 Maritime Aquaculture and the Natural Heritage – Policy Statement No 01/01 and Oil and Gas Exploration and the Natural Heritage – Policy Guidance Note 00/02

The above two policy notes are primarily concerned with the biodiversity impacts but there are sections relevant to landscape. The key issue to be drawn from them is that existing and potential developments in aquaculture and oil and gas exploration need to be fully considered as part of the cumulative change that can impact on the character of a seascape. Of particular concern is the impact on hitherto undeveloped or remote/wild seascapes. The approach considers landscape rather than seascape impacts.

Key Issues

- Of particular concern is the impact on hitherto undeveloped or remote/wild seascapes.
- The approach considers landscape rather than seascape impacts.

4.5 Conclusion to the policy review

4.5.1 Background

This capacity study provides a unique focus on seascapes different to the land centred information garnered by other SNH policies and guidance considered in the review. While the capacity study has used information on values from the *Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage* and also considers wildland search areas set out in *Wildness in Scotland's Countryside*, it is different in adopting a largely character led approach in determining sensitivity to offshore windfarm development.

A number of correlations, gaps and potential conflicts were found to exist between the capacity study and current policy and guidance and these are set out below with recommendations for further work also being defined.

4.5.2 Correlations between the seascape capacity study and existing policy and guidance

The capacity study has used information on values from the *Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage* and also considers wildland search areas set out in *Wildland character of Scotland's Countryside*. In terms of values, the capacity study adopts a broadly similar approach to the weighting of these values to that set out in the Strategic Locational Guidance document.

The capacity study shows a correlation with current guidance in that lower capacities are defined for the north west coast with higher capacities prevalent on the east coast of Scotland. In terms of the current policy and guidance this has come about because of the presence of NSAs and wildland which give a high sensitivity on the north west seaboards with the eastern coastal areas being far less sensitive with a limited number of AGLVs being the only constraint with the exception of the Dornoch Firth NSA. Seascape sensitivity assessments within the capacity study tend to reflect these values based sensitivities, allocating high sensitivity grades for much of the north and west mainland and some island seascapes, despite a high values index only being defined in four of the units assessed.

4.5.3 Gaps within, and potential conflicts with, existing policy and guidance

A balance needs to be struck between realising technical and economic opportunities on the north and west coasts of Scotland, as identified in the *Policy on Renewable Energy,* with the safeguarding of the natural heritage and minimising the impacts of offshore development. The capacity study will provide more detailed information towards the consideration of this issue.

Current policy favours locating onshore wind energy development relatively close to settled areas and in more modified landscapes. While it is not presently clear how this policy could translate to guiding offshore development, there are a number of issues that need to be addressed in considering seascapes. The more populated seascapes in Scotland include the firths, particularly the Clyde, Forth and Tay, as well as large settlements which are not associated with firths, such as Aberdeen. There is potential conflict here in applying the same locational policy as that recommended for onshore development, as while the landward component of seascape is indeed often greatly modified, the marine and coastal components of seascape tend to provide an important contrast to this hinterland by virtue of their apparent naturalness and are also valued as a recreational resource.

There are also potentially conflicting issues associated with guiding development towards more populated areas as opposed to the more remote and sparsely populated north west coast, where designated landscapes are more of a constraint and where the policy is to protect natural heritage interests. The seascape capacity study takes no account of population and numbers of people potentially affected by views of offshore development. None of the guidance and policies reviewed have been informed by visibility analysis. It is possible that the identification of areas of low visibility within this capacity study may conflict with areas of high sensitivity and vice versa, providing different results.

Whilst assumptions about the potentially decreased impact of offshore wind (in comparison to onshore wind) are being made scale issues need to be factored into the equation. Offshore windfarms are likely to be significantly larger in the near future and any such assumptions should be checked carefully with regard to this aspect.

4.6 Guidance

From the review it is clear that gaps appear in the present policy and guidance in relation to seascape and further policy guidance is required on the following areas:

- we recommend further investigation into the integration of these potentially conflicting areas: on the one hand supporting local communities in the remoter areas of the north and west to exploit economic opportunities of renewables and on the other safeguarding the natural heritage of those areas;
- we recommend that current policy and guidance needs to address how it incorporates and considers offshore windfarms into the favoured siting away from centres of population;
- we recommend that visibility issues should be considered by decision-makers and a balance achieved in future policy;
- we recommend the scale of future offshore wind energy developments be considered more closely when assuming offshore wind has a potential for decreased impact when compared to onshore;

- we recommend consideration of potential cumulative landscape and visual effects of offshore windfarms including those associated with other onshore windfarm developments present within Seascape Units;
- offshore windfarm development is not considered in detail in either the Policy on Renewable Energy or in Strategic Locational Guidance and assumptions tend to be made as to its likely effects on landscape and visual aspects. We recommend investigation into the correlation between distance and significance for Scottish seascapes in relation to offshore windfarms.

In addition, exclusion of the marine element in the original analysis put together for wildland search areas means that an incomplete picture of wildness for seascapes exists.

In terms of seascape it is a complex exercise to identify wild areas due to the greater degree of intervisibility at the coast and over water. The perception of wildness and the physical remoteness/isolation need to be dealt with separately as it is likely that the qualities of wildness due to the naturally elemental nature of the coast will be present in many more places than actual physical remoteness. With this in mind, we would recommend that the terms 'remote' and 'isolated' (with reference to NPPG 13) (Scottish Executive, 2001b) need to be defined more clearly in terms of coastal areas.

We would suggest that the physical remoteness of marine areas could be assessed using some or all of the following criteria (along the lines of those contained in PAN 53 "Classifying the Coast for Planning Purposes") (Scottish Office, 1999):

- stretches of coastline which are not overlooked from any roads or centres of population;
- views onto sea or uninhabited islands where there are no signs of development, or development is too far away to be significant (distances of visual significance need to be applied);
- isolated stretches of sea eg absence or sparseness of shipping lanes, oil and gas infrastructure. This may include hazardous or inaccessible stretches of sea where sailing and shipping is absent;
- coastlines which are inaccessible except by hiking or boat (need to consider distances from roads).

This sort of mapping will need to rely more heavily on visual analysis and information regarding character and nature of seas and views rather than only a mapping of distance from roads, settlements etc.

4.7 Recommendations for further research

This project has identified issues that have been beyond the constraints of this study to fully explore and resolve. We therefore recommend research in the following areas:

4.7.1 Methodology

Methodological developments in assessing landscape sensitivity for regional areas have been made over the last two years with several strategic studies being commissioned (LUC, University of Newcastle, Edinburgh College of Art, GONE). The assessment of seascape rather than landscape and the assessment of offshore rather than onshore is an area of work where innovations are still being made. Our study has developed a method which has been derived from studies done elsewhere but has been adapted for the

current subject matter. There is still a great deal of work to do to fine tune these methodologies. When we reviewed other studies we found a variety of different approaches and criteria used, some of which we found useful and others less so. We also found the terms capacity and sensitivity used differently and visibility being confused with character. Now that various capacity studies have been carried out with regard to wind energy developments and at the dawn of a new renewable energy era, an overview and full critique of the various approaches and methodologies would be timely and useful.

4.7.2 Field work and ground truthing

This study was predominantly a desk based remote study and some detailed field work to test the sensitivity judgements and ground truthing to check visibility analysis would be of benefit. This would help with the development of more detailed sensitivity criteria relating to different scenarios of development.

4.7.3 Further work on seascape assessment

Seascape assessment could be undertaken on a unit by unit or regional basis to develop a more detailed suite of seascape assessments of a similar grain to the LCA series.

4.7.4 Limits of visual significance

Further research into the relative visual ranges of Scotland and the impacts on the currently accepted distances of visual significance (based on visibility distances in Wales) would provide some answers to issues we have been unable to fully resolve here and may reflect more accurately the substantially higher potential visual ranges in Scotland.

4.7.5 Limits of visual acuity and windfarm layout

Stated in Hill *et al.* (2001), and subsequently quoted elsewhere are figures which provide guidance on the limits of the acuity of the human eye (see Appendix B). Whilst these figures serve as a useful guideline their application to offshore developments must be accurate. Often assumptions are made about visibility taking into account only the thickness of the tower but disregarding the fact that at various angles of view several turbines may coalesce theoretically making their composite thickness visible at greater distances. Further research into effects of layout on visibility distances is recommended.

4.7.6 Forces for change and cumulative impact

Renewable energy is seen as being one of the main drivers of change in the landscapes and seascapes of Scotland. Scotland may be on the verge of some dramatic changes to the character of its seascapes and how they are perceived. With increased development generally comes less sensitivity to more development, the 'thin end of the wedge' argument. Capacity studies are intended to provide guidance regarding the limits of development a particular location can accommodate before it undergoes a substantial or transformative change to its key characteristics. It is then up to society at large to evaluate the worth of those characteristics in relation to the benefits from any proposed development. However, landscape and seascapes are not static and will need to be re evaluated regularly and in these new evaluations sensitivity is likely to be decreased as development increases. Therefore further research to address the impact of this incremental effect on strategic assessment processes and policy would be useful.

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6 LIST OF ACRONYMS

AGLV	Area of Great Landscape Value
BWEA	British Wind Energy Association
CA	Cumulative Assessment
CIA	Cumulative Impact Assessment
CCW	Countryside Council for Wales
CE	Cumulative Effect
DEM	Digital Elevation Model
DTI	Department of Trade and Industry
ECA	Edinburgh College of Art
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
ETSU	Energy Technology Support Unit
GIS	Geographical Information System
GONE	Government Office North East
HGDL	Historic Gardens and Designed Landscapes
LCA	Landscape Character Assessment
LUC	Land Use Consultants
LURI	Land Use Research Institute
LULU	Locally Unwanted Land Use
MLURI	Macaulay Land Use Research Institute
NSA	National Scenic Area
SCA	Strategic Cumulative Assessment
SCIA	Strategic Cumulative Impact Assessment
SCF	Scottish Coastal Forum
SEA	Strategic Environmental Assessment
SNH	Scottish Natural Heritage
SRF	Scottish Renewables Forum
UKCS	United Kingdom Coastal Strategy
ZTV	Zone Theoretical Visibility
ZVI	Zone of Visual Influence

APPENDIX A: STUDY BRIEF

AN ASSESSMENT OF THE SENSITIVITY AND CAPACITY OF THE SCOTTISH SEASCAPE IN RELATION TO OFFSHORE WIND FARMS

1 Purpose

Scottish Natural Heritage (SNH) has produced *Strategic locational guidance for on-shore wind farms* [5], which sets out principle natural heritage sensitivities to wind farm development and offers advice on a zoned basis as to the areas best suited, in natural heritage terms, to land based wind developments. SNH considers that there is a need to extend this work to wind energy developments located in the sea.

The purpose of this project is to assess the seascape issues surrounding off-shore windfarm developments, in order that the consideration of offshore windfarm development proposals may be better informed. The results of this study will be combined with a view on the potential impacts of offshore wind farms on biodiversity interests and on recreational enjoyment to develop SNH locational guidance for offshore wind farms, as a companion policy to the existing onshore wind farm guidance. This will assist policy formulation and decision making to guide the location of offshore wind developments so as to minimise effects on the natural heritage.

2 Background

Meeting renewable energy targets

In response to the UK undertaking at Kyoto to reduce CO_2 emissions by 2010, the Scottish target for the proportion of electricity generated from renewables is about 18%. A new target of 40% by 2020 has now been agreed by the Scottish Executive.

SNH estimates that a 40% target is likely to require some 3.6 GW of additional installed renewables capacity. This is not an unreasonable target to set, but if it is to be attained in a way compatible with natural heritage interests, it will require a substantial proportion of new capacity to be derived from marine renewable energy technologies. To meet such a target, SNH has suggested that around 1.25 GW of renewables capacity would have to be from offshore wind, wave or tidal stream generators.

The study *Scotland's Renewable Resource 2001*[22] undertaken by Garrad Hassan for the Scottish Executive identified a potential 25GW of generation capacity available from offshore wind technology. However exploitation is currently limited by the need for technological development and grid constraints.

Future Offshore – planning framework

The Department of Trade and Industry (DTI) consultation *Future Off-shore*[20] sets out the potential for off-shore windfarms, identifies possible constraints and opportunities and seeks to establish a strategic planning framework, and a legal framework for regulation of proposals outside territorial waters. The first round of Strategic Environmental Assessments (SEAs) are being carried out for three areas in England and Wales. SNH recommends a SEA should be undertaken covering all waters around Scotland with potential for marine renewable development technology.

Scotland's seascape resource

Scotland is renowned for the diversity of its landscapes and seascapes and the quality of its scenery, attributes which all developments have the potential to change. In contrast with land areas, much of the Scottish marine area has seen little in the way of development and consequently remains dominated largely by natural processes.

The character of the land elements and some coastal elements that make up the Scottish coastal resource has been assessed and classified[10], and some coasts are designated for their national scenic value[15], however there is no direct equivalent to these policy and protection systems in place for the marine elements.

Natural heritage impacts of offshore windfarms – SNH policy and research

Depending on a number of factors, including the distance from shore, offshore wind development may have lesser visual and landscape impacts than onshore wind development. In a UK context, offshore wind also has the advantage that it can be sited nearer to the main centres of UK demand, thus reducing the need for onshore transmission lines with associated impacts. SNH believes that there is considerable potential for off-shore renewable energy generation and therefore supports the identification of appropriate locations for offshore renewable energy development through a process of systematic assessment so as to minimise adverse effects on both the marine and terrestrial environments.

SNH's Renewable Energy Policy[7] accepts that some change to landscapes may be required in order to deliver sufficient renewable energy, but such change should be appropriately directed by guidance.

Recent research by SNH includes the commissioned report *A review of possible marine renewable energy development projects and their natural heritage impacts from a Scottish perspective.*[1] This provides information, guidance and advice on the environmental, engineering and planning aspects associated with offshore renewable energy projects and is expected to contribute to the development of SNH policy on all marine development.

