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GORDONBUSH WINDFARM

Scottish and Southern Energy

Location of Tourism and Recreation Sites

- Turbine Location
- 501 year old harbour
- Bird and sea life watching
- Built and cultural heritage
- Coastal visitor area
- Community heritage initiative with genealogical significance
- Deer stalking and grouse shooting
- Fishing - lower end to the sea open to the public – southern bank
- Fishing by boat – estate and hotel boats
- Genealogical tourism and heritage
- Gold panning interpretation / Layby
- Golf club
- Golf course
- Harbour
- Heritage interpretation centre
- House and gardens popular
- Informal walking route
- Interpretation centre
- Local visitor centre / information point
- Natural resource with interpretation centre
- RSPB visitor centre
- Retail and visitor facilities
- Retail and visitor information, mineral museum

Scale 1:300,000

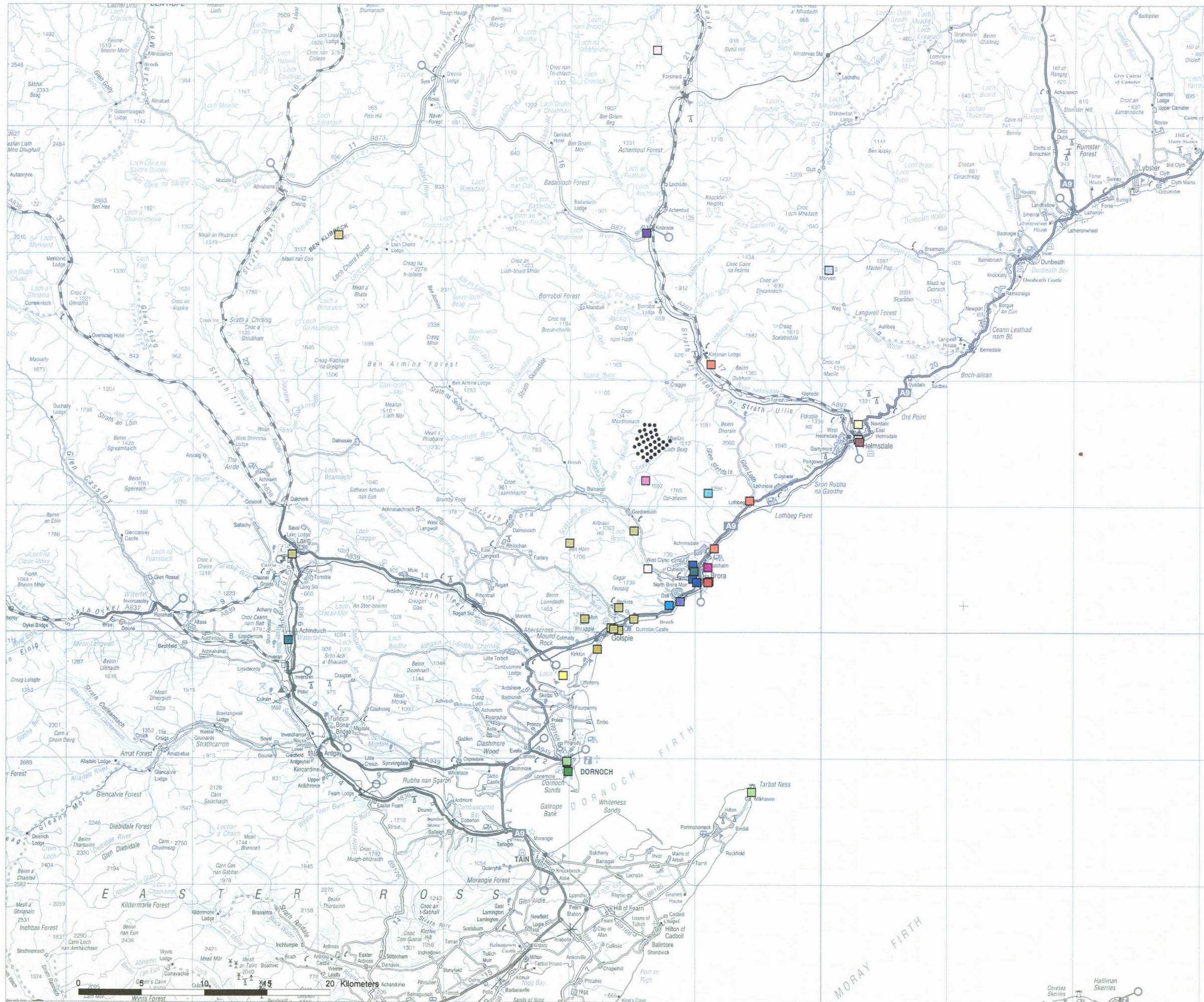


Figure 16.1

17. SOCIAL AND ECONOMIC EFFECTS

INTRODUCTION

- 17.1. This Chapter considers the potential social and economic effects of the proposed development. This includes consideration of existing land uses on and in the vicinity of the site, potential effects on communities, and economic effects (including investment and employment generation) in terms of both direct and indirect effects. The analysis also considers potential effects on public safety during construction and operation of the windfarm.
- 17.2. Key aspects of the development which are relevant in this part of the assessment include the proposed construction process, ongoing operational maintenance requirements, as well as the presence of the windfarm in the area. The health and safety procedures associated with construction and operation of the windfarm, have also been taken into account.
- 17.3. The assessment also builds on the findings of the previous chapter, by assessing the economic implications of the predicted effects of the development on recreation and tourism. The social and economic assessment has considered the effects of the windfarm in relation to the wider area, including communities within the ZVI (a 30km radius).
- 17.4. This part of the assessment is closely linked with several other aspects of the EIA, including recreation and tourism, and consequently the landscape and visual assessment.
- 17.5. This part of the assessment has been undertaken by Land Use Consultants. A fuller description of the relevant experience of the company is provided in **Appendix I.I**.

POTENTIAL SIGNIFICANT EFFECTS

- 17.6. The development could have a number of direct social or economic effects including changes to the ongoing use of the site or adjacent land. Public safety issues should be considered in terms of the ways in which the windfarm is constructed and operated. Indirect social and economic effects could also arise, for example in relation to tourism expenditure and its links with local businesses. Positive social and economic effects may also arise from the development, including employment generation, support for local businesses, and of course electricity generation.
- 17.7. **Table 17.1** below summarises the potential social and economic effects of the windfarm.