3 Aims and objectives

The key **aim** of the study is:

- to generate recommendations for the seascape dimension of strategic locational guidance for offshore windfarms to sit alongside SNH's existing Strategic Locational Guidance for On-shore Windfarms[5] in respect of the natural heritage.

The locational guidance will be a spatial planning tool.

This will be achieved through the following project **objectives**:

Objective 1: develop, agree and apply a methodology for the strategic assessment of seascape sensitivity to, and capacity for, offshore windfarm development.

Objective 2: relate the findings of the assessment to relevant SNH policies and make recommendations for the seascape dimension of SNH locational guidance for offshore windfarms.

The methods to be employed for the above objectives are outlined in Section 4.

4 Methods

Objective 1: develop, agree and apply a methodology for the strategic assessment of seascape sensitivity to, and capacity for, offshore windfarm development.

The terms 'seascape', 'sensitivity' and 'capacity' are defined in the glossary.

Seascape sensitivity should derive from an assessment of seascape character and the nature and potential impacts of offshore windfarms.

Seascape capacity should derive from the combination of seascape sensitivity with assessments of visual sensitivity and seascape value.

This is an innovative area of work and involves the development and application of a methodology which is:

- robust, repeatable and defensible;
- specific to windfarm development in off-shore locations;
- appropriate to the character of Scotland's coastline;
- informed by work undertaken to date in this field;
- on a scale appropriate to the strategic-level outputs (this is not a detailed study);
- achievable within the time and financial constraints of the study.

The assessment method should build on the *Guide to Best Practice in Seascape Assessment*, published by the Countryside Council for Wales[4] (with supplementary *Notes to SNH on proposed seascape project*[4a]) and should be informed by a desk review of recent relevant research, projects and developments, including the *Landscape Capacity study for onshore wind energy development in the Western Isles*[3], the *Landscape Capacity Study for windfarm development in East and North Highland, and Moray*[2] and *Landscape Character Assessment Guidance* produced by the Countryside Agency and SNH[19].

Instructions to Consultants

Consultants will be expected to review the approaches referred to in paragraph 4.2, the guidance in this section that follows, and any other research they consider relevant. Consultants should consider the suitability of these methodologies for the project and should set out a proposed methodology, and justification, in their submission.

Post-appointment, the consultant will agree the final methodology with the project steering group. This will be a focussed, desk based task to be completed early in the contract period and will include familiarisation with the study area, review of relevant research and references and consultation with the steering group.

The following paragraphs provide guidance only on what consultants should consider including in the methodology.

As a guide the methodology should incorporate the following elements:

- identify and agree the geographical scope of the work and review during the project;
- understand the nature of offshore windfarm developments, and their potential seascape impacts;
- division of the coast into national-scale seascape units for the assessment;
- assess the sensitivity of seascape character to offshore windfarms;
- assess visual sensitivity of the seascape to offshore windfarms;
- assess seascape value;
- synthesis of seascape sensitivity, visual sensitivity and seascape value to identify seascape capacity for offshore windfarms.

The process should be iterative, for example, the geographical limits of the project may need to be amended in the light of findings from the seascape character assessment.

More detailed guidance on what these elements may include is given below.

Identify and agree the geographical scope of the work and review during the project

Propose and verify the geographical extent of the study area (see reference to scope of study in Section 5). This is likely to include:

- desk-based survey and familiarisation with the proposed study area;
- a sift of the SNH Landscape Character Assessments (LCAs);
- reference to *Analysis of National Landscape Character Types in Scotland*[16];
- establishing intervisibility between land and sea, and 'limits of visual significance' in order to define the exact landward and seaward extent of the study area. It is expected that intervisibility will be identified and mapped using GIS.

During the project, the consultant will review the general parameters identified in Section 5, and agree any alterations with the steering group as these arise.

Understand the nature of offshore windfarm developments, and their potential seascape impacts

Familiarisation with offshore windfarm development scenarios, including reference to relevant work in other countries. Consultants will appraise relevant texts and contact relevant organisations to gain up-to-date technical information. Consultants shall investigate possible future scenarios which take into account likely technological advances.

Identification of the key aspects of offshore windfarms that are likely to affect the seascape. Categorisation of different types of offshore windfarm development (in terms of location, number, size, type and layout of turbines), including related on-shore facilities, grid connection and other associated structures.

Determine a range of windfarm scenarios and their potential impacts, identifying areas where clustering may occur and considering cumulative impacts between offshore windfarms and between offshore and onshore windfarms.

Division of the coast into national-scale seascape units

This is likely to be based on existing coastal planning cells, coastal geometry and orientation, viewsheds and intervisibility, utilising GIS. Guidance on this is available in *CCW Guide to Best Practice on Seascape Assessment*[4]. SNH *Natural Heritage Futures* series[11] provides useful background information.

Assess the sensitivity of seascape character to offshore windfarms

The seascape character assessment should focus on those physical and experiential characteristics most likely to be affected by offshore windfarm development. It will include identifying key forces for change in the seascape. It is likely that the existing classification of landscape character types within the SNH's *Landscape Character Assessments*[10] and *Natural Heritage Futures* series[11] will form a good basis for this work. In addition, SNH has identified 7 landscape characteristics (see appendix 1) that are specifically affected by windfarm development. This work provides a starting point and consultants will be required to develop criteria for assessing the effects of offshore windfarm development.

This work will result in a classification of the seascape into seascape character units. The classification should take into account how seascape characteristics are experienced/perceived, both on land and at sea. It should include an assessment of the seascape from fixed points and from travelling round it and through it (routes and viewpoints to be agreed at inception meeting).

The assessment of seascape character along with the potential impacts of offshore windfarms shall be used to generate maps of the relative sensitivity of seascape character units.

Assess the visual sensitivity of the seascape to offshore windfarms

Visual sensitivity assessment will be based on the nature of windfarm proposals and their interaction with visual aspects of the seascape. This will include aesthetic factors (such as scale, enclosure) and visibility analysis. Visibility analysis will include the identification of visually significant areas of sea and land (eg areas of high intervisibility), areas of sea that have greatest visibility from land, and areas important in key views from the land/sea. This work will also inform decisions on the geographical extent of the study area (see Section 4.6).

Assess seascape value

The study should take value-related issues into account. These issues should be kept separate from the initial assessment of seascape character. Such issues are likely to include: areas of core wildland; National Scenic Areas; Areas of Great Landscape Value, rare or unusual occurrences or combinations of seascape characteristics; and also broad indicators of historical; cultural; recreational and scientific values. The consultant should refer to the hierarchy of designations in SNH's Strategic Locational Guidance for Onshore Windfarms.

Synthesis of seascape sensitivity, visual sensitivity and seascape value to identify seascape capacity for offshore windfarms

The assessment of seascape sensitivity should be combined with the visual sensitivity and value assessments to rank seascape character units according to their capacity to accommodate change. This will include assessing the capacity of each seascape character unit for each of the different categories of windfarms and making judgements about:

- the amount of change that can be accommodated without unacceptable adverse effects on seascape character, visual aspects and without compromising the values attached to the seascape; and
- where change might be deemed unacceptable.

The assessment of capacity should take into account the degree to which adjacent character units may affect the capacity of any one particular unit.

The assessment should take account the cumulative seascape and visual impacts arising within and between seascape character units as a result of multiple off-shore windfarms and other existing offshore developments. In order to do this, the consultant is to take account of all information about windfarm developments that are currently in the public domain and those areas likely, on the basis of up-to-date information, to be targeted for off-shore windfarms.

The assessment of capacity should consider relevant forces for change in seascape character, and the rate of change.

Nature of the work – general guidance

It is envisaged that the work will be largely desk based and will include a review of offshore windfarm development scenarios, including reference to proposals and studies in other countries, review of relevant texts (see Appendix 2) and maps and consultations with the steering group, planning authorities, SNH, windfarm developers and any other relevant groups and organisations.

Field work will be required (including some sea-based work) for verification purposes. However the amount of field work is expected to be limited by the resources available and the proposed methodology proposed should take this into account. Any field work shall be carried out by a minimum of two surveyors, at least one of whom shall be a qualified landscape architect with relevant experience. The consultants may be accompanied on some visits by SNH staff. Any sea-based survey routes should be on standard ferry routes.

No work shall be undertaken on private land without the landowner's or tenant's permission. Initial enquiries for access will be made by the nominated officer. The consultant will be responsible for finalising the details of any site visits with landowners/tenants.

It is the responsibility of the successful consultant to be aware of his obligations under the Health and Safety legislation. Risk assessments will need to be completed and agreed with the Nominated Officer prior to any fieldwork commencing. A copy of consultants Health and Safety Policy should be included in submissions.

Objective 2: relate the findings of the assessment to relevant SNH policies and make recommendations for the seascape dimension of SNH locational guidance for offshore windfarms.

In order to put recommendations into existing policy context, relate the findings to relevant SNH policies, in particular:

- Renewable Energy (01/02) [7];
- Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage (02/02) [5];
- Wildness in Scotland's Countryside (02/03) [6];
- Maritime Aquaculture and the Natural Heritage (0101)[8];
- Policy Guidance: Oil and Gas Exploration and the Natural Heritage (00/02)[9].

Recommendations should:

- identify key aspects of windfarm development that are likely to have an impact on the seascape;
- draw conclusions as to the likely impacts of offshore windfarms on seascape character, visual aspects and value;
- draw conclusions on the potential magnitude, significance and acceptability of these impacts;
- provide guidance about ways in which offshore development can best be accommodated in the seascape;
- make recommendations for SNH's locational guidance for offshore wind farms, with regard to seascape and visual impacts;
    - recommendations should include advice on the sensitivity of different areas to windfarm development and cumulative impact;
    - recommendations about capacity should identify where, in the light of SNH Policies, change can be accommodated and where change might be deemed unacceptable.

Recommendations should, as far as possible, complement SNH's Strategic Locational Guidance for Onshore Wind Farms in respect of the Natural Heritage. The consultant should identify wherever there are differences and briefly explain the reasons for these differences.

Identify any areas for future research in this field.

5 Scope

In this study seascape is defined as:

An area of any extent or scale which includes the sea as a key feature. Seascape has physical and experiential attributes, and encompasses the interrelationship between the sea and sky, and may include land.

The study will consider proposed and potential offshore windfarms sited in Scottish waters and wherever they may impact on Scottish seascapes or landscapes. This may include windfarms located outside the UK Territorial limit, and within in English or Irish waters.

The study area is to include the whole of the Scottish coast. The landward and seaward boundary will be defined in consultation with the steering group following analysis of intervisibility of land and sea and the

nature and potential locations of windfarm development. The consultant should identify and apply any criteria relevant to windfarm developments which can narrow down the study area.

There is no cut-off in terms of sea-ward distance from shore, though diminishing visibility and perceived scale as distance from shore increases will lead to a natural cut-off. At an early stage in this project, the consultant should identify this distance (to be known as the 'limits of visual significance') by reference to relevant studies. The limits of visual significance will vary according to aspect, atmospheric conditions and nature of windfarm developments, and may vary between night and day.

The study should consider likely seascape and visual impacts upon both land-based viewers in Scotland, and sea-based viewers in Scottish seas. This will include marine recreational users, ferry passengers, and cruise ship passengers.

The study should consider both daytime and night-time impacts.

Footnotes

1 Scott Wilson & Downie, A.J. 2003. *A review of possible marine renewable energy development projects and their natural heritage impacts from a Scottish perspective*. SNH Commissioned Report No. F02AA414.

2 Macaulay Land Use Research Institute and Edinburgh College of Art. 2003. *Landscape Capacity Study for windfarm development in East and North Highland and Moray*. Scottish Natural Heritage (draft commissioned report).

3 University of Newcastle. 2003. *Landscape Capacity Study for Onshore Wind Energy Development in the Western Isles*. Scottish Natural Heritage (draft commissioned report).

4 Hill, M. *et al.*, 2001. *Guide to Best Practice in Seascape Assessment*. Countryside Council for Wales.

4a Notes to SNH on proposed seascape project. John Briggs, Seascapes Officer, Countryside Council for Wales. 16 May 2003.

5 Strategic Locational guidance for on-shore windfarms. SNH Policy Statement 02/02.

6 Wildness in Scotland's Countryside. SNH Policy Statement 02/03.

7 Renewable Energy. SNH Policy Statement 01/02 (SNH, 2002b).

8 Maritime Aquaculture and the Natural Heritage. SNH Policy Statement 01/01.

9 Policy Guidance: Oil and Gas exploration and the Natural Heritage. SNH Policy Statement 00/02.

10 SNH Landscape Character Assessment Reviews (Nos. 37, 71, 78, 90, 91, 92, 93, 94, 97, 100, 101, 102, 103, 111, 112, 113, 119, 122).

11 SNH. 2002. Natural Futures Series.

12 SNH response to Future Offshore. February 2003.

13 SNH response to Scotland's Renewable Energy Potential. December 2002.

14 University of Newcastle. 2002. *Visual Assessment of Windfarms – best practice*. SNH Commissioned Report No. BAT/AA303/01/02/106(B)

15 Countryside Commission for Scotland, 1978. Scotland's Scenic Heritage.

16 David Tyldesley Associates. 1998. *Analysis of National Landscape Character Types in Scotland*. Scottish Natural Heritage, unpublished report – available from nominated officer.

17 Land Use Consultants. July 2002. *Assessment of the sensitivity of landscapes to windfarm development in Argyll & Bute*. Scottish Natural Heritage, unpublished report – available from nominated officer.

18 *Cumulative effect of windfarms*. 2003. SNH draft guidance note, unpublished – available from nominated officer.

19 Countryside Agency & Scottish Natural Heritage. 2002. *Landscape Character Assessment Guidance for England and Scotland*.