Table 17.1 Summary of Potential Social and Economic Effects

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|--|
| <ul style="list-style-type: none"> • Disturbance of existing activities within the site and surrounding area; • Employment generation during manufacture, construction and operation; • Indirect economic effects from the proposed scheme (e.g. opportunities for local supplier businesses); • Risks to public safety; • Scope for meeting the ongoing need for electricity, thereby supporting / enhancing quality of life; • Possible benefits for the local community through community assistance. |
|--|

CONSULTATION

- 17.8. Consultation undertaken during the scoping stage was followed by interviews with key stakeholders with social and economic interests. Views relating to tourism (including sporting activities) and its importance within the local economy were set out in the previous chapter. Additional views are summarised in the table below:

Table 17.2 Summary of Consultation Responses relating to Social and Economic Effects

Consultee	Summary of Comments
Brora Community Council	Community benefit should be provided. Concerns about the economic implications of tourism impacts.
Caithness and Sutherland Enterprise	Raised the importance of securing community benefits including direct support and provision of employment opportunities in the area.
Golspie Community Council	No issues raised in relation to the EIA although concerns were raised in relation to traffic and the use of roads.
Highland Council	Highlighted Structure Plan Policy G4
Highlands and Islands Enterprise	Recommended that the EIA takes into account the wider implications of the windfarm for the Highland economy by considering manufacture etc. Noted the importance of linking employment opportunities with local people. Willing to work with developer to link employment opportunities with training provision. Emphasised the importance of securing community benefits.
Sutherland Partnership	Whilst the group is not in favour of, or in opposition to any particular windfarm development, they stressed the importance of tourism to the local economy and therefore the need to take potential impacts on this sector into account.

- 17.9. Views gathered in relation to the recreation and tourism effects of the development (e.g. from neighbouring landowners) have also been taken into account.

POLICY CONTEXT

- 17.10. Several policies provide the context for the assessment of the social and economic effects of the proposed windfarm development, including:

- *NPPG15, Rural Developmentⁱ*
- *NPPG6 Renewable Energy Developmentsⁱⁱ*
- *Highland Structure Planⁱⁱⁱ*
- *South and East Sutherland Local Plan^{iv}*
- *Highlands and Islands Enterprise Policy^v*
- *Sutherland Partnership Policies^{vi}*.

- 17.11. **NPPG15 Rural Development** notes that ‘*development should benefit local communities economically, socially and environmentally.*’ The NPPG states that planning authorities should adopt a more positive and proactive approach to providing development opportunities in rural areas. It also notes that renewable energy schemes form one element of rural development and that they should consequently be discussed through structure plan policies.
- 17.12. Paragraph 26 of **NPPG6 Renewable Energy Developments** recognises that renewable energy developments will also have a contribution to make in support of the Scottish Executive’s policy to encourage rural development. Whilst recognising that the number of jobs created may not be large, the guidance notes that the contribution of additional jobs during the construction period may have locally significant effects for the local economy.
- 17.13. Paragraph 2.6.15 of the **Highland Structure Plan** states that ‘*A major aspect of the Structure Plan strategy is to assist in the creation of small scale economic activity to provide employment opportunities in rural areas.*’ Paragraph 2.6.16 goes on to note that ‘*One means of achieving rural economic development is to maximise the use of the area’s natural resources and support the diversification from traditional rural industries...The high quality natural environment also underpins Highland’s primary sector industry and much of the tourism related business.*’ Policy G4 of the Structure Plan also states the Council’s expectation that developments should ‘*benefit the local community and contribute to the well-being of the Highlands, whilst recognising wider national interests.*’ This policy emphasises the commitment by the Council to enter into agreements with developers on behalf of local communities as appropriate. Such agreements will be linked with environmental, social and economic benefits.
- 17.14. The **South and East Sutherland Local Plan**^{vii} sets out the economic and social needs of the area, and provides policies which aim to achieve population growth, additional employment and housing. Policies which aim to realise these aims include land allocations and provision of premises for business and industrial use, encouraging further education, and tourism promotion.
- 17.15. *A Smart Successful Scotland – the Highlands and Islands Dimension*, prepared by **Highlands and Islands Enterprise** proposes four main objectives for the Highlands and Islands:
- Strengthening communities;
 - Developing skills;
 - Growing businesses;
 - Making global connections.
- 17.16. Key aims to achieve these objectives include, investing in community assets and services, developing community strengths, leadership and confidence, and the enhancement of the quality of the environment and culture. In order to develop skills the aims shall be fulfilled by promoting access to education and training and providing a more highly skilled and adaptable workforce. A further aim is to improve operation of the labour market, tackle economic disparities between different parts of the Highlands and Islands and invest in the labour force. For growing businesses, key aims relate to increasing e-business, entrepreneurialism and creativity, exploring opportunities to develop new businesses and achieving global success in key sectors.

17.17. The **Sutherland Partnership** is working ‘*to bring about sustainable economic, social and environmental change which will improve the quality of life for people in communities throughout Sutherland by tackling the problem of rural disadvantage and maximising the potential of its environmental assets.*’^{viii} Key aims of the partnership include:

- to enhance income and employment levels;
- to strengthen local communities and their capacity to develop local solutions to local issues;
- to ensure that development and economic activity is environmentally sustainable; and
- to strengthen and diversify the local economy.

ASSESSMENT APPROACH

Overview

17.18. The assessment, which was primarily undertaken through the desk based review and incorporated consultation findings, covers both direct and indirect activities and comprises:

- a review of existing social and economic characteristics of the site and the surrounding area (baseline analysis);
- prediction of potential direct and indirect effects of the windfarm on the local community and economy;
- input to the design of the windfarm to avoid / minimise any potential adverse effects;
- description of any residual effects.

17.19. The assessment necessarily adopts a macro level approach to social and economic effects, and does not assess effects in relation to individuals or individual businesses.

Baseline Assessment

17.20. Baseline data from published sources has been compiled and analysed, in order to establish the economic context within which the development will take place. This part of the assessment drew from the following sources of information:

- reviews of development plans and other policy documents noted above;
- analysis of economic and social data;
- reviews of site management and construction safety procedures.

Evaluation Method

17.21. The assessment has been undertaken by comparing the existing situation (baseline) with the anticipated situation should the scheme be developed. Effects relate to the nature of construction process, the indirect effects which are likely to occur and the development of the windfarm at this location. These have been considered in relation to the local economy, including use of the site itself and adjacent land.

Significance Criteria

17.22. **Table 17.3** sets out the significance criteria that have been used to evaluate the effects of the development:

Table 17.3 Significance Criteria for Assessing Social and Economic Effects

Criteria	Description
Major significance	There will be a major effect on economic activities, local businesses, the local population, or public safety.
Moderate significance	There will be a moderate effect on economic activities, local businesses, the local population or public safety.
Minor significance	There will be a small effect on economic activities, local businesses, the local population or public safety.
Insignificant	There will be no effect or a barely noticeable effect on economic activities, local businesses, the local population or public safety.

EXISTING SITUATION

General Context

17.23. The site forms part of the wider Gordonbush estate. The estate is a traditional Highland sporting estate of some 18,000 acres, which primarily generates its income from countryside sports. As noted in the previous chapter, much of the land surrounding the estate is also in use for countryside sports and game conservation. The site is within the Caithness and Sutherland Enterprise (CASE) area.