20 DTI. 2002. *Future Offshore – a Strategic Framework for the Offshore Wind Industry*.

21 Scottish Executive. 2002. *Scotland's Renewable Energy Potential – Beyond 2010*.

22 Snodin, H. 2001. *Scotland's Renewable Resource*. Garrad and Hassan Partners – Report for the Scottish Executive.

APPENDIX B: FACTORS AFFECTING VISIBILITY

B.1 Curvature of the Earth

The curvature of the Earth's surface imposes a fundamental limit on the distances from which objects can be seen from sea level or ground level.

In order to arrive at a maximum distance from which an observer at sea level can just see the tips of a wind turbines blades, consider the following situation. An observer located at a point ***A*** on the coast is looking across open sea at a wind turbine located at point ***C.*** The line of sight just grazes the surface of the sea at point ***B.*** Two right-angled triangles are formed: ***ABO*** and ***OBC,*** where ***O*** is the centre of the Earth (which we assume to be spherical with radius ***r*** for these purposes). The height of the observer's eyes above sea level is h_1 and the turbine's height is h_2.

We can apply Pythagoras' theorem to the triangle ***ABO*** to get the relationship:

$$d_1^2+r^2 = (r+h_1)^2$$

Rearranging to give a formula for d_1, we get:

$$\begin{aligned} d_1^2+r^2 &= r^2+2rh_1+h_1^2 \\ d_1^2 &= 2rh_1+h_1^2 \\ &= 2(r+h_1)h_1 \\ d_1 &= \sqrt{2(r+h_1)h_1} \end{aligned}$$

h_1 is very small in relation to ***r,*** so we can approximate this formula as:

$$d_1 = \sqrt{2rh_1}$$

Clearly, the same argument applies to triangle ***OBC*** so that:

$$d_1 = \sqrt{2rh_2}$$

The maximum distance at which an observer of height h_1 can see a turbine of height h_2 is therefore given by:

$$d = d_{1+}d_2 = \sqrt{2rh_1}_{+}\sqrt{2rh_2}$$

Note that h_1, h_2, ***d*** and ***r*** must all be in the same units, usually either metres or kilometres.

In the absence of the Earth's atmosphere, it would be sufficient to apply this formula, using a suitable value for the radius of the Earth. 6,370km is an accepted value for the mean radius of the Earth to 3 significant digits. (from NASA's "Earth Fact Sheet" http://nssdc.gsfc.nasa.gov/planetary/factsheet/earthfact.html)

However, the atmosphere plays an important part in the distance we can see. Refraction of light through the air means that we can actually see slightly further than would be suggested by the simple geometry described above. A standard technique to allow for this effect is to use a larger value for the radius of the Earth by multiplying the true radius by 7/6, giving about 7,430km. (Most nautical almanacs describe this approximation.)

For example given an observer's eye height of 1.5m and a turbine height of 150m, the formula gives:

$$d = \sqrt{2rh1} + \sqrt{2rh2}$$
$$= \sqrt{2x7430x0.0015} + \sqrt{2x7430x0.150}$$
$$= \sqrt{22.29} + \sqrt{2229}$$
$$= 4.72 + 47.2$$
$$= 51.92km$$

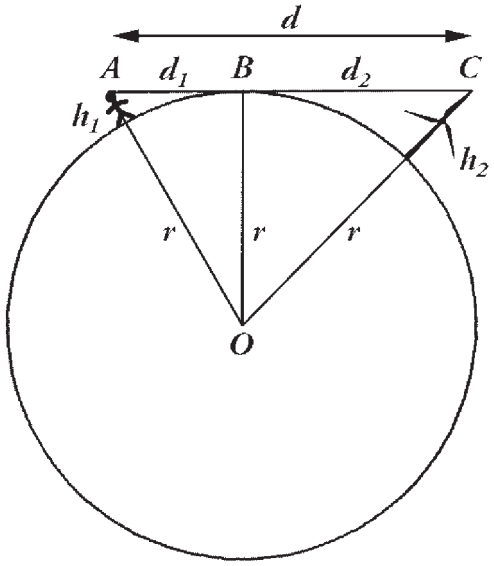
Note that if the adjusted radius of the Earth is in kilometres, the observer and turbine heights also have to be expressed in kilometres.

The calculated result of 51.92km is unnecessarily precise, given the approximations used, and it would be reasonable to state the distance as "about 52km".

The heights used in this calculation have been specified somewhat imprecisely as "above sea level". It is important to understand what that actually means in this case. The observer is assumed to be standing on solid ground and therefore has a fixed relationship with the surface of the Earth. Similarly, the wind turbine has a solid foundation on the seabed. The surface of the intervening water will, however, go up and down with the rise and fall of the tide twice each day.

The greatest visual range at which a turbine will be seen will naturally be at the lowest tides. The height of the turbines above the Admiralty Chart datum will almost certainly be known. The depths shown on each chart are relative to the "Lowest Astronomical Tide" (LAT) which provides the effective datum. The LAT is a calculated value for the lowest possible tide, taking into account only the gravitational effects due to the sun and moon (hence "astronomical"). The relationship between chart datum and the Ordnance Survey datum is given in the marginal information on each sheet (and varies from sheet to sheet).

It should be noted that, although the LAT is a good approximation to the lowest tides possible (and the one used in published tide tables) somewhat lower tides will still sometimes occur. This is because barometric pressure and wind both have an influence on the tidal flows and therefore on the level of the water.



B.2 Global visibility study

There follows a précis and discussion of the paper on global visibility:

Husar, R. B. and Husar, J. D. (1998) *Global Distribution of Continental Haziness* (Draft), Center for Air Pollution Impact and Trend Analysis, Washington University.
http://capita.wustl.edu/CAPITA/CapitaReports/GLOBVIZ/GlobVis1.html accessed October 2003.

Visibility in this study is defined as 'the maximum distance at which an observer can discern the outline of an object.' The limitations to visual range include visual acuity, number, configuration and physical and optical properties of the visible targets. The lower contrast of real targets as opposed to black objects imposes an underestimate of visual range.

This study has eliminated meteorological phenomena eg rain, snow and fog from the calculations. This study just measures haze (particulate matter in the air).

The lowest haze in Europe is found in Scandinavia. Very low haze levels below 0.1 are also observed in Iceland, Scotland and Ireland.

The study uses a standard formula to calculate visibility which is:

$$V = C/E$$

Where V is the visual range in km and E is the extinction co-efficient (measurement of how much haze is in the air). C is a constant generally taken to be 3.9 (but it depends on the threshold sensitivity of the human eye as well as the assumed contrast of visible objects against their background.) Mike Smith, a meteorological academic at Leeds University, informed us that some academics argue that a factor closer to 3 may be more suitable for marine environments. This seems to contrast other studies which suggest a greater visibility in coastal locations. However this may be something to do with the distinction between good visibility based on clean air and other optical conditions to do with the interaction of light and water etc. which may in fact reduce visibility over the sea. In this international study they have used the constant value of 1.9 which seems very low in comparison and drastically reduces visual ranges.

Therefore when one calculates the visual ranges for the extinction values of 0.1, 0.15 and 0.2 (which are the main range of values for the UK) they work out at 19km, 12km and 9.5km respectively for a constant of 1.9 whereas for a constant of 3.9 they work out as 39km, 26km and 19.5km.

However what the study shows is some regional and seasonal differences in visibility for the UK. The North West of Scotland is consistently in the highest visibility bracket throughout with extinction values of below 0.1 which gives a visual range of at least 19km (C=1.9) or 39km (C=3.9). This compares to parts of England which have extinction values of between 0.2 and 0.25 which is a visual range of 9.5km – 4km (C=1.9) or 19.5km – 15.6km (C=3.9).

In the study of global visibility some limited areas of coastal Wales are in the highest visibility bracket but only in the summer months, for the rest of the time Wales experiences lower visibility than most of Scotland. This means the difference between a visual range of at least 39km for much of Scotland and one of between

26km and 19.5km (using C=3.9) for much of Wales. This has correlations with the assessment of 24km as being at the limit of visual significance. However we must bear in mind that visual significance is not the same as visual range although obviously the latter will influence the former. Also we must bear in mind the nature of the development and the Welsh distances have been designed particularly for offshore wind farms.

Whilst interesting and useful for general assumptions, the grain of the study is far too coarse to make detailed conclusions for particular areas.

B.3: Meteorological effects on visibility in Scotland

From some general meteorological studies we have been able to conclude that the seasonal and diurnal patterns of visibility for coastal environments are significantly different and generally visibility is higher compared to landward sites. This is largely to do with meteorological effects such as fog, rain and wind patterns (Lawrence, 1976). Seasonal variation such as land fogs occur in winter and are mostly due to nocturnal radiation cooling. Coastal fogs occur more in spring and early summer when sea temperatures are low and the excess of air temperature over sea temperature is generally high. Summer coastal fogs are relatively infrequent in comparison to winter land fogs. Visibility reaches its maximum in the summer.

Fog is produced when warmer moist air moves over a colder sea or land. Therefore where the north Atlantic drift (originating from the Gulf Stream) influences sea temperatures on the west coast of Scotland there will be less fog build up than in areas unaffected by north Atlantic drift. In calm and damp conditions general widespread 'heterogeneous' fog will build up. Therefore where winds and sea breezes are strongest less fog develops. The highest maximum wind speeds are experienced on exposed west coasts, whereas on the east coast they are much lower. The highest mean speed for the east coast of Scotland is 27 mph whilst in the Western Isles it is 36 mph.

The foggiest areas with about 40 days or more per year of fog (visibility less than 1km) at some time of the day are in the lowland areas of Scotland from the Clyde basin to the Firth of Forth. The least foggy areas are the extreme northern areas of Scotland with fewer than 10 foggy days per year.

Minimum temperatures occur around dawn and therefore fog is most likely to occur then. In areas affected by air pollution this is delayed to 2–3 hours after dawn. Highest values of visibility tend to occur in the afternoon whilst poor visibility builds up during the night. This means that clear views of turbines at sunset are more likely than at sunrise, making seascapes with aspects towards sunset slightly more sensitive in this respect.

Coastal areas near centres of population may experience lower levels of visibility due to reduced air quality. However, coastal sites have much fewer occurrences of poor visibility (less than 20km) than 'clean' inland sites or polluted sites. Variations in visibility are also more stable throughout the year and times of day, whereas polluted coastal and inland sites show marked seasonal and diurnal fluctuations.

Aerosol particles are raised in dry weather by wind, vehicles etc., and this dust will persist in the air until winds disperse it or rainfall lays it. Several days rain are needed to lay this dust and afterwards evaporation from the damp ground will cause reduced visibility. However, just after the rain and before the evaporation there exist a window of exceptional visibility. Due to the regularity of rainfall in the north and west of Scotland, the lack of prolonged periods of dry weather and lack of vehicle movements etc, these 'windows'

are likely to occur more frequently. From elevated positions horizons at more than 80km distant may be identified on many days of the year and under special weather conditions detail may be visible. In Britain excellent visibility is associated with unstable polar airstreams, particularly if these come directly from more northern latitudes and across sea tracks rather than urban areas. These will disperse pollution. Thus the north west of Scotland, when other meteorological conditions are right, has some of the highest visibility in the UK and indeed globally.

High wind speeds and low pollution levels along coasts (other than urban coasts) contribute to a relatively low incidence of fog compared to inland sites. However coastal sites experience an increase in fog in spring and summer particularly in March – the most likely time of year for the creation of sea fog.

Although smoke pollution is not normally a feature of coastal areas, the atmospheric chloride content is often high. The greatest concentrations are measured in the winter months along north-western coasts owing to the general storminess of the sea which increases the spray content of the air and the salt content at cloud level. With strong onshore winds marine salt can be deposited up to 80km inland.

Haar (sea fret) is a phenomenon which occurs on the east coast of the UK north of The Wash. In late spring/early summer a light easterly wind is driven across the North Sea due to high pressure in Scandinavia. This air is cooled by the sea and leads to large scale condensation, so forming sea fog and low stratus cloud across the coast. This is largely due to the coldest patch of water for its latitude being found immediately offshore in the North Sea. This is a narrow tongue of water which may be due to a cold tidal stream from the north. The low sea temperatures plus the very long fetch (the distance over which winds can blow unimpeded) across the North Sea at this point create efficient chilling of the air mass. The sea reaches its lowest temperature (in relation to the land) during May and June. Unlike other fogs, haar can exist in wind speeds of up to 9 miles per hour. The most affected area is the strip from the Humber to the Tweed. The Scottish haar can penetrate as far inland as Glasgow. In more polluted areas man-made aerosols are a contributory factor.

In conclusion, whilst much of this information is relevant it can only be very tentatively interpreted by non-meteorologists and applied in a very general way when discussing comparative patterns of visibility for different regions of Scotland.

B.4: Illumination of the scene

The angle at which the sun illuminates a vista or landscape feature is an important consideration in studies on visibility. At higher sun angles there is less scattering of light by the intervening atmosphere in the direction of the observer. Also the vista reflects more light and therefore more image forming information, including contrast detail, reaches the eye (Malm 1999). However, John Briggs (CCW) notes that in periods of high lighting there is insufficient light/dark or colour contrast to see objects over large distances and that backlit hills in the sunset are far more visible. However, he is referring to the lighting conditions that extend the visual range of objects rather than the sort of high lighting that accentuates landscape features. This issue of backlit objects at sunset extending visual range is also noted by Malm and by various grey literature accessed on the internet discussing optimum visibility conditions for horizon astronomy. These sources state that visibility in the direction of the sun on the horizon may be virtually unlimited (given good weather conditions). However it is only the outline rather than the internal details of the object that are visible.

B.5: Object characteristics and acuity of the human eye

The eye detects relative differences in brightness. The contrast of an object is the percent difference between the object brightness and the background brightness (Malm). An object is barely visible when the contrast between the brightness of the sky and the brightness of the object is at a minimum.

The sky is lightest and whitest at the horizon and darkest at its zenith (for a midday sun). The sky is also darker when viewed from higher elevations. This is due to the reduced number of molecules of air in the line of sight scattering (reflecting) the sunlight. The more molecules, the whiter the sky will appear. Light traverses the minimum amount of atmosphere when its path is perpendicular to the surface of the earth. Towards the horizon the line of sight passes through much more air mass, which is why it is lighter. The brightness at the horizon is as bright as the air can be (Lynch and Livingston 1995). This has implications for viewing offshore turbines on the horizon as opposed to viewing onshore turbines at a high elevation on land. The sky colour will generally be much lighter/brighter (in a cloudless sky) at the sea horizon and so light coloured turbines would have less contrast with the sky and be less visible. However, it should be noted that light coloured turbines will contrast sharply with dark, stormy clouds.

APPENDIX C: LANDSCAPE CHARACTER ASSESSMENT REVIEW

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Borders (SNH Review No. 112)	19. Coastal Farmland	Coldingham/Cockburnspath	• Cliffs • Rolling farmland hinterland, cut by incised valleys
	20. Coastal Pasture	Lamberton Moor	• Cliffs • Varied knolly hinterland, coastal pasture • Exposed/rugged/open views
	21 Coastal Moorland	Coldingham Moor	• Expansive moorland plateau sloping steeply to cliffs • Dramatic open views/exposed/barren
Lothians (SNH Review No. 91)	23. Dunbar Plain		• Undulating agricultural plain backed by Lammermuir Hills • Rounded headlands and cliffs to north enclose small sand and pebble beaches backed by grass-turfed dunes • Road and rail routes often highly visible as is cement works and Torness Power Station • Open views across sea
	24. North Berwick Plain	Dunbar to Port Seton	• Coastal plain extends well inland due to flat to gently undulating landform • North Berwick Law/Bass Rock important foci Crags and low rocky outcrops form much of coastal edge and enclose sandy bays, backed by dunes – particularly extensive at Aberlady and Gullane • Arable land backs coast – historic golf courses and settlements. Major transport routes present but not generally intrusive • Views across the sea common in most of this type due to openness of plain
	25. Musselburgh/ Prestonpans Fringe		• Backed by well-defined ridgeline and merges with urban area • Coastline of low rock platforms, small rocky headlands and sandy beaches • Semi-industrial character with Cockenzie Power Station, bings, pylons and transport routes visually dominant • Agricultural hinterland and continuous settlement along coast
	26. Linlithgow/ Queensferry Farmlands		• Coastline west of Forth bridges fringed with mud flats and backed by wooded slopes with areas of raised beach above • East of bridges, small rocky headlands and sandy flats Drum Sands to Cramond Island • Diverse coastal scenery with wide reaching views of coast dominated by Forth Bridges, views of Fife across Firth have semi-industrial character interspersed with wooded policy landscapes

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Fife (SNH Review No. 113)	11. Coastal Hills	13 units around Fife coast	• Close association with coast but do not directly abut water – cliffs, Coastal Terrace or settlements generally form seaward edge • Predominantly open farmland with few trees • Extensive views across North Sea or Firths and to land beyond – inland views restricted by landform
	12. Coastal Terrace (Raised Beaches)	9 locations lying above the Coastal Flats and below Coastal Hills	• Flat or gently sloping landform Heavily settled in parts eg St Andrews, Newburgh, Leuchars
	13. Coastal Cliffs	St Andrews, Kinkell Braes, Kittock's Den, Buddo Ness and south of Kincraig	• Cliffs, cut by steep sided wooded dens • Absence of settlement although some ruins and historical features • Landward views generally confined
	14. Coastal Wooded Braes	3 locations on north coast at Drybrae, near Newport on Tay, south of Balmerino and at Flisk. Also on the south coast at Castleback, Culross, from Torryburn to Limekilns and from Aberdour to Burntisland	• High steep wooded rounded braes • narrow platforms of land at the foot of the braes, usually occupied by small linear traditional settlements • Views tend to be seawards where they are of a vast scale across the Firth of Forth
	15. Coastal Flats	17 locations including 9 on the east coast of Fife, 2 on north coast and 6 on the south coast	• Flat, low-lying, open large scale exposed coastal landscapes at sea level – some created artificially • Intensively cultivated, arable fields or forestry • Variety of other land uses including industrial, golf courses and grasslands Seaward and landward views across the flats themselves invariably extensive
	16/17 Intertidal Mudflats and Other intertidal Shores	Located almost continuously around coast of Fife	• Natural landscape dominated by sea comprising intertidal mudflats, sands, shingle and rock between mean, high and low watermarks • Typically large scale and open, simple • Views extensive in seaward direction
	18/19 The North Sea and the Firths of Forth and Tay	Two major Firths to south and north. North Sea at St Andrews Bay from Tentsmuir Point to Fife Ness	• Large scale flat horizontal natural maritime landscape • Many prominent off-shore islands • Navigation and shipping artefacts on the water plus movement of these • Effects of lights reflecting on Firths at night • Views of famous bridges, extensive and distinctive views and clear sense of place • Clutter of industrial infrastructure particularly where made-ground juts out into Firth

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Tayside (SNH Review No. 122)	14 A. Coast with Sands	Broughty Ferry-Carnoustie South of Arbroath Lunan Bay Montrose	• Low sections of coast • Sand dunes inland/blown sand deposition • Golf courses/some settlement
	14B. Coast with Cliffs	North of Carnoustie Arbroath – southern end of Lunan Bay Lunan Bay –Montrose	• Cliffs, arches, bays and rocky reefs • Headland castles/fishing villages • Productive farming up to cliff edge • Exposed
South and Central Aberdeenshire (SNH Review No. 102)	1. Formantine Links and Dunes	North of Aberdeen	• Extensive sands, beaches and dunes • Gorse/grass behind dunes, backed by flat farmland • Long expansive views along beaches and across sea • Some settlements
	2. Kincardine Cliffs	30km coastline between Aberdeen and Inverbervie	• Steep cliffs, stacks and arches, raised beach platforms • Farmland extends to cliff edge • Fishing settlements • Expansive views/exposed
	3. Kincardine Links	South of Inverbervie	• Raised beaches backed by soft eroded and vegetated cliffs • Agricultural hinterland • Settlement – some new extensive building on cliff tops
Banff and Buchan (SNH Review No. 37)	Cliffs of the North and South-East Coasts		• Cliffs, headlands, inlets occasional sandy bays and notable blow holes • Fishing villages at base of cliffs
	Dunes, Beaches from Fraserburgh to Peterhead		• Long sweeping beaches backed by dunes • Uninterrupted views • Loch of Strathbeg enclosed by dune system north of Rattray Head • Little settlement although St Fergus Gas Terminal present
Moray and Nairn (SNH Review No. 101)	Soft Coastal Shore	3 areas	• Broad intertidal flats, dunes, marsh and spits and sandy beaches • Settlement including RAF Base
	Hard Coastal Shore	2 areas	• Small coves, cliffs, pebble beaches • Farmland up to cliff edge • Views over Moray Firth to distant land • Settlements on headlands and in coves

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
	Coastal Forest	Hinterland to Soft Coastal Shore type	• Distinctive backdrop planted on dunes and gravel • Provides a feeling of remoteness and containment of views • Little settlement although quarrying
Inner Moray Firth (SNH Review No. 90)	Open Firth	Outer Moray Firth	• Low-lying coastal ledge, sand/shingle beaches • Panoramic views/lack of foci, opposite shoreline pale band
	Enclosed Firth		N/A
	Hard Coastal Shore	Portmahomack – Tarbet Ness South to the Sutors and Rosemarkie	• Raised beaches/cliffs • Abrupt edge to farmland • Greater area of sea visible as raised viewpoints • Exposed
Caithness and Sutherland (SNH Review No. 103)	High Cliffs and Sheltered Bays	North and north-east coast – extensive	• Long narrow exposed stretches of very high cliffs interrupted by bays at glen intersections • Stacks, caves, pebbles and collapsed cliffs views directed along coast and out to sea focussing on islands, rigs or boats • Backed by moorland or small farms/crofts. Road aligned parallel to coast • Access and views to coast restricted due to cliffs
	Long Beaches, Dunes and Links	East Caithness/Sutherland	• Soft linear edge to sea • Wide open space, extensive visibility • Recreation/golf links/caravan parks • May be backed by farmland or settlements
	Kyles, Firths and Sea Lochs		• Relatively well populated along shore • Frequently offer views of mountainous interior and funnelled views to sea
	Coastal Shelf	East Coast	• Elevated platform, linear semi-enclosed by inland hills thus directing views out to sea • Transport corridor/small settlements. Often farmed
	Open Intensive Farmland		• No specific coastline characteristics outlined in LCA for these types which abut the coast.
	Mixed Agriculture and settlement		
	Dispersed Small Farms and Crofts		

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Ross and Cromarty (SNH Review No. 119)	Enclosed Bay and Offshore Islands	Covers the entire coast of Wester Ross and islands	• Fingers of land, islands, sea and sky • Offshore islands site within or at edge of bays allowing some views to distant open sea • Indented coastline with sheltered rocky and sandy bays, exposed rocky promontories • Islands strong focal points within simple horizontal composition • Views from bays contained by headlands • Dead end roads to remote promontories although development with through roads aligning bays and cutting across headlands, settlement concentrated along coast and bays • Fish farms a feature within some sea lochs and bays
	Fjord		• Narrow sea loch strongly contained wither side by steep vertical shore • Rugged Mountain massif often directly backs this type • Funnelled views directed out to sea and often framed by mountains
	Moorland	A variety of moorland types are identified in this LCA. Although they form the hinterland to the coast, the shoreline itself appears to fall with the 'Enclosed Bay and Offshore Islands' LCT	
	Cnocan	Occurring occasionally in Wester Ross (also in Western Isles)	• Complex landform forming highly indented and undulating rocky knolls and dips • Intimate scale and often remote • Small islands create a fragmented coastline
	Rugged Mountain Massif	Occurs directly against the coast in parts of Wester Ross. In other areas, mountain massif further inland also influences views from coast	
Skye and Lochalsh (SNH Review No. 71)	Fjord	only occurs in small areas such as Loch Hourn and Kylerhea	• Deep dark waters/narrow sided fjords contained by steep sided mountains • Little coastline as land appears to sink into water due to steepness of slopes • Often inaccessible and remote

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Skye and Lochalsh *(continued)*	Sounds and Narrows	Covers extensive areas of coast	• Linear spaces • Views dominated by sea and coastal edge • Settlement and activity concentrated along shoreline with crofting and roads • Tranquillity in narrow channels due to sheltered aspect • Tidal banding prominent on shore • Islands often present • Fish farming
	Off shore Islands	Found in sounds	views of islands dominant feature and character of islands themselves varying visibility of island dependant on whether island is seen against land backdrop location relative to mainland important in terms of focus
	Moorland	Various forms of moorland present	Stepped moorland on north west Skye forms cliffs settlement and access routes utilise shelter of steps in moorland Smooth moorland has a weakly defined coastal edge Rocky Moorland forms indented coastal edge often with scattering of off shore islands
	Harbour Settlement	associated with Sounds and narrows LCT NB Linear Crofting LCT also associated with coast but no specific description given and only small areas defined	Shelter offered by Sounds and narrows attract harbour development
	Rugged Massif/ Sweeping Peaks	appear to abut coast description focuses on characteristics of type only	(need to take account of presence of these types as hinterland to coast)
Lochaber (SNH Review No. 97)	Rugged Coastal Hills		• Low rounded hills with relatively steep sides and rugged ice scoured rocky surface • Generally wild and inaccessible • Views of sea and island; hills descend either directly to the coast of via more gentle 'Rocky Moorland'
	Rocky Coastland		• Low rounded rocky peninsulas heather covered/grazed • Incised coastal edge with off-shore rocky outcrops • occasional white sandy beaches often backed by crofts or machair • Views of characteristic profiles of Small Isles

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
	Stepped Basalt/Crofted Basalt Coast		• In places, dark basalt cliffs with stepped profile • Views across sounds and narrows emphasising dramatic cliff profiles of eroded stacks and arches • Small patchwork of fertile croft farmland backed by exposed basalt hills • Presence of sea and interceding beaches is a key component of views lending an exposed feel to the landscape
Argyll and the Firth of Clyde (SNH Review No. 78)	Coastal Plain	NB This LCA defines landscape types directly abutting the sea rather than type solely categorised on the basis of shoreline characteristics	• Flat linear coastal plain • Pasture, transition to marsh, mudflats and beach
	Rocky Mosaic		• Rocky indented coast with off shore islands and small sandy bays • Raised beaches, cliffs and distinctive rounded knolls
	Low Coastal Hills		• Narrow sandy beaches at coast
	Coastal Parallel Ridges		• Narrow rocky ridges which break down to form chain of rocky islands at coast • Horseshoe shaped narrow sandy bays and extensive mudflats
	Rocky Moorland/ Boulder Moors		• Steep cliffs • Rocky Bays with off-shore islands • Wild rugged landscape
	Slate Islands		• Low coastal hills, distinctive dark ledges of slate jutting into the sea • Wedge shaped islands • Deeply indented coastline with peninsulas and chains of rocky off shore islands
	Sand Dunes and Machair		• Open windswept sand dunes in broad coastal bays • Golf courses/hotels
Ayrshire (SNH Review No. 111)	Raised Beach Coast	Forms much of Ayrshire coastline and western coast of Arran	• Level shelf backed by steep, sometimes craggy escarpment • Mostly farmed, woodland on escarpment • settlements, transport routes • Views of Arran and Ailsa Craig distinctive
	Lowland Coast		• Lowland wind blown sand, rounded bays with sandy beaches backed by dunes • Settled and heavily developed in areas
	Coastal Fringe with Agriculture	Found on Great and Little Cumbrae and on Arran	• Agricultural fringe backed by mountains and hills