Designations

17.24. No designations are relevant to this part of the assessment.

Previous Studies / Data

17.25. Secondary data relating to local social and economic conditions was used to inform the assessment including:

- data provided by The Highland Council, including 'Sutherland Snapshots', and census statistics;
- NOMIS¹ statistics including unemployment by ward for 2002;
- Scottish Executive (2002) Economic Briefing for Highland;
- Highlands and Islands Enterprise Unemployment Digest (July 2002), and HIE Network Economic Information relating to the Caithness and Sutherland Enterprise Area;
- Information from the Sutherland Partnership, including area statistics and the Sutherland Tourism Action Plan (draft revision).

¹ The Employment Department Group on-line information system

Desk Assessment

Demographic Profile

17.26. The site is not inhabited at present. The principal settlements of Dornoch, Golspie, Brora and Helmsdale are situated near the A9 trunk road which links Sutherland to the north and south. The close proximity of the settlements generates significant movement of people between the communities on a daily basis. The spread of services and functions between the three main settlements means that they form a single economic unit for planning purposes. There are significant levels of pressure for housing in the countryside along the corridor. Closer to the site, key areas of settlement include the outlying crofting townships at East Clyne, Doll and Uppat, and there are some further areas of dispersed residential settlement along Dunrobin glen.

17.27. In terms of the wider area, demographic data suggest that the population of the area has been declining since 1981, and that this has corresponded with a decrease in employment and educational opportunities within the area. The South and East Sutherland Local Plan notes that employment generation is likely to form the most significant opportunity for reversing the decline in the local population, and that the quality of the area's environmental quality is a key factor in attracting investment. In line with national trends the population of Sutherland is getting older^{ix}.

Economy

17.28. The local economy of the Caithness and Sutherland Enterprise area depends largely on service sector employment and investment through tourism. Although agriculture continues to be a key sector, its importance, together with that of other land based industries has continued to decline in relative terms over recent years. The Local Plan confirms these figures, whilst also emphasising the importance of crofting, forestry and estate, as well as miscellaneous manufacturing businesses within the area.

17.29. New business start-up rates are a useful indicator of the economic health of an area. The 1998 rate of new business start ups in Caithness and Sutherland was higher than the Scottish average although lower than for the Highlands and Islands area as a whole.^x

17.30. The local plan notes that key prospects for future economic growth in the area include:

- improved telecommunications which could be a critical component of economic development throughout the Highlands;
- the maintenance and interpretation of high environmental quality will help to improve local job prospects. This has close links with the local tourism industry.

17.31. According to the Local Plan, national growth is predicted in employment in forestry, ranger service wardens, rural craft skills, agriculture and wildlife, visitor centres and environmental education. This is mainly a result of the wider increase in interest in 'green' tourism and enjoyment of the natural heritage.

Employment

17.32. **Table 17.4** provides a breakdown of employment within the various economic sectors of the Caithness and Sutherland Enterprise area:

Table 17.4 Employment by Sector in the Case Area

Sector	Percentage
Agriculture, forestry and fishing	2.0
Energy and water	0.6
Manufacturing	8.9
Construction	6.4
Distribution, hotels and restaurants	24.6
Transport and communications	4.5
Banking, finance and insurance	19.2
Public administration, education and health	29.2
Other services	4.4

Source: Highlands and Islands Enterprise Network Economic Information: Caithness and Sutherland Area Economic Update November 1999.

- 17.33. The South and East Sutherland Local Plan notes that an estimated 3,100 jobs are based within the plan area, with a further 80-100 residents working outside of the area. There have been significant job losses in the area in recent years in fishing, food processing, construction, retail and estate work. Within Brora itself the textile and clothing manufacturing company, Hunters of Brora, went into receivership in 2003. Unemployment rates for the Sutherland travel to work area showed a decrease from the previous year's figure of 6.5% to 5.7%. However, these figures do not take into account the influence of seasonal employment in the tourism industry which can mean that winter rates of unemployment can be up to one third higher than the annual average. The area also has the highest share of part time jobs when compared with other parts of the Highlands, (around 38%), again reflecting the significance of the tourism and service sector. Data from the 1995 Annual Employment Survey for the Sutherland area indicates that for Sutherland the proportion employed in distribution, hotels and restaurants is higher at 32.6%, with 8.1% employed in other services, compared to the Caithness and Sutherland area as a whole.^{xi}

Future Situation without the Scheme

- 17.34. It is very difficult to accurately predict local social and economic futures for the area as a whole, should the windfarm not be developed. In broad terms, population ageing and decline is an established trend which may continue, although policy making is aiming to reverse this through employment and investment. It is likely that service employment would continue to dominate, although predicted growth sectors are likely to account for a larger share of the local economy in the medium to longer term.

Summary

- 17.35. Public administration, education and health provide the most important employment sector in the area and this is unlikely to be affected by the development. Effects on the service sector are likely to have implications for the economy as a whole, despite sectoral, disadvantages such as the seasonal nature of employment and its relative vulnerability to change. Potential effects on other growth areas, such as environmental management and telecommunications / IT related developments are also likely to have an influence on the long term viability of the economy as a whole.

ASSESSMENT OF POTENTIAL EFFECTS

Project Assumptions

- 17.36. The assessment is based on the assumptions made on employment generated during construction and operational phases of the scheme. Predicted expenditure levels have been used to inform the findings. It is assumed that the turbines will not be sourced from within the Highland Council area for the purposes of the assessment. The effects associated with recreation and tourism set out in the previous chapter have also been taken into account.

Construction Effects

Disturbance of existing activities within the site and surrounding area;

- 17.37. Consultation with the Estate has shown that the use of the site during the construction period would have no adverse impact on the economic operation of the estate as a whole. Indeed the windfarm will provide scope for diversification of the income generated by the estate as a whole. As shown in **Chapter 16**, there will be an insignificant impact on the use of some parts of the surrounding estates for sporting activities during the construction period. These are predicted to have **insignificant – minor** effects on the local economy as a whole.

Employment generation during manufacture and construction

- 17.38. It is estimated that the capital cost of the development will be of the order of £45 million. At present there are no turbine manufacturers located in the Highland Council area, so it is likely that turbine installation staff will be sourced from further afield. However, more than 80% of the construction staff will be civil engineering and electrical contractors. There are several such contractors in the local area. The appointment of contractors will be subject to a procurement process which will consider the capabilities and experience of the prospective contractors, and their commercial proposals. It is envisaged that local contractors would be well placed to compete in such a tendering process for contracts with a value of approximately £10 million. In a regional context, such contracts would represent a **moderate** input to the construction sector economy which is sensitive to the availability of local construction projects. However, since it is a temporary impact, the overall effect is predicted to be of **minor - moderate** significance.
- 17.39. The growth of the UK renewable market has triggered a growth in UK based wind energy related manufacturing. There is currently a turbine manufacture factory at Machrihanish in Kintyre, opened in 2002, which employs a workforce of approximately 180 (Source: Vestas, 2003), and there are plans to open a tower fabrication plant at Arnish in the Western Isles. Continued growth in the renewables market may trigger further developments, which are well suited to regeneration of industrial facilities, especially oil industry fabrication yards. Any such development would probably be of major positive economic significance, local to the facility, depending on the local economic sensitivities. However, there is no certainty that such developments will proceed. Development at Gordonbush could, with other developments, provide an impetus for further wind energy related manufacturing.