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
	Coastal Headlands	Found on Arran – too detailed to be significant in capacity study	N/A
	Coastal Lowland Moor	Found on Arran – too detailed to be significant in capacity study	N/A
Dumfries and Galloway (SNH Review No. 94)	Coastal Flats	Found adjacent to river mouths in 3 areas – various sub-types	• Exposed, long views across coastal flats as they merge into waters of Solway • Coastal Plain (sub-type) comprises gently undulating pasture/major communications/ sparse settlement • Estuarine flats, sand and mud, salt marsh occasional dunes, hinterland of coastal moss and forestry
	Peninsula	In western half of D+G	• Intimate sheltered bays with stony beaches or narrow shelf used as transport corridor, frequently inaccessible coastline • Mull of Galloway – steep cliffs up to 180m • Farmed, pasture or gorsey moorland forms hinterland • Old forts and castles on rocky western coast • Coast and its influences not generally apparent beyond 1km on mainland
	Coastal Granite Uplands	Present in 3 locations	• Rugged granite hills rising steeply form coast to 100m altitude • Improved pasture/rough grazing, gorse and rocky outcrops, farms • Forested hill slopes, policy parkland • Exposed
Shetland Isles (SNH Review No. 93)	Farmed and Settled Lowlands and Coast		• Scattered crofts, grazing land, gently sloping to flat landform • Open exposed landscapes • Views of outlying islands and fragmented coastline NB many sub-types of this
	Coastal Edge	Covers much of coastline	• Dramatic cliffs, stacks, arches and some sandy beaches • Backed by moorland/rough grazing
	Farmed and Settled Voes and Sounds		

Appendix C *(continued)*

Landscape Character Assessment	Coastal Types	Location	Summary of Key Characteristics
Orkney (SNH Review No. 100)	Cliff landscapes	This is a particularly complex LCA with a number of LCTs lying on the coast – some of these are small and only significant types are therefore outlined in this review	• Predominantly found on Atlantic west coasts • Eroding coastal features, cliffs, stacks and caves with cliffs up to 200m • Rough grassland/moor to cliff edge
	Coastal Sand		• Generally flat with sand deposition landforms and features • Wide sandy bays and dunes, backed by grassland • Archaeologically sensitive landscapes
	Holms and other Islands		• Holms: small rocky uninhabited islands • 'Whaleback' and 'Ridgeback' islands also identified
	Low island Pastures		• Flat pastures – machair and links, allowing extensive views over sea • Exposed and open
Western Isles (SNH Review No. 92)	Knock and Lochan	Mainly found on the east coast of Harris/Uists	• Small knocks and depressions, fragmenting into coast, small rocky promontories, bays and off shore skerries • Small scale intimate landscape with filtered views to open sea
	Rocky Moor	Found on western coasts in general	• Views across sounds dotted with small islands to larger islands beyond and out to sea
	Mountain Massif		• Deeply indented coast dominated by rocky headlands, sea cliffs and occasional caves
	Crofting		• Parallel to coast, backing either sandy bays or rocky coasts (in case of sub types 2 or 3)
	Machair	Found on western coasts	• Sweeping curves of coastal beaches, low headlands backed by dune systems protecting expansive machair grasslands • Views to open sea predominate, more varied in Harris where islands and mountain landscapes add diversity

APPENDIX D: DESCRIPTION OF SEASCAPE CHARACTER TYPES

Type 1: Remote High Cliffs

Location

- St Abbs, Borders
- Mull of Galloway and some headlands on Solway Firth
- North west Sutherland Coast
- Atlantic coasts of Orkney
- Parts of Shetland Coast
- North Caithness

Physical characteristics

High cliffs, often over 200m tall, with occasional small sandy or stony bays at their base, contained by rocky headlands. Stacks, caves and collapsed cliffs are often features of this coastline. There is a strong contrast of line and form arising between the sheer verticality of cliffs and wide horizontal expanse of the sea.

This type usually has a high moorland, or occasionally, mountainous, hinterland where semi-natural heathland is the dominant landcover. Settlement is generally absent although occasional small villages can be found tucked in bays and inlets or extensive crofting on tops within Highland areas. Light houses can be prominent features on headlands. This type has a remote, wild character due to the absence of roads and settlement. Where roads exist they are aligned parallel to the coast, for example, the North Sutherland coast.

Access and views to the coast from the hinterland are restricted due to the cliffs. Wide elevated views are directed along the coast and out to open sea, although views of other islands are possible from parts of Orkney. Views of rigs or boats can be a focus within the maritime component of this type. The Northern quality of light often gives intense clarity in views.

Experiential qualities

Atlantic coasts of Orkney and Sutherland and parts of Shetland coast have a particularly exposed character and are physically remote from settlement. The coast is difficult to access and the water's edge is often blocked by impassable steep cliffs. These are exhilarating and awe-inspiring coastlines due to the great height of cliffs giving elevated and distant views and being particularly dramatic when the sea is turbulent. The noise of sea birds nesting on cliffs and waves add to the attraction and excitement of this seascape type.

Type 2: Mainland rocky coastline with open sea views

Location

- Extensive stretches of the north-east (Angus and Aberdeenshire) coast
- East Lothian coast between Dunbar and Pease Bay
- East Sutherland

Physical characteristics

Long straight stretches of coastline with cliffs rising to some 30 metres height and often with a raised beach edge. There are few significant headlands although geological differences create variety with softer sandstone forming an indented coast with bays and inlets, arches and caves; harder volcanic rocks producing a more resistant coastline of promontories, low cliffs and rocky shoreline. Notable blow holes on the north east coast. Productive arable farming occurs up to the cliff edge and tree cover is minimal. Compact fishing villages are found located at the base of cliffs in small bays while castles and cliff top forts occur on dramatic headland locations, for example, Dunottar near Stonehaven, and are highlighted against the simple sea backdrop. These settlements and built features appear to be spaced at even intervals and thus provide a visual rhythm of foci along the coast. Views over the North Sea are generally wide and open, although parts of the Caithness coast have views of Hoy over the Pentland Firth. Shipping is a common feature seen out to sea. Some isolated industry occurs along this coast, for example the cement works and Torness Power Station south of Dunbar.

Experiential qualities

Exposed coastline with open views. Strong historical associations of castles and cliff top fort and cultural interest of fishing villages. These coastlines are of geological and ecological interest and support nesting birds. While these are exposed seascapes, their agricultural hinterland, the presence of settlement and nearby roads and also views of shipping and occasional industry, limits the sense of wildness likely to be experienced.

Type 3: Mainland deposition coastline with open views

Location

- East coast of Angus and Aberdeenshire
- Parts of the East Caithness and Sutherland Coast
- Parts of the Outer Solway Firth

Physical characteristics

Low sections of coast comprising long, sweeping curved sandy beaches, often backed by dunes and forming a soft linear edge to the sea. This type tends to have a simple horizontal visual composition of sky, sea and land. Grassland and gorse occurs behind dunes and this is backed in turn by flat, mixed or arable farmland. Some areas of dunes (eg Barry Links) are reserved for military live firing. Golf courses occur within this type and settlements are located within farmland. Larger settlements such as Carnoustie, are popular holiday and golf resorts. St Fergus Gas Terminal is noted as being visually prominent in Aberdeenshire.

Views are long and expansive along beaches and uninterrupted, although low level, views occur over the North Sea. Ships are commonly seen at sea.

Experiential qualities

This type is located within a relatively well-populated area and beaches are an important recreational resource. The straightness of the coast and open views of the sea give a degree of exposure. The northern

coastal light can often accentuate particular textures, shapes and colours. This type has a dynamic character – both physically and experientially – visible in the migration of sand and the constantly changing character of the sea and passing weather systems.

Type 4: Outer firths

Location

- Outer Firth of Forth
- Outer Moray Firth
- Outer Firth of Tay
- Outer Dornoch Firth/Loch Fleet
- Outer Solway Firth

Physical characteristics

Sandy beaches interspersed with low rocky headlands. Backed by farmed plain of varying width with viewshed contained by the Lammermuir hills in the Lothians and coastal hills in Fife and the Black Isle which can often considerably restrict the coastal edge. Broader agricultural plains are present against the coast in East Lothian and Morayshire, although views in the latter are often restricted by coastal forestry located on dune systems. Relatively well populated with small towns and villages along coast, some of these comprising small holiday resorts. Internationally renowned golf courses on links and dunes backing coast. Occasional industry and roads and railways are aligned parallel to the coast.

Views focus on distinctive islands (Bass Rock/Isle of May) within Firth of Forth. Islands are less significant in views over Moray and Tay Firths. Land on either side of the Firths is a focus common to all these types, with settlements, and often masts and other infrastructure located on ridges, forming significant features in views. The profile of land on the opposite side of the Firth tends to flatten due to both the distance and often subtle topography. The Outer Firths, and particularly the Firth of Forth, are major shipping routes.

Sub type 4A : Smaller and less developed outer firths

This type applies to the outer Dornoch Firth and Loch Fleet which are less developed and relatively sparsely settled. These firths are generally narrower than the larger east coast firths and backed by high hills. Forestry is commonly planted on coastal dunes, some of this ecologically important in Loch Fleet, and this limits views of the coast from inland. Extensive intertidal zones and wetlands occur in this sub type.

Sub type 4B: Outer firth with distinct headlands and inlets

This sub type comprises the outer Solway Firth lying west of Southerness Point. It has a more diverse coastline than the general type with a distinctive pattern of narrow inlets interspersed and contained by rocky headlands on the Scottish coast. These inlets often have an intimate scale and contain broad estuarine flats and marsh. Forestry and policy landscapes are a feature of the hinterland with small settlements generally located within these sheltered inlets. Long views over estuarine sand, mud, salt marsh of the Firth are a feature of this sub type with the mountains of the Lake District and isolated hills, such as Criffel on the Scottish coast, forming foci in views.

Experiential qualities

The containment of the Firths where land is visible and provides shelter, generally gives a less exposed and dramatic seascape. However this sense of enclosure is weakened further to the east of the Moray Firth and Firth of Forth where the firths suddenly broaden and land flattens creating a more open seascape. The presence of ships, rigs (in the Moray Firth and Firth of Forth) settlements (particularly visible at night) and other built features and well farmed hinterland gives this type a developed character away from the open sea.

Type 5: Developed inner firths

Location

- Inner Firth of Forth
- Inner Firth of Clyde
- Cromarty Firth

Physical characteristics

Coastline of low rock platforms, small rocky headlands and raised beaches, often highly modified by settlement and communications, particularly within the Firth of Clyde. Further inland, the coastline is often fringed with tidal mud flats. These Inner Firths are backed by the well-defined ridgelines of coastal braes. Bridges, communications and industry are prominent features within this type. Industrial structures can often be tall and include oil refineries and docks within the Forth and oil rigs within the Cromarty Firth. Dockyards and ferry terminals dominate the Firth of Clyde and settlements tend to be closer together and larger, often extending onto lower slopes of the enclosing braes. Settlement along the coast is usually backed by farmland and policy landscapes. A more upland character exists within the Inner Clyde with distant views of mountains present to the north and within the Cromarty Firth to the north and west. Views of land on the opposite side are prominent due to the narrowness of the firth. The Clyde and Forth are a focus in views, the flat plane of light reflective water, although narrow, acting as a foil to land either side; the strong containment of hills direct views towards the water.

Experiential qualities

Although tidal, the inner firths do not have the same experience associated with the expansiveness, light and openness of the sea ie) no large waves or exposure to the elements. Views of settlement and industry dominate and the opposite shore is close by giving a well-settled character within the context of a landscape which is highly modified by humans.

Type 6: Narrow coastal shelf

Location

- East Sutherland Coast between Golspie and north of Helmsdale
- South Ayrshire coast

Physical characteristics

Predominantly rocky but insignificant 'straight' coastline, backed by a narrow corridor of level land tightly constricted by inland hills and the open sea and creating a distinctly linear space. The coastal shelf forms an important corridor for communications including major roads, railway lines and power lines. Steep sided narrow glens intersect the coastal shelf and these are often wooded. The coastal shelf is largely utilised for agriculture due to favourable drainage and soils. In Sutherland, crofts are often located in a linear fashion parallel to the coast. This type is generally sparsely settled with small harbour settlements situated on inlets; and with historic churches, harbours and houses within these settlements forming foci. Views focus on open sea, although Alisa Crag is a key focus from the Ayrshire coast.

Experiential qualities

The Coastal Shelf can feel remote due to the containment of inland hills/coastal scarp, although communications often are aligned close to or within this type. Views directed over sea rather than hinterland due to the presence of steep hills inland.

Type 7: Kyles and sea lochs

Location

- North Sutherland Coast

Physical characteristics

This type occurs on the deeply indented coastline of North Sutherland, forming a transition between the open sea and the glens and straths which extend from an interior landscape of large scale mountains and moorland. The sea lochs tend to form a narrow inlet of water, strongly enclosed by steep high hills. Kyles tend to be broader, surrounded by a low and gently sloped landform. The kyles are quite densely populated along their shores with small settlements concentrated at bridging points at the inlet mouth and forming a key focus in the landscape/seascape. Access routes are aligned around the shoreline or over the kyles via causeways. This landscape tends to penetrate into areas of moorland slopes and hills and its open central water space offers views of mountains.

Funnelled views along the kyle or sea loch to open sea are also a feature although, islands can sometimes restrict views. Fish farms have significant impacts within this type forming foci within coastal waters.

Experiential qualities

The containment of kyles and sea lochs limits experience of the open sea, with views focussing on land either side and an often mountainous interior. The settled character of this type together with this containment give a calm, secure feel. Strong visual rhythm of kyles, sea lochs and settlements at bridging points experienced when travelling sequentially through this type.