Indirect economic effects from the proposed scheme

- 17.40. In order to promote the use of local services and suppliers, Scottish and Southern Energy will seek to work with the local enterprise organisations to raise the profile of local businesses

with the main contractors. Also, during the consultation process, Highlands and Islands Enterprise and Caithness and Sutherland Enterprise expressed willingness to contribute to training of operational employees and construction staff by combining ongoing skills development initiatives within the area with information about opportunities generated by the scheme. There are likely to be orders for locally supplied materials, in particular for concrete aggregates, with associated haulage. Local services required may include port services, accommodation (including out of season long term bookings), and any specialist environmental support, such as archaeologists. In turn, the expenditure will have moderate indirect positive effects on the wider economy, helping to support the local service sector, albeit for a temporary period. The effect of this is therefore considered to be of **minor** significance overall.

Risks to public safety

- 17.41. Construction sites are inherently hazardous operations, and therefore require to be managed such that risks are identified and appropriately addressed. The construction will be subject to the *Construction (Design and Management) Regulations 1994*. These regulations oblige the developer to notify the Health and Safety Executive (HSE) of the project, and to establish a safety management system encompassing risk assessment, design measures and management instructions to ensure the safety of construction and operation staff and the public. General best practice health and safety guidelines have been published by the British Wind Energy Association.^{xii} With appropriate systems in place adverse health and safety effects will be **insignificant**.

Ongoing and Operational Effects

Disturbance of existing activities

- 17.42. As with the construction effects on the immediate area, it is not anticipated that the scheme will have any significant effects on the viability of the estate as a whole. Long term disturbance to activities in the areas immediately surrounding the site, primarily in terms of impacts on sporting activities, are assessed to be minor (see **Chapter 16**) and, are considered to be **insignificant** in scale when considered in relation to the local economy as a whole. This is largely based on the conclusions of the previous assessment of tourism effects.

Employment generation during operation

- 17.43. The scheme itself will generate long term employment for around 1.5 FTE jobs, based on the assumption that 8 person days maintenance work will be required for each turbine annually. Operational staff are likely to be located relatively local to the development. This will result in a **minor** positive effect on the local economy.

Indirect economic effects during operation;

- 17.44. The main potential indirect economic effects of the scheme relate to the impact of the development on tourism in the local area. The assessment in the previous chapter showed that there would be minor effects on the recreation and tourism enjoyment of the area during construction and operation of the windfarm. **Chapter 16** showed that there will be no direct impact on the majority of the area's tourist attractions and accommodation which are the main sources of income from tourism in the study area. It is considered that this will result in an **insignificant** effect on the local tourism industry and economy overall.

Risks to public safety

- 17.45. The public will be able to access the windfarm site, although locked gates will prevent vehicular access. Wind turbines are fundamentally safe pieces of equipment and provided they are maintained properly and the standard operation procedures for continued inspection are appropriate there is no requirement for turbines to have restricted public access. Turbines are manufactured in accordance with relevant standards, such as BS EN 61400-1: 1995 *Wind turbine generator systems - safety requirements*.
- 17.46. The two most commonly cited "risks" are the loss of blades and the potential for ice shedding.
- Blade loss*
- 17.47. PAN 45, paragraph 48 states:
- "A possible but rare source of danger to human or animal life from a wind turbine would be the loss of a piece of the blade or, in most exceptional circumstances, of the whole blade. Many blades are composite structures with no bolts or other separate components. Even for blades with separate control surfaces on or comprising the tips of the blade, separation is most unlikely."*
- 17.48. In reality the loss of blades or parts of blades is very rare and usually accompanied by a catastrophic event such as a direct major lightning strike. The same risks apply to all tall buildings including church spires. Wind turbine blades contain metal lightning strips, similar to the copper strips which run down a church steeple which, in the event of a strike, conduct the energy generated down the length of the blade and to the hub where they are then conducted to earth.
- 17.49. The majority of lightning strikes are dealt with completely successfully in this way, and it is often possible, on close inspection of blades which have been in service for some time, to see blades with multiple strike marks typically close to the tip of the blade. PAN 45, paragraph 49 notes:
- "The possibility of attracting lightning strikes applies to all tall structures and wind turbines are no different. Appropriate lightning protection measures are incorporated in wind turbines to ensure that lightning is conducted harmlessly past the sensitive parts of the nacelle and down into the earth."*
- 17.50. Where major lightning strikes occur on buildings or trees, the results are inevitably significant. On buildings this can result in exploding masonry and collapse of parts of the structure and, on trees, the splitting of the trunk and again falling of all, or part of, the trunk. Major strikes on wind turbines are less catastrophic and are invariably confined to the rotor blades themselves. The result of a major strike, which cannot be dissipated by the lightning protection system, is usually the axial rupture of the blade as the superheated air inside the blade expands rapidly and splits the blade from the inside. This would result in an immediate emergency turbine trip (shutdown) and the turbine would be brought to a halt. Normally in these instances the blade remains intact although occasionally there is some material loss.
- 17.51. Blade loss is therefore predicted to be an unlikely event, local to the turbine. Conditions which could result in blade loss are likely to be weather conditions which discourage recreational access. Consequently blade loss is considered to be an **insignificant** effect.

Blade Icing

17.52. Blade icing, and the potential icing shed from blades is not a common issue. For example, the Searsburg project in Vermont, USA is situated on a high ridgeline at an elevation of over 760m, and experiences both high snowfall and perfect freeze thaw icing conditions. Even on this project it is the build up of ice sheets formed on the nacelle roof which is more of a problem than the icing of rotor blades themselves. These sheets tend to build over time and unless physically removed will eventually slide off the roof of the nacelle and land within a few meters of the tower.

17.53. PAN 45, paragraph 48 recognises that design features can be applied to prevent ice being propelled from a moving turbine:

“The build-up of ice on turbine blades is unlikely to present problems on the majority of sites likely to be developed in the near future. In those areas where icing of blades does occur, fragments of ice might be released from blades when the machine is started. However, most wind turbines are fitted with vibration sensors to detect any imbalance which might be caused by icing of the blades. This enables the operation of machines with iced blades to be inhibited.”

17.54. With adequate control measures in place, ice shedding does not constitute a significant effect.

Provision of Sustainable Energy

17.55. Use of electricity is central to the application of many 20th and 21st century technological advances which improve aspects of quality of life. The concern is that such energy consumption may not be sustainable in the long term, due both to fuel supply issues (e.g. the UK is predicted to be a net gas importer in 2006/7) and environmental effects of conventional fossil fuel and nuclear generation. Renewable energy resources provide an alternative form of electricity generation, which, although there will be a continued role for conventional electricity generation for the foreseeable future, contribute towards a more a sustainable future. It is anticipated that the windfarm will generate sufficient electricity to meet the needs of approximately 42,000 households (see **Chapter 15**). The project forms part of a portfolio of renewable energy projects being developed by Scottish and Southern Energy (see Scottish and Southern Energy Strategy, **Chapter 2**), and by other developers. Cumulatively, with a target for 10% of UK energy to be supplied from renewable sources in 2010, new renewable energy projects will provide a more sustainable future source of electricity generation than the present UK generation mix. Whilst it is difficult to quantify specific impacts, on a UK-wide scale, development of new renewable energy sources is considered to be potentially of major cumulative significance for UK sustainability.

Community Assistance

17.56. Structure Plan Policy G4 addresses the issue of community benefit associated with major developments. It is common for developers to enter into agreements to provide a community fund over the lifetime of the project. In addition to its existing north of Scotland community programme, Scottish and Southern Energy recently entered into such an agreement for a new hydro scheme in Lochaber, and has initiated discussions with the Chief Executive’s Department of The Highland Council to establish principles for such a fund relating to the Gordonbush proposal. One such principle was that, whilst there is a willingness to initiate such a fund, any fund should reflect the nature and effects of the development. It was therefore agreed that it was not appropriate to progress the detail of an agreement until the proposal was finalised, at the time of the application. Consequently, at this time it is not

possible to quantify the positive impact of a community fund. although the effect is likely to be of minor to moderate significance.

Mitigation

17.57. No significant adverse effects have been identified which may require mitigation.

Residual Effects

17.58. The residual effects of the scheme would be as stated above following mitigation.

SUMMARY AND CONCLUSIONS

17.59. Table 17.5 below provides a summary of the predicted effects, mitigation and residual of the windfarm in social and economic terms:

Table 17.5 Summary of Social and Economic Effects of the Windfarm

Effects	Significance	Mitigation	Residual effects
Construction effects			
Disturbance of existing activities within the site and surrounding area	Insignificant - Minor	N/A	Insignificant - Minor
Employment generation during manufacture and construction	Minor – moderate (positive)	N/A	Minor – moderate (positive)
Indirect economic effects from the proposed scheme during construction	Minor (positive)	N/A	Minor (positive)
Risks to public safety during construction	Insignificant	N/A	Insignificant
Operational effects			
Disturbance of existing activities within the site and surrounding area	Insignificant	N/A	Insignificant
Employment generation during operation	Minor (positive)	N/A	Minor (positive)
Indirect economic effects from the proposed scheme during operation	Insignificant	N/A	Insignificant
Risks to public safety during operation	Insignificant	N/A	Insignificant

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- ^{xii} *Guidelines for Health & Safety in the wind energy industry*, The British Wind Energy Association, 2002

18. SUMMARY AND CONCLUSIONS

INTRODUCTION

- 18.1. Chapters 7 to 17 set out the assessment of effects of Gordonbush windfarm on each aspect of the environment. **Table 18.1** summarises these effects, in terms of significance, mitigation and residual effects. As set out in the Regulations, particular attention should be paid to the effects which are of major or moderate significance, and the scope for mitigating against them.

SIGNIFICANT EFFECTS PRIOR TO MITIGATION

- 18.2. As shown in **Table 18.1**, prior to mitigation, the windfarm would have the following **major** effects on the environment:
- landscape effects from three viewpoints including Viewpoint 7 (Gordonbush access track), Viewpoint 13 (Beinn Dhorain) and Viewpoint 15 (Beinn Smeorail).
 - visual effects from four viewpoints including Viewpoint 6 (Ben Horn), Viewpoint 7 (Gordonbush access track), viewpoint 13 (Beinn Dhorain) and Viewpoint 15 (Beinn Smeorail).
 - effects during construction on groundwater and surface water quality should a pollution incident occur. The ES also concluded that the probability of such incidents occurring is low.
- 18.3. In addition, the following effects would have an effect of **moderate** significance prior to mitigation:
- landscape effects from six viewpoints including: Viewpoint 4 (A897 Kildonan) Viewpoint 6, (Ben Horn) Viewpoint 11 (Beinn Bhragaidh), Viewpoint 12 (Craggie Beg) Viewpoint 14 (Sciberscross) Viewpoint 17 (Armine Lodge access track).
 - visual effects from five viewpoints including Viewpoint 4 (A897 Kildonan), Viewpoint 5 (Creag nam Fiadh), Viewpoint 12 (Craggie Beg) Viewpoint 14 (Sciberscross) and Viewpoint 17 (Armine Lodge access track).
 - direct loss of blanket bog, wet modified bog, unimproved acid grassland, wet dwarf heath, wet dwarf shrub heath, dry dwarf shrub heath.
 - effects on the golden plover population on the site.
 - physical damage to archaeological sites or remains.

SIGNIFICANT EFFECTS AFTER MITIGATION

- 18.4. Mitigation cannot be undertaken to reduce the landscape and visual effects which are of major or moderate significance.
- 18.5. Effects on golden plover would also not reduce in significance, although further consideration of mitigation measures will be undertaken.
- 18.6. None of the other previously stated significant effects would occur following mitigation.

Table 18.1 Summary of Effects of Gordonbush Windfarm

Effect	Significance	Mitigation	Residual Effect
Landscape effects: construction			
site compound	minor	N/A	minor
borrow pits	minor	N/A	minor
on-site activities	minor	N/A	minor
disturbance around turbine bases and access track routes	minor	N/A	minor
Landscape effects: operation			
landscape character types that contain the site	minor	N/A	minor
adjoining landscape character types	minor	N/A	minor
Landscape effects on viewpoints <ul style="list-style-type: none"> • three viewpoints: 7, Gordonbush access track; 13, Beinn Dhorain; 15, Beinn Smeorail. • six viewpoints: 4, A897 Kildonan; 6, Ben Horn; 11, Beinn Bhragaidh; 12, Craggie Beg; 14, Sciberscross; 17, Armine Lodge access track. • eight other viewpoints included in the assessment 	major moderate minor- negligible	N/A	major moderate minor-negligible
effects on designated landscapes <ul style="list-style-type: none"> • Dornoch Firth NSA • Ben Horn AGLV. • other existing and proposed AGLVs • historic gardens and designed landscapes • wild land search areas 	negligible moderate minor– negligible negligible minor– negligible	N/A	negligible moderate minor– negligible negligible minor– negligible
effects on wild land search areas	minor	N/A	minor
effects on setting of archaeological features	negligible	N/A	negligible
Visual effects: construction			
construction of turbines	minor	N/A	minor
construction of monitoring masts	negligible	N/A	negligible
Visual effects: operation			
Visual effects on viewpoints <ul style="list-style-type: none"> • four viewpoints: 6, Ben Horn; 7, Gordonbush access track; 13, Beinn Dhorain; 15, Beinn Smeorail. • five viewpoints: 4, A897 Kildonan; 5, Creag nam Fiadh; 12, Craggie Beg; 14, Sciberscross; 17, Armine Lodge access track. • eight other viewpoints included in the assessment 	major moderate minor–negligible	N/A	major moderate minor - negligible
Sequential views when travelling along the A897	minor	N/A	minor
Cumulative effects			
effects on viewpoints	minor- negligible	N/A	minor to negligible
effect when travelling through landscape	negligible	N/A	negligible
Permanent / long term effect			
landscape and visual effects as stated in the assessment	negligible	N/A	negligible