Type 8: Enclosed bays, islands and headlands

Location

- North west Sutherland
- Wester Ross

Physical characteristics

An indented coastline with sheltered rocky and sandy bays, exposed rocky promontories and islands creates a small scale seascape character. Offshore islands, sited within or at the edge of bays, allow some views to distant open sea. Views from headlands are of open sea, often with a 'Minch' influence and with distant views of the low Lewis coastline. Settlement and crofting is concentrated along the coast and particularly in the sheltered bays with headlands being more remote and exposed. The hinterland generally comprises rough grazing and moorland clad hills rising to steep sided mountains in some areas, giving a diversity of views. A main road is aligned close to the coast of the bays and across the base of headlands; narrow roads form dead end routes on headlands. Islands in bays form strong focal points and these tend to restrict views of distant open sea from bays.

Experiential qualities

Diversity of seascape breathtaking as each headland is traversed and a new bay opens up to view. The contrast between the remote, rough moorland of headlands and the sheltered settled bays and inlets, which provide a sense of tranquillity and sanctuary, gives this area special scenic qualities. Dominant westerly weather systems often differentially highlight sea, islands and mainland landscapes. A diverse type to travel through with views thrown back and forth, variably focussing on distant vistas or foreground details. Remote headlands can often give a sense of intense wildness.

Type 9: Sounds, narrows and islands

Location

- Applecross peninsula to Mid Kintyre and encompassing eastern seaboard of Islay, Jura, Mull, Small Isles and Skye
- Loch Fyne, Argyll
- Eriskay/Barra, Harris/North Uist, Loch Seaforth, Lewis
- Loch Ryan, Galloway.

Physical characteristics

A deeply indented and fragmented coastline, with narrows and sounds strongly enclosed by islands and mainland. The coastline line is generally low and rocky and is often an 'incidental' feature, the focus being the narrow elongated stretches of open water which act as a visual foil to often diverse landform of mountains and craggy islands. Sandy beaches occur occasionally at inlets, although are more extensive between Arisaig and Morar. The coast is strongly fragmented in places, breaking up to form a myriad of small islands such as the Slate Islands off Argyll coast. Settlement occurs along the narrow coastal edge of

sheltered sea lochs. This type is backed occasionally by crofting land but mainly comprises moorland hills. Forestry occurs in places against coast with ancient woodlands found in more inaccessible narrows such as fjords. High mountain massif occurs close to coast and dramatically features in views. Views of islands tend to be the focus from the Mainland and vice versa, with mountain ridges eg Cuillin on Skye/Paps of Jura/Rum and Harris being particularly arresting. The profiles of sea, islands and mountain ranges build up different contrasting layers which create a overall high scenic quality. The open sea is not generally obvious with views characteristically very contained in narrows and sounds and further broken by islands. A broader bay containing the Small Isles between Mallaig and North Ardnamurchan allows more open views in contrast. Fish farming occurs in sheltered bays and the Sounds are important ferry routes between islands and the mainland.

Experiential qualities

This type forms a highly scenic seascape due to the variety of landscapes seen in views against the sea. Key ferry routes cross the sounds and give changing views of islands, mainland and sea. Sandy beaches although rare, are magnets for recreation and climbing and walking are all popular pursuits within this type due to the presence of mountains close to the shore. The sheltered waters of the sounds also attract sailors and scenic coastal road and rail routes eg Fort William to Mallaig are present.

This type is not exposed to the open Atlantic being relatively calm and sheltered due to its inherent enclosure, however, views of mountains can often give it a dramatic character and it can feel remote in some of the more inaccessible narrows eg parts of Knoydart, Morvern and Loch Nevis.

Sub-type 9A: Island sounds

This sub-type principally occurs between Eriskay/Barra, Barra/Mingulay and Harris/North Uist in the Western Isles. This is a diverse seascape of sea, islands, skerries and mountainous backdrop but with distinct perception of being on an island with glimpses of open sea, with occasional rougher sea being indicators of this. Usually experienced from ferry with the 'end' destination being the focus of views.

Type 10: Outer firth with strong island influence

Location

- Outer Firth of Clyde

Physical characteristics

This type comprises a broad sea basin, distinct from the Outer Firth types on the East Mainland coast by virtue of the containment provided by hills, mountains and the large islands of Arran and Bute.

The Coastline is generally low and rocky with occasional sandy and stony beaches – often a narrow coastal ledge with prominent scarp and coastal hills limiting views inland. This type is well-settled along coastal fringes, particularly on the mainland coast where many tourist facilities and resorts are present but also concentrated on the eastern island coasts. There are a number of key ferry routes and sailing is popular in the sheltered waters of the Firth. Industry and power stations on the North Ayrshire Coast form large scale

features. Policy landscapes and woodlands are often a feature along the coast and forestry is present on steeper hillsides, principally within Cowal, Kintyre and parts of Arran. Farmland occurs on lower ground where valleys abut the coast. The serrated ridge of Goat Fell on Arran dominates views within this Firth, but views of other islands are also a feature and these can often merge with the mainland in some views, creating a highly scenic, indented coastline of kyles and sounds backed by mountains, particularly evident to the north and east.

Experiential qualities

This semi-enclosed, generally sheltered seascape is well settled and accessible. Diverse views of islands, sea and mainland focus on the mountains of Arran which provide a highly scenic seascape type despite the well settled character of the coastal fringe and the presence of isolated industry.

Type 11: Less developed inner firths

Location

- Beauly, Tay and Dornoch Firths
- Inner Solway Firth

Physical characteristics

Generally flat fertile carselands or coastal deltas contained within 'U' shaped valley and semi-enclosed by steep hills or mountains further inland. The valley form creates a strong physical and visual connection with surrounding landscape character types and the Firth is therefore less of a dominant feature than in Outer Firth types. These Inner Firths are farmed with large rectangular fields often resulting in a distinct landscape pattern seen against a simple backdrop of rough grazing/moorland on hills and foreground of water. Estuarine reed beds and mud flats occur in the Firth and there is a narrow intertidal zone; tides bring dynamic qualities to this type. A well settled landscape although with no large scale urban centres. Roads and railways are aligned along the shore of the Firth and bridging points and causeways often provide distinctive views. Historic features often form distinct landscape foci.

Sub type 11A: Inner firth with extensive intertidal zone

This sub type applies to the Inner Solway Firth which has a broad open flat character comprising extensive estuarine flats backed by a farmed coastal plain and occasional policy landscapes. While this sub type has predominantly rural character in accordance with the main type, roads, railway lines and power lines are prominent features. Long views over estuarine sand, mud, salt marsh of the Solway Firth are a feature of this type with the mountains of the Lake District forming a distinctive distant focus in views.

Experiential qualities

A calm landscape with little relationship to the sea as the firth narrows and land and landuse dominates views. The proximity of opposing sides of the Firth give clear finite horizons and a feeling of enclosure and shelter although sub type 11A has a more exposed and open character.

Type 12: Deposition coasts of islands

Location

- Atlantic coasts of Western Isles
- Low lying coasts of the Orkney Islands
- West facing coasts of Coll, Tiree, Islay, Iona

Physical characteristics

Long sandy beaches backed by dunes and low lying machair or pastures and with crofting or farms set back from coast. An open, low lying, largely treeless and windswept landscape with views of the Atlantic Ocean or North Sea, although dunes can often screen views of open sea and coast inland. Sparsely settled, low key land management and lack of coastal development.

Sub type 12 A: Machair with mountain backdrop

This sub type occurs on Harris and Barra where islands, such as Taransay, and mountainous headlands funnel and add drama to sea views.

Experiential qualities

Often wild, remote 'edge of ocean' feel. Big breakers and low lying exposure of island landscapes with few sightings of land in large scale sea views. Combination of mountains with coast provides particularly high scenic quality and drama.

Type 13: Low, rocky island coasts

Location

- Much of Lewis coastline
- East coast Western Isles
- West coast of Skye
- Coll, Colonsay and west coast of Jura/parts of Islay and west coast Mull
- Shetland Voes and Sounds.

Physical characteristics

Generally low rocky coastline, rising to cliffs in places. Moorland, either rocky, 'Stepped' or boggy, tends to back a narrow sparsely settled open coastal fringe, usually some crofting and few settlements. Views of open Atlantic Ocean in the main.

Sub type 13A: Low rocky island coasts with dramatic mountain backdrop

Applies principally to the eastern coasts of Lewis/Harris and South Uist, but also to parts of the western coasts of Skye, Rum and Mull where mountains lie close to the coast and visually contain and lend a dramatic backdrop to views.

Sub type 13B: Low rocky island coasts with distinctive mainland/island views

This sub type principally applies to north-east Lewis where views of the Assynt hills are a key feature across the Minch.

Sub type 13C: Fragmented low rocky island coasts

The 'Knock and Lochan' and fragmented lower lying coasts of the Western Isles, particularly the east coasts of Harris and North Uist where fragmented small knocks and flatter boggy islands, break off into the sea as rocky promontories and off-shore skerries. Sparsely settled, backed by small areas of crofting but mainly moorland hinterland. This is an small scale landscape with an intricate pattern where views to the open sea are restricted.

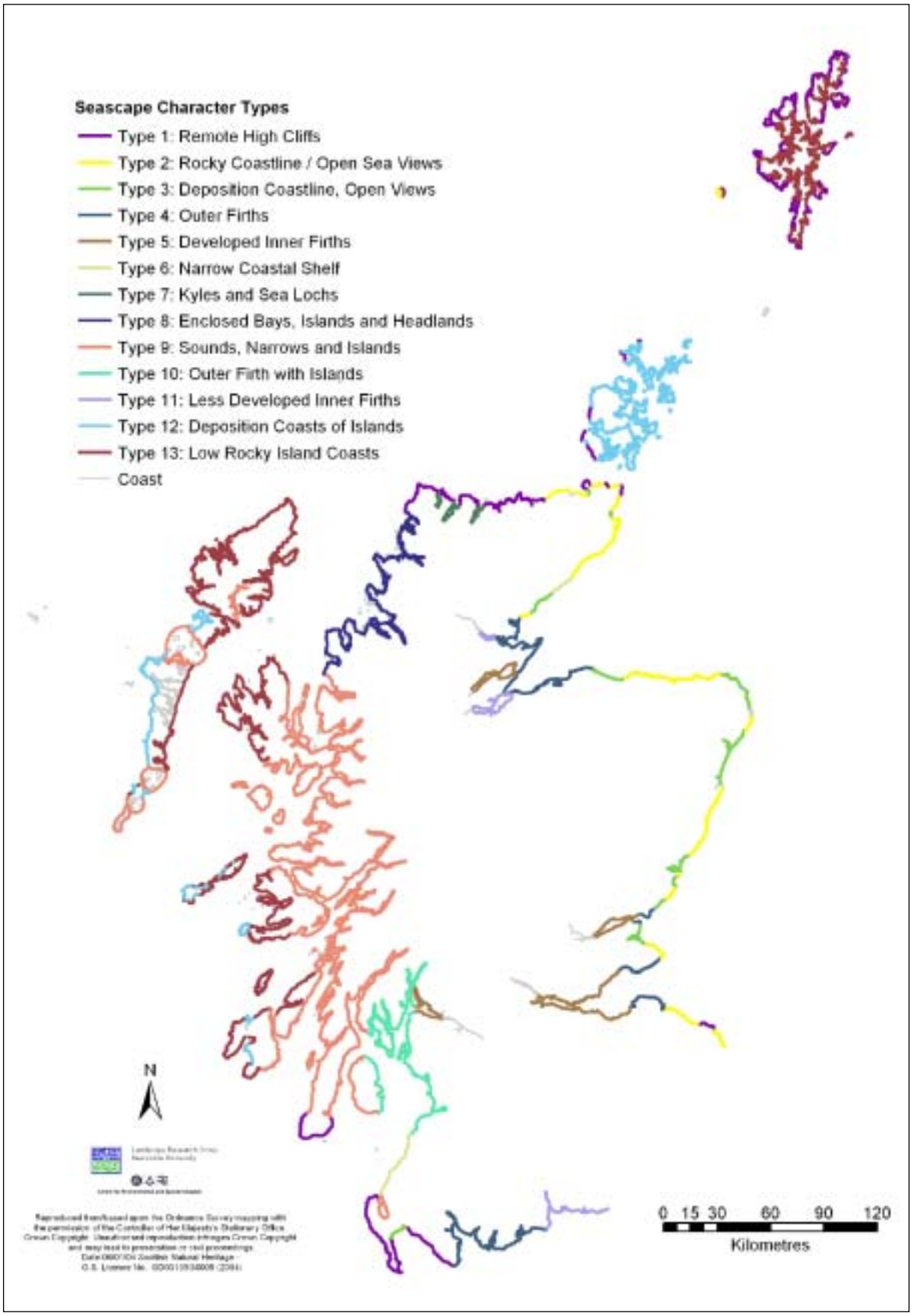
Sub type 13D: Islands, sounds and voes

This sub type comprises the farmed and settled coastal lowlands of Shetland where a deeply indented coastline creates sounds and voes with fragmented islands. This sub type generally has an insignificant low, hard coastal edge, often appearing smooth and 'submerged'. Voes and sounds form sheltered narrow channels of coastal waters with open, gently sloping hinterland of pasture, rough grazing and scattered crofting. Views over small islands to open sea are often a feature.