Effect	Significance	Mitigation	Residual Effect
Ecological Effects			
Direct loss of blanket bog, wet modified bog, unimproved acid grassland, wet dwarf heath, wet dwarf shrub heath, dry dwarf shrub heath,	Moderate	<ul style="list-style-type: none"> Modification of burning regime 	Minor
Direct loss of flush / acid grassland mosaic, marshy grassland, and bracken	Minor	<ul style="list-style-type: none"> Modification of burning regime 	Minor
Effects on Birds			
Golden Eagle	Moderately low	<ul style="list-style-type: none"> N/A 	Moderately low
Peregrine	Low	<ul style="list-style-type: none"> N/A 	Low
Golden plover	Moderately high	<ul style="list-style-type: none"> N/A 	Moderately high
Snow Bunting	Very low	<ul style="list-style-type: none"> N/A 	Very Low
Noise Effects			
Noise from construction activities	Insignificant	<ul style="list-style-type: none"> N/A 	Insignificant
Noise from construction traffic accessing site	Minor, properties adjacent to local roads only away from the A9 main road	<ul style="list-style-type: none"> Management of timing, vehicle handling, speed 	Minor
Noise from operational turbines.	Insignificant	<ul style="list-style-type: none"> N/A 	Insignificant
Effects on Archaeology			
Physical damage to sites or remains (partial or total removal) on the site and listed buildings (Former Clyne Parish School)	Negligible - Moderate	<ul style="list-style-type: none"> Watching brief during construction to ensure contractors pay regard to known sites and to allow unknown remains to be identified and recorded. Sites to be fenced off prior to construction. Micrositing of access track to avoid remains. 	Negligible
Severance of features, particularly linear features e.g. field boundaries;	Negligible	<ul style="list-style-type: none"> N/A 	Negligible
Indirect impacts arising from vibration from site traffic at Sites 7 and 9	Negligible	<ul style="list-style-type: none"> N/A 	Negligible
Visual intrusion on the setting of on-site archaeology.	Negligible	<ul style="list-style-type: none"> N/A 	Negligible
Visual intrusion on the setting of Scheduled Ancient Monuments in the vicinity of the site.	Negligible	<ul style="list-style-type: none"> N/A 	Negligible
Traffic, Transportation and Access Effects			
Increased vehicle movements on local roads during construction	Minor	<ul style="list-style-type: none"> No mitigation measures required, as environmental controls form part of the construction strategy 	Minor
Changes in traffic composition, predominantly HGVs during construction	Minor	<ul style="list-style-type: none"> No mitigation measures required, as environmental controls form part of the construction strategy 	Minor
Change to traffic volumes and flows during operation	Negligible	<ul style="list-style-type: none"> No mitigation measures required, as environmental controls form part of construction strategy 	Negligible
Improvements to local roads	Minor (positive)	<ul style="list-style-type: none"> None required 	Minor (positive)
Landtake associated with junction improvements and new access track	Negligible	<ul style="list-style-type: none"> None required 	Negligible
Abnormal wear to roads	None	<ul style="list-style-type: none"> With the section 96 agreement and traffic management plan in place, no specific mitigation measures are required. 	None
Effects on Telecommunications and Aviation			
Interference with point to point transmission links operated by telecommunication service providers in the area	None	<ul style="list-style-type: none"> None required 	None
Interference with military and civilian aviation radar / communication systems	None	<ul style="list-style-type: none"> None required 	None
Interference with the reception of terrestrial TV at residences in the surrounding area	Negligible	<ul style="list-style-type: none"> Technical solutions in the event of isolated TV interference 	None
Interference with the reception of radio services at residences in the surrounding area	None	<ul style="list-style-type: none"> None required 	None
Disruption to aircraft activity in the area	None	<ul style="list-style-type: none"> None required 	None

Effect	Significance	Mitigation	Residual Effect
Effects on Hydrology and Hydrogeology			
<i>Construction Effects</i>			
Natural drainage patterns	Minor	<ul style="list-style-type: none"> Undertake site survey to identify peat pipes Modify tracks locally to avoid peat pipes where practicable. Use artificial pipes where peat pipes are disturbed. 	Negligible
Runoff volumes and rates	Minor	<ul style="list-style-type: none"> Minimise drain lengths Buffer strips No impediment of watercourses 	Negligible
Groundwater and surface water quality	Minor (major with a low probability of occurrence)	<ul style="list-style-type: none"> Good working practice including appropriate and well-located storage/ bunding of concrete and oils Follow SEPA PPG guidelines No on-site maintenance of vehicles and equipment Use of drip trays Pollution response plans developed for emergency procedures 	Minor
Groundwater levels	Minor	<ul style="list-style-type: none"> Minimised depth and extent of trackside drains Appropriate groundwater control measures 	Minor
Water supplies	Minor	<ul style="list-style-type: none"> Undertake pre construction survey Modify access track locally to avoid sensitive areas. Identify and install temporary arrangements. Reinstate existing facilities on completion of construction. 	Minor
Erosion and deposition	Minor	<ul style="list-style-type: none"> Erosion & sedimentation controls Disposal of dewatering discharge appropriately Settlement / filtration Appropriate access track design, especially in gully bottoms 	Minor
Compaction	Minor	<ul style="list-style-type: none"> N/A 	Minor
<i>Operational Effects</i>			
Natural drainage patterns	Minor	<ul style="list-style-type: none"> Construction of appropriately sized culverts Maintain land drainage standards 	Negligible
Runoff volumes and rates	Minor	<ul style="list-style-type: none"> Minimise drain lengths Minimise impermeable areas Buffer strips No impediment of watercourses 	Negligible
Groundwater and surface water quality	Minor	<ul style="list-style-type: none"> Good working practice Pollution response plans 	Minor
Groundwater levels	Minor	<ul style="list-style-type: none"> Minimise drain extents and depths Watching brief in ecologically sensitive areas Ecological monitoring of blanket bog area once windfarm is operational 	Minor
Water supplies	Minor	<ul style="list-style-type: none"> N/A 	Minor
Erosion and deposition	Minor	<ul style="list-style-type: none"> Monitor drainage network Plant exposed surfaces 	Minor
Compaction	Minor	<ul style="list-style-type: none"> Appropriate access track design 	Minor
Air Quality and Climate			
Effects on receptors from changes in air quality as a result of dust arising from construction activities	Negligible (temporary)	<ul style="list-style-type: none"> No mitigation measures required, as environmental controls form part of construction strategy 	Negligible
Effects on receptors from changes in air quality as a result of emissions from construction vehicles	Negligible	<ul style="list-style-type: none"> No mitigation measures required, as environmental controls form part of a construction strategy 	Negligible
Contributing to UK emissions reduction (cumulative effect)	Major (beneficial)	<ul style="list-style-type: none"> N/A 	N/A