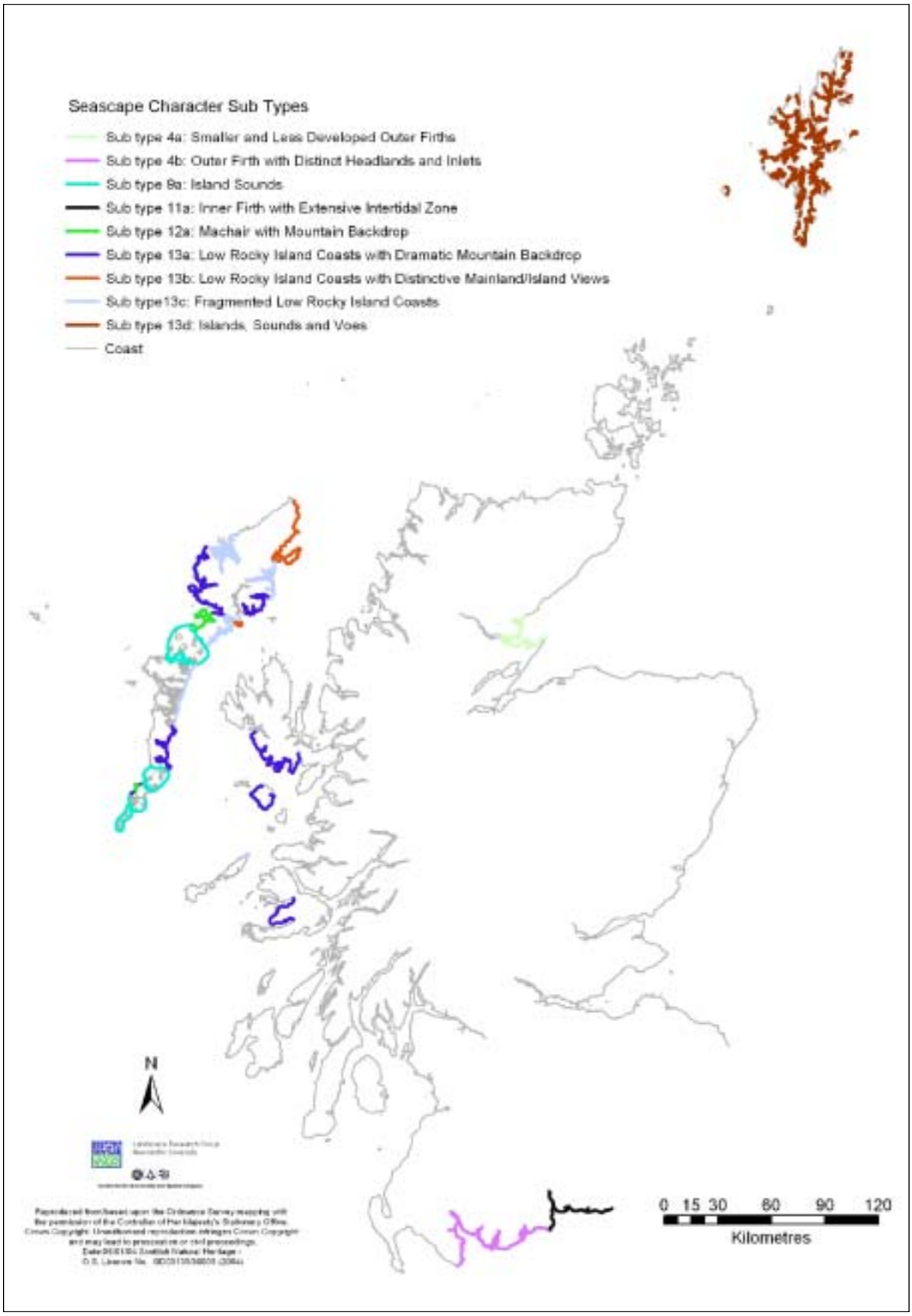
Experiential qualities

These island seascapes can feel very remote due to the sparse settlement, moorland or low key crofting hinterland and exposure to open sea. Strong sense of being on an island due to close proximity of sea often with 'all round' views and little distance from the sea.

AD1: Seascape character types



AD2: Seascape character sub-types



APPENDIX E: CURRENT AND PROPOSED DEVELOPMENTS

Development	Number	Height	Capacity	Total capacity	Water Depth	Shore	Area	Layout
North Hoyle (North Wales)	30	130m in ES (107m on website)	3MW	90MW	Less than 11m	7–8km	c 6km^2	Rectangular grid 5 x 6
Burbo (Merseyside)	30	130m	3MW	90MW	Less than 20m	6.4km	(within 10km^2)	Rectangular grid pattern spaced at intervals of 560m in a NW/SE direction and 760m in a NW/SW direction
Robin Rigg (Solway Firth)	60 (30x2)	130m	2.5MW–3.6MW	120MW	Less than 20m	7–8km	(within 10km^2)	
Codling Bank (Ireland)	220	160m	2.5MW–5MW (turbines larger than 3MW are expected to be in production by construction date)	550–1100 MW	Less than 20m	13km	55km^2	Offset grid pattern block in 13 NW/SE rows separated by 450m in the crosswind direction and 600m in the down wind direction
Horns Rev (Denmark)	80	110m	1.8MW	150MW	15m	14km	c.16km^2 (estimate from map)	In a grid 10x8 with 560m between lines

Other international proposed developments are:

Mouth of the Western Scheldt River, Holland, 100MW
Ijmuiden, Holland, 100MW
Laeso, Denmark, 150MW
Lillgrund Bank, Sweden, 48MW
Omo, Stalgrunde, Denmark, 150MW
Gedser Rev, Denmark, 15MW
Rodsand, Denmark, 600MW
Barsebank, Sweden, 750MW
Kish Bank, Ireland, 250MW+
Arklow Bank, Ireland, 200MW+

APPENDIX F: VISIBILITY PARAMETERS

In the visibility assessments of the sea from land (Figure 23) and sea to land (Figure 24) were both assessed. When considering which data to use to create a visibility index for the comparative ratings for each seascape unit the sea to land data was deemed most appropriate (Figure 25). The parameters for this were any area of sea within a buffer of 35km and a sea depth of 0–50m which could see any area of land within a 10km landward limit of the seascape unit (see Figure AF1). This most closely resembled visibility sensitivities for each unit as it is **related to this scenario of offshore wind energy development.** This is because it represents those land areas in the seascape unit which can see areas of sea below 50m depth ie it discounts areas where development would not be placed and gives a more specific view of potential change. It is also restricted to 10km inland more closely reflecting seascape areas. Note that this will give a different pattern to the more general land to sea visibility which considered all sea to a limit of 35km from a landward limit of 35km and was considered too general for this project which was looking at a specific scenario(Figure AF2). It would however give a useful general index which could be applied to other considerations.

Figure AF1: Visibility parameters used to create visibility ratings

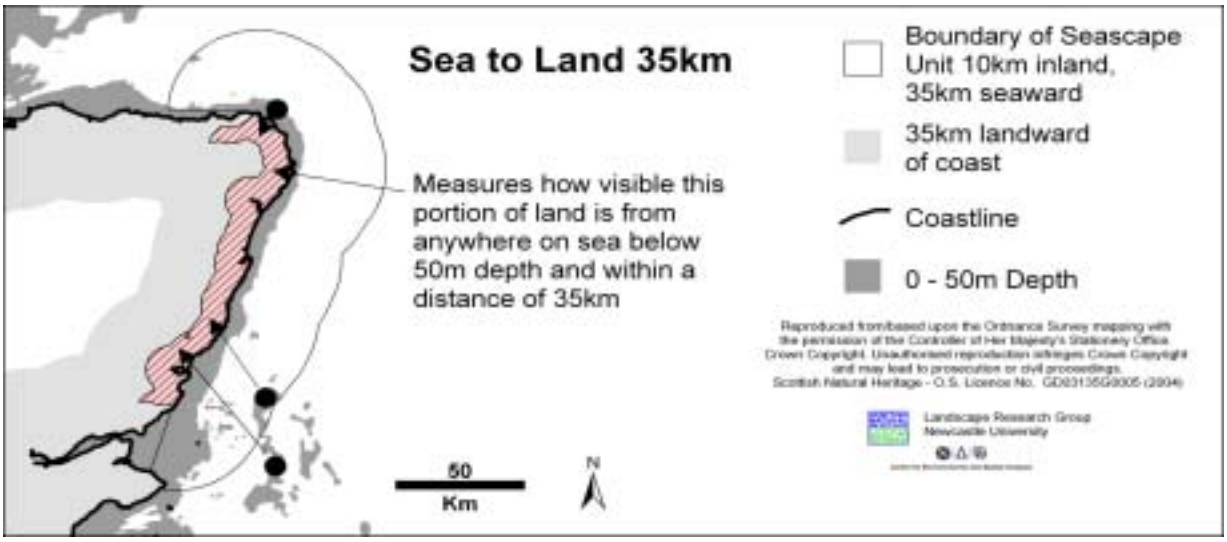
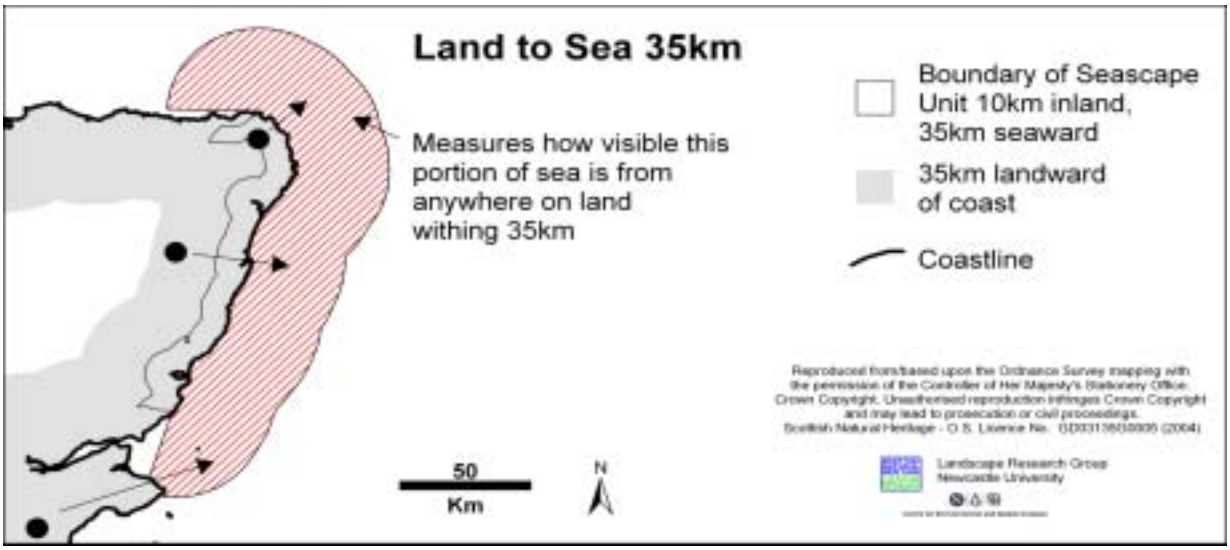


Figure AF2: Visibility parameters rejected as considered too general for this specific brief



APPENDIX G: VISIBILITY INDEX

10km landward limit/35km seaward limit/50m depth

Seascape Unit	Number of Grid Cells (GC)	Visibility Count (VC)	Ratio (GC:VC)	Visibility Index	Visibility Ranking
1 Berwick Upon Tweed	1539	443197	288	24	LOW
2 Firth of Forth	8029	3661658	456	13	LOW-MEDIUM
3 East Fife/Firth of Tay	5458	2674304	490	12	LOW-MEDIUM
4 North East Coast	6624	2534032	383	18	LOW-MEDIUM
5 North Aberdeenshire/Morayshire Coast	3112	1268497	408	17	LOW-MEDIUM
6 Moray Firth	10025	4149397	414	16	LOW-MEDIUM
7 East Caithness and Sutherland	3749	1894141	505	10	MEDIUM
8 North Caithness/Pentland Firth	2886	472942	164	28	LOW
9 Kyles and Sea Lochs	3053	293387	96	32	LOW
10 Cape Wrath – Loch Torridon	8744	1011252	116	30	LOW
11 Inner Sound/Sound of Raasay	6300	519488	82	33	LOW
12 North East Lewis	2495	589969	236	26	LOW
13 Butt of Lewis – Carloway	1420	491977	346	21	LOW-MEDIUM
14 The Little Minch	5181	1507220	291	23	LOW
15 Carloway to Griminish Point	3697	1383074	374	20	LOW-MEDIUM
16 West Uists	1405	1591432	1133	1	HIGH
17 Barra and the Sounds	400	259378	648	8	MEDIUM
18 West Coll and Tiree, Canna and Rum	569	406304	714	6	MEDIUM-HIGH
19 Sound of Sleat – Point of Ardnamurchan	569	406304	714	7	MEDIUM-HIGH
20 Sound of Mull/Firth of Lorn/Sound of Jura	12022	1309099	109	31	LOW
21 West Mull/East Tiree and Coll	2515	1137148	452	14	LOW-MEDIUM
22 West Islay	1784	1286612	721	5	MEDIUM-HIGH
23 South Mull/Colonsay/West Jura/ Sound of Islay	1776	1053424	593	9	MEDIUM
24 West Kintyre/South East Jura and South East Islay	3046	1262327	414	15	LOW-MEDIUM
25 Loch Fyne/Kilbrannan Sound	5258	1283739	244	25	LOW
26 Firth of Clyde	10616	1685156	159	29	LOW
27 South Arran/South Ayrshire/South East Kintyre	2494	1251279	502	11	MEDIUM
28 Corsewall Point – Mull of Galloway	501	401472	801	2	MEDIUM-HIGH
29 Outer Solway	6773	4996839	738	4	MEDIUM-HIGH
30 Inner Solway Firth	2952	1109582	376	19	LOW-MEDIUM
31 West Orkney	709	242156	342	22	LOW-MEDIUM
32 East Orkney	3151	2384247	757	3	MEDIUM-HIGH
33 Shetland	5353	1139569	213	27	LOW

APPENDIX H: POLICY REVIEW

Introduction

The brief required a review of SNH policies in order to sit this study within the context of current guidance and to make recommendations for the seascape dimension of SNH locational guidance for offshore windfarms. The review focussed on the following documents identified in the brief:

- Renewable Energy (01/02);
- Strategic Locational Guidance for Onshore Windfarms in Respect of the Natural Heritage (02/02);
- Wildness in Scotland's Countryside (02/03);
- Maritime Aquaculture and the Natural Heritage (01/01);
- Policy Guidance: Oil and Gas Exploration and the Natural Heritage (00/02);
- Marine renewable energy and the natural heritage: an overview and policy statement, SNH 04/01, 2004.

In addition, *Marine Renewable Energy and the Natural Heritage* (SNH 04/01) was also considered in the policy review. The brief also required that recommendations for offshore should wherever possible complement the locational guidance for onshore and where this was not the case to explain potential conflicts in policy. Below, the five documents are reviewed by pulling out the main points which relate to the current study and providing comments on any areas needing further investigation, analysis or research.

Policy on Renewable Energy – Policy Statement No. 01/02

Key points

1. Broad support for development of renewables in conjunction with energy conservation measures.
2. Wind energy has potential to change valued landscape characteristics which are intrinsically important and important for tourism.
3. Wildness particularly is a quality which SNH is keen to protect. In areas where natural heritage value is associated with low evidence of human intervention, and where renewable energy developments would significantly detract from these values, SNH will seek to safeguard such qualities.
4. Support good practice to encourage a positive image for renewables through good practice on siting & design.
5. Unless sensitively guided renewable technologies could result in a major and pervasive built intrusion into landscapes, some of which are already modified.
6. Renewables should be guided to landscapes that can accept change or are not highly valued. This is suggested to be already developed or visually man modified landscapes, relatively close to centres of population eg agricultural land, forests, brownfield land close to or in the Central Belt.
7. Support for offshore renewables development, especially those at a distance from the shore, as they are assumed to have less significant visual impact.

8. Renewables like offshore wind can be particularly well placed to harness the resources in remote areas in north and west Scotland and therefore present attractive opportunities to those areas which are economically fragile.

9. The major income from tourism which natural heritage values bring to economically fragile areas needs to be considered. May indicate small scale developments are better.

10. Grid infrastructure is not well geared to support renewables at present. SNH supports strengthening the grid particularly in areas of low landscape sensitivity and value without significant disbenefits for the natural heritage.

11. SNH recognises that some change to some of Scotland's landscapes is unavoidable and a priority should be to foster the kinds of technology and approaches to their adoption which are most likely to be consistent with natural heritage objectives.

12. Seek a strategic approach to safeguard elements of natural heritage which are nationally and internationally important.

13. Supports locational guidance set out in NPPG 6.

14. Supports development which minimises transmission losses.

15. Supports exploration of one or more locations for very large windfarms relatively close to the Central Belt or centres of population. Will resist pressure to place developments away from centres of population in more remote areas where impacts on natural heritage would be greater than necessary.

16. Encourages offshore renewables. Outwith areas of high scenic value such impacts may be lower than land based renewables. Supports strategic identification of appropriate locations.

Comments

Wildness analyses undertaken by SNH have been done purely on land based data. Some analysis of the wildness qualities of seascapes (including marine element) needs to be done. Point 8 – Offshore wind on north and west coasts need to consider that this does not conflict with points 3 and 9 about wildness, tourism etc.

It is not clear how the policy of siting near centres of population and in more modified landscapes translates to offshore windfarms. There seems to be an assumption that if development is offshore it is more likely to be accommodated in more remote areas due to the distance from shore reducing landscape impacts. Again this suggests a landscape rather than seascape approach and depends heavily on the distance from shore. There needs to be a full investigation of the correlation between distance and significance for Scottish seascapes.

Issues of cumulative impact with other sorts of large development is not addressed.

Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage – Policy statement No. 02/02

Key points

1. Provides a broad overview of where there is likely to be the greatest scope and the most significant constraints for onshore wind.

2. Wind energy seen as the latest driver of extensive change in the landscape, previous developments (hydro, forestry and fish farms) have largely been developed without the help of strategic approaches.

3. Outlines the main impacts of onshore wind; scale and form can cause visual confusion with surroundings, highly visible from long distances due to elevated positioning, movement attracts the eye.

4. Scale and impact is increasing significantly with larger numbers and heights.

5. Adverse impact is defined as one which leads to a loss of overall natural heritage value.

6. Reiterates guiding principles for renewables set out in above policy; national and international designations and wildland areas should be safeguarded, steer towards landscapes already developed or man modified and close to centres of population, elsewhere it will be supported if there is no significant adverse impact.

7. Produced sensitivity maps relating to landscape and biodiversity factors (primarily taking designated areas) and came up with three zones of sensitivity with hatched areas indicating that sensitivity may not relate to the whole of the area:

   Zone 1 (lowest sensitivity) covers 26% of land area where there is greatest opportunity for siting. This covers more modified and developed landscapes, eg agricultural and forestry. Cumulative impacts however will need to be considered carefully and also more localised areas of importance/sensitivity. Particularly mentioned is "the high degree of intervisibility and recreational popularity associated with coastal locations means that they are likely to require particular care.";

   Zone 2 (medium sensitivity) comprises 48% of land area and includes local and regional designations (the non-core areas of the two national parks, a 10km buffer around NSAs (hatched), the three regional parks, AGLVs and Gardens and Designed Landscapes). Some areas are hatched to suggest that not all land within that area will be sensitive and there may be some opportunity for siting. Overall there is some limited scope for careful development at the appropriate scale.;

   Zone 3 (high sensitivity) covers 26% of land area where there are designations of national or international importance, in landscape terms, the 40 NSAs. The core parts of the two national parks, Loch Lomond and the Cairngorms are included but these are defined as the NSAs which fall within that area. It also includes SNH wildland search areas (hatched and stresses that these areas are not definitive). It is judged that development would generally be incompatible with the natural heritage sensitivities (although some very limited development may be possible) and developers are encouraged to look outwith this zone.

8. For each of the above landscape designations/categories the document includes the relevant NPPG guidance taken from:
   NPPG 6 Renewable Energy Developments
   NPPG 11 Sport, Physical Recreation and Open Space
   NPPG 14 Natural Heritage
   NPPG 18 Planning and the Historic Environment

Comments

This approach combines landscape, biodiversity and earth science interests whereas the current study is assessing only landscape/seascape issues. The onshore locational guidance is also taking a value led

approach and has not considered landscape character although it does mention the strategic regional capacity studies (Western Isles, Argyll and the Highlands). The current study is more integrated with the landscape character work on a strategic level. Another major difference is the visibility analysis which is absent in the onshore locational guidance. The identification of areas of low visibility may conflict with areas of high sensitivity and vice versa. This may mean slightly different results. The current study is a capacity study whereas the locational guidance is a sieve analysis of previously identified areas of value.

It is interesting how National Parks have been treated, in effect treating only those parts which are also NSAs as the highest sensitivity implying that the designation of national parks in itself is not enough for it to be included in the highest sensitivity. The justification for this is that not all areas within the national park are necessarily of the highest natural and cultural heritage and that in the absence of more detailed park plans only the core areas are included in zone 3. This will be reviewed when more detailed plans are available.

The maps give a good indication of the coastal area sensitivity in terms of designations. The western and parts of the northern seaboards are identified as very highly sensitive with combinations of NSAs and wildland. The eastern coastal areas are far less sensitive with a limited number of AGLVs being the only constraint with the exception of the Dornoch Firth NSA.

Wildness in Scotland's Countryside – Policy statement No. 02/03

Key points

1. This report considers the value and significance of wildness, the pressures and forces for change and gives guidance on how to identify wildness and wild land.

2. It supports the policy approach to wildland in NPPG 14 The Natural Heritage which defines wildland as *'uninhabited and often relatively inaccessible countryside where the influence of human activity on the character and quality of the environment has been minimal.'*

3. Wild landscapes are valued for engagement with the physical world, closeness to nature, solitude and sanctuary and as a quality in their own right.

4. A distinction is drawn between wildness, a quality enjoyed which can be found in many places, and wildland, where wildness is best expressed and which is limited to the most remote and uninhabited landscapes. These are taken to be the core areas of mountain, moorland, remote/isolated coast and uninhabited islands. Wilderness is a term taken to refer to the type and scale of pristine landscape not found in Britain eg the Arctic wastes and as such its use is avoided.

5. Wildness can be experienced in more managed countryside settings. Isolated coasts (including those in more developed areas of southern Scotland) are mentioned here as having potential for local significance.

6. The challenges of western and northern waters are acknowledged to offer similar wildness qualities as those on land but are not covered by this policy statement.

7. Wildland in Scotland is significant within the context of Britain and also Europe. It rests on five main factors: scarcity, intrinsic quality, potential for nature, economic (importance for tourism), accessibility (they are relatively accessible with the advent of better trunk roads).

8. Change to wildland has been incremental and hard to catalogue. Main forces for change are: hydro-electric schemes, forestry, roads, access for recreation, marine fish farming, military purposes, masts, pylons, broadcasting stations, ski developments, increased grazing, traffic noise and light pollution, renewables and the perception of wildland as land not utilised which makes it attractive for LULUs.

9. The cumulative effect of all the changes listed above can be significant.

10. The report has attempted to identify areas of potential wildland using a number of criteria and mapping areas distant from public and private roads. They used 2km, 5km and 8km. At 8km only a few locations show such land, notably south east Lewis, west Jura, Fisherfield and west Inverness-shire. It is noted that not all areas will have the same intrinsic qualities and criteria used to assess these are as follows:

    perceived naturalness
    lack of constructions or other artefacts
    little evidence of contemporary land uses
    rugged or otherwise challenging terrain
    remoteness and inaccessibility
    extent of area
    a sense of solitude and sanctuary
    a sense of risk, awe or anxiety
    perceptions that the landscape is arresting or inspiring
    fulfilment from the physical challenge required to penetrate such places.

11. SNH's policy is that in the core areas of wild land a restrictive approach to development should be taken as it would be inimical to the intrinsic qualities and character of the landscape.

12. Wildland should not be made a designation as there is already a suite of designations which provide some protection. Another layer of designation would add to the confusion already experienced.

Comments

The existing search areas identify locations which include coastline and this has been used in the current study to map wildland search areas to input into the value layer. However, the wildland analysis has been purely land based with the marine element missing (this has been confirmed with SNH staff), also the uninhabited islands are not included in the search areas. This means that an incomplete picture of wildness for seascapes exists. The terms 'remote' and 'isolated' in terms of coastal areas (with reference to NPPG 13) need to be defined more clearly.

In terms of seascape it would be a complex exercise to identify wild areas due to the great intervisibility at the coast. For example a long stretch of isolated coastline on one side of a sea loch may face onto developments and settlements on the other side of the loch in which case does the water in between give a greater sense of separation than if it was land? In other words we cannot view all stretches of water as 'wild' and certain waters and views over water may detract from qualities of wildness.

The perception of wildness and the physical remoteness/isolation need to be dealt with separately as it is likely that the qualities of wildness due to the naturally elemental nature of the coast will be present in many

more places than the actual physical remoteness. Physical remoteness of marine areas could be assessed using some or all of the following criteria:

- stretches of coastline which are not overlooked from any roads or centres of population;
- views onto sea or uninhabited islands where there are no signs of development, or development is too far away to be significant (distances of visual significance need to be applied);
- isolated stretches of sea eg lack of shipping lanes, oil and gas infrastructure. This may include hazardous or inaccessible stretches of sea where sailing and shipping is absent.;
- coastlines which are inaccessible except by hiking or boat (need to consider distances from roads).

This sort of mapping will need to rely more heavily on visual analysis and information regarding character and nature of seas and views rather than only a mapping of distance from roads, settlements etc.

Maritime Aquaculture and the Natural Heritage – Policy Statement No. 01/01

Key points

1. The aquaculture industry has grown rapidly and is dominated by the farming of Atlantic salmon. Farming of other fin-fish such as cod and halibut and the growing of shellfish are on the increase.

2. Planning control is to be transferred from the Crown Estate to the local authorities and new planning guidance has been issued.

3. Fin-fish and shellfish farms are widespread in west coast sea lochs and among the Western and Northern Isles. Development pressure exists for new sites creating an increasing need to consider the cumulative impact on the natural heritage.

4. Fish farming can have landscape impacts. These are the cumulative impact of increasing numbers of sites and the use of currently undeveloped coastline. Strategic planning as well as good siting and design are essential.

Oil and Gas Exploration and the Natural Heritage – Policy Guidance Note 00/02

Key points

1. Much of the North Sea has already been licensed for exploration and technological advances mean that the exploitation of deeper more exposed areas to the west of Shetland (the Frontier Blocks) are now the main areas of interest within the UK Continental Shelf (UKCS).

2. Most of the current exploration is carried out in waters between the twelve nautical mile limit and the edge of the UKCS and is within the advisory limit of the Joint Nature Conservation Committee. Within the territorial limit the responsibility for advice regarding impacts on the natural heritage is held by SNH.

3. Advice will mainly relate to impacts on wildlife and biodiversity, but in inshore waters and for landward licences, there may be additional concerns about the impact of associated infrastructure on the landscape and amenity and these should be fully considered.

Comments

The above two policy notes are primarily concerned with the biodiversity impacts but there are sections which are relevant to landscape. The key issue to be drawn from them is that existing and potential developments in aquaculture and oil and gas exploration need to be fully considered as part of the cumulative change which can impact on the character of a seascape. Of particular concern is the impact on hitherto undeveloped or remote/wild seascapes. The approach also considers landscape rather than seascape impacts and this may need further analysis.

Marine Renewable Energy and the Natural Heritage: An Overview and Policy Statement, SNH 04/01, 2004

This policy document supports offshore renewables as it considers that potential impacts may be less than onshore technologies. However it does not seem to address the difference in likely scale of future offshore schemes in comparison to onshore schemes. Offshore windfarms are likely to be significantly larger in size of turbine, number of turbines and area taken up. It outlines potential impacts and mitigation measures and suggests that of all the offshore renewables wave and tidal stream generators have the potential for the least impact. It strongly recommends a strategic approach to planning for renewables and this current study sits well within that policy.