Effect	Significance	Mitigation	Residual Effect
Effects on Recreation and Tourism			
<i>Construction Effects</i>			
Temporary or permanent closure or diversion of permissive paths and tracks.	Insignificant	• N/A	Insignificant
Creation of new access routes with potential for informal recreational use.	Insignificant	• N/A	Insignificant
Noise and dust impacts on recreational users	Insignificant	• N/A	Insignificant
Changes to the landscape character and its influence on recreation and tourism enjoyment during construction	Insignificant	• N/A	Insignificant
Effects during construction on stalking	Insignificant	• N/A	Insignificant
Effects during construction and operation on fisheries and fishing	Insignificant	• N/A	Insignificant
<i>Operational Effects</i>			
Temporary or permanent closure or diversion of permissive paths and tracks	Insignificant	• N/A	Insignificant
Creation of new access routes with potential for informal recreational use.	Minor (positive)	• N/A	Minor (positive)
Noise and dust impacts on recreational users	Insignificant	• N/A	Insignificant
Changes to the landscape character and its influence on recreation and tourism enjoyment during construction	Insignificant	• N/A	Insignificant
Effects during construction on stalking	Insignificant - Minor	• N/A	Insignificant - Minor
Effects during construction and operation on fisheries and fishing	Insignificant	• N/A	Insignificant
Social and Economic Effects			
<i>Construction Effects</i>			
Disturbance of existing activities within the site and surrounding area	Insignificant -Minor	• N/A	Insignificant -Minor
Employment generation during manufacture and construction	Minor – moderate (positive)	• N/A	Minor – moderate (positive)
Indirect economic effects from the proposed scheme during construction	Minor (positive)	• N/A	Minor (positive)
Risks to public safety during construction	Insignificant	• N/A	Insignificant
<i>Operational Effects</i>			
Disturbance of existing activities within the site and surrounding area	Insignificant	• N/A	Insignificant
Employment generation during operation	Minor (positive)	• N/A	Minor (positive)
Indirect economic effects from the proposed scheme during operation	Insignificant	• N/A	Insignificant
Risks to public safety during operation	Insignificant	• N/A	Insignificant

Appendix I.1 **Statement of Competence of the Assessors**

Land Use Consultants

LUC is one of the leading Environmental Consultants in the UK specialising in planning, design and management. For over thirty years we have been exploring the concepts of sustainable development and evolving practical forms of resource management with strong emphasis, through design, on the conservation and enhancement of environmental quality. We have pioneered thinking and approaches to significant areas of environmental planning and design and are proud of our achievements in design, environmental impact assessment, river management, land reclamation and historic landscape restoration.

Much of our recent work has been driven by global as well as more local environmental issues. Central to this has been the potential and actual role of renewable energy and the national and regional targets that have been set for its generation. Whilst recognising the importance of avoiding unnecessary environmental damage, much of our recent work on the subject has been concerned with overcoming obstacles, providing the appropriate information systems for decision makers and developing assessment techniques which are capable of setting local effects in the context of national benefits, and integrating social and economic factors with environmental issues. Members of LUC's Glasgow office have played an important part in this work.

LUC has also been centrally involved in the development of environmental impact assessment methodologies since this North American concept was first introduced to Europe in the early 1970s. The Glasgow office has been responsible for EIAs of some of the largest and most controversial development projects in Scotland. These include the Cairngorm Funicular, the Eurocentral Business Park and the proposed International Business Campus at Abbotsholm, adjacent to Glasgow Airport. In addition, we provide specialist ecological and landscape and visual impact assessment inputs to assessments prepared by third parties. Examples include the major St Andrews Bay golf course and hotel development near St Andrews which is currently under construction. LUC undertook the assessment of the tourism and recreation effects of the windfarm at Beinn an Tuirc on Kintyre for ScottishPower.

Land Use Consultants has extensive experience in undertaking of Environmental Assessments and is a registered assessor of The Institute of Environmental Assessment. The practice completed the Environmental Statements for two windfarms in Scotland for which planning applications were lodged in March 2002. They have also been involved in two further schemes, one of which having been approved in early 2003, and the other was lodged in May 2003.

Other Environmental Assessments for windfarm developments are ongoing.

Natural Research (Projects) Ltd.

Natural Research is committed to independent wildlife research. The company has specialised in studies of rare and scarce upland birds, particularly raptors. They have pioneered survey and assessment methods in relation to terrestrial windfarms in the UK. Natural Research is a registered charity (SC 209393) with all profits used to fund wildlife research.

Stuart Farrell, Archaeologist

The archaeological assessment has been undertaken by Stuart Farrell, an archaeologist of 10 years experience with a degree in Archaeology and Prehistory from the University of Sheffield. The assessor is also a Fellow of the Society of Antiquaries of Scotland and an Associate of the Institute of Field Archaeologists. He has been a freelance consultant archaeologist for the last 5 years.

Hoare Lea Acoustics Ltd.

The reported noise impact assessment has been undertaken by Hoare Lea Acoustics (HLA). With over a decade's experience in windfarm acoustics and with a portfolio that includes involvement with over 30 windfarms in the UK to their credit, acting both on behalf of developers and local authorities, HLA are one of the most experienced firms in the UK in undertaking windfarm environmental noise impact assessments.

Arup

Arup is an international consulting firm providing business solutions, engineering design, environmental, planning and project management services in the infrastructure, building and industrial sectors. They aim to help our clients meet their business needs by adding value through technical excellence, efficient organisation and personal service.

Arup provide world class consulting services needed at every stage of a project, from inception to implementation. These are available to clients singly or in combination, to suit the particular circumstance of the job through some 7000 staff based in 71 offices in more than 32 countries; and projects been undertaken in more than 160 countries.

Arup are a Registered Environmental Impact Assessor of the Institute of Environmental Management & Assessment (IEMA) and the work is undertaken by suitably qualified environmental scientists and communications engineers.

Appendix 7.1 **Design Statement**

GORDONBUSH WINDFARM LAYOUT – DESIGN STATEMENT

Introduction

The Gordonbush windfarm is located in an open, exposed and elevated location. The turbines to be used will be up to 107m high to blade tip. As a result the windfarm will be visible and difficult to screen from the more elevated parts of the surrounding area. The original layout included within the scoping report did not consider factors such as 3 dimensional composition, topography, ecology, or detailed wind data.

The design of the proposed windfarm was considered as a distinct stage in the development and evolution of the windfarm layout during the EIA process. During this stage the windfarm layout was analyzed as a 3 dimensional composition within the landscape. Consideration was given to issues of landscape context and visibility, scale, topography, composition and geometry.

The purpose of this exercise was to identify an 'optimum' design layout with respect to how the windfarm would appear as an object or composition in the landscape. Subsequent alterations to the layout were made in response to ecological, hydrological and energy yield considerations. These latter changes could be made with a better understanding of the implication of such changes on the appearance of the windfarm within the landscape. As a result therefore, the final proposed layout, as submitted with the application, inevitably represents a compromise between alternative options.

Aims

The aims of the design were as follows:

- To use turbines of a size which are appropriate to the scale of the local landscape and to consider the overall size (scale) of the proposed windfarm;
- To produce a cohesive layout which would be legible in views from the surrounding landscape;
- To develop a layout that relates to the topography of the site;
- To examine geometry of the layout in view of the characteristics of the proposed turbine size;
- To provide a layout that projected a clean and 'sculptural' image.

The design was considered and developed by two landscape architects working for Land Use Consultants. Sketch layouts were drawn up on map overlays. Concept layouts were then transferred and developed digitally in *Autodesk Map* with wireframes created using *Resoft Windfarm* software to allow quick analysis of the layout changes in key views.

Context

The proposed windfarm is located on the Gordonbush Estate, approximately 12km North West of Brora in Sutherland. The site comprises a gently sloping plateau and lies mid-way between Strath Brora and Strath of Kildonan.

The site lies within the *Moorland Slopes and Hills* landscape character type as described in the Caithness and Sutherland Landscape Character Assessment. This character type occurs throughout Sutherland and is associated with vast openness, subtle mix of ground cover and sloping landform.

The proposed site itself is covered in heather, heath, moss and grasses. There are no trees and only very limited scrub vegetation along lower sections of incised streams.

The nature of the site's surrounding area is that of simplicity. The surrounding landscape is devoid of clear vertical features with the exception of the overhead power line to the west of the site and large tracts of coniferous commercial forestry to the south west. To the north west and west the landscape is overwhelmingly open. To the east the landscape is contained by a range of coastal hills.

It is considered that new elements within this landscape will potentially form strong visual foci within this landscape character type. They may seem more appropriate where they relate to specific site conditions and appear to 'fit' (to the site). The openness of the landscape will result in potentially extensive visibility of tall objects.

Scale

The overall landscape of the site and surroundings is of large scale. Initial layouts considered options with up to 55 smaller turbines as well as options with lesser number of taller turbines. Layout geometry requirements for smaller turbines are different than those for the bigger turbines although similar principals apply. As a general rule turbines are spaced 5 times rotor diameter. The site area required to generate a similar amount of power is broadly similar irrespective of the turbine used when all other factors are considered. Selection of the size of the turbine is therefore substantially influenced by landscape and visual reasons. In this location early visibility analysis did suggest that the potential visual envelope of 75 metre high structures (such as the 'Vestas V-52' or similar on 49 meter high tower) is not significantly less than the potential visual envelope of a 107 metre high structure (such as the 'Vestas V-80' or similar on 67 meter high tower).

For this reason it was suggested that large turbines could be further considered in the design development. Use of large turbines was subsequently considered against overall scale of the proposed development and overall scale of the landscape of the site. It was concluded that large scale structures could match the overall scale of the landscape and that overall size of the development should be such that a reasonably compact grouping could be achieved to form a clear and distinct object within the landscape. Great variations in apparent height differences between individual turbines within the group should also be avoided.

Topography

Topography of the proposed site is characterised by a gentle, almost even, gradient rising from approximately 275AOD at its south west edge to approximately 400AOD at its highest point in the north east. Contours are gently 'rounded' from the north, via west to south east. There are no prominent features protruding above the average character of the slope and no prominent depressions. A series of streams radiate from the higher parts of the plateau to the lower sections. These streams are very shallow on high ground but become more incised below 300AOD approximately, forming natural lines and undulations crossing the large, curved contours.

As no prominent landcover pattern or physical features exists on or near the site, it was decided that the windfarm design should reflect and relate to the landform of the site as this proved to be its most defining feature; a curved, sloping plateau under a ridge of rolling hills. This could potentially result in reducing visual confusion, and achieving a layout that represents the topography and its surroundings.

Design Process

The windfarm layout required cohesion and form and the initial layout design for Gordonbush windfarm was conceived as a grid of five 'columns' of seven turbines running south west to north east. It was envisaged that a grid would provide a simple layout as to which to relate to the simple topography and landcover. The grid also provides a composition that allows the turbines to be evenly spaced and relate to each other providing a visual cohesion and a sculptural image.

The relationship between the proposed windfarm and the site's topography was enhanced by adjusting the grid geometry. The development of the design saw the columns of seven turbines within the grid radiate from the ridgeline to the north east. The natural lines of the streams generally form a similar pattern.

This relationship was further enhanced by arcing the shorter rows of five turbines from the north via the west to the south east, to generally follow the large convex curves of the local topography. This also addressed the relative height of towers along these lines to each other.

These adjustments resulted in a fanned grid layout. This layout was then projected into wireframe models that confirmed that the simple form and composition of the layout appeared more rational with each turbine not only relating to each other but also creating a cohesive whole relating to the local and surrounding landscape. This provided the basic design concept from which the final layout developed.

Final Layout

There were a number of further constraints that had to be considered after the design concept was in place that led to the optimum design composition being tailored by the following:

- Landcover
- Hydrology
- Habitat and species conservation
- Visibility
- Energy yield
- Site boundary

These factors led to subsequent alterations although these were made with a better understanding of the overall design aim. The changes led to informed siting of individual turbines away from sensitive sites. In some cases entire lines of turbines were moved or adjusted to maintain the design concept.

The concept for the access tracks sought to reinforce the layout structure connecting the turbines along the columns and rows of the grid. However, during the detailed design development, surface habitat considerations became the defining feature in determining the access track routes to minimize the impacts on sensitive areas. In practice, the track layout will only be visible from some of the highest viewpoints (eg Beinn Smeorail).

The layout design development from the initial concept through to the final layout is shown in Figure A.

GORDONBUSH WINDFARM

Scottish and Southern Energy

Layout Design Development

- Turbine locations
- Access Track
- Blanket Bog

Map scale: 1 : 50,000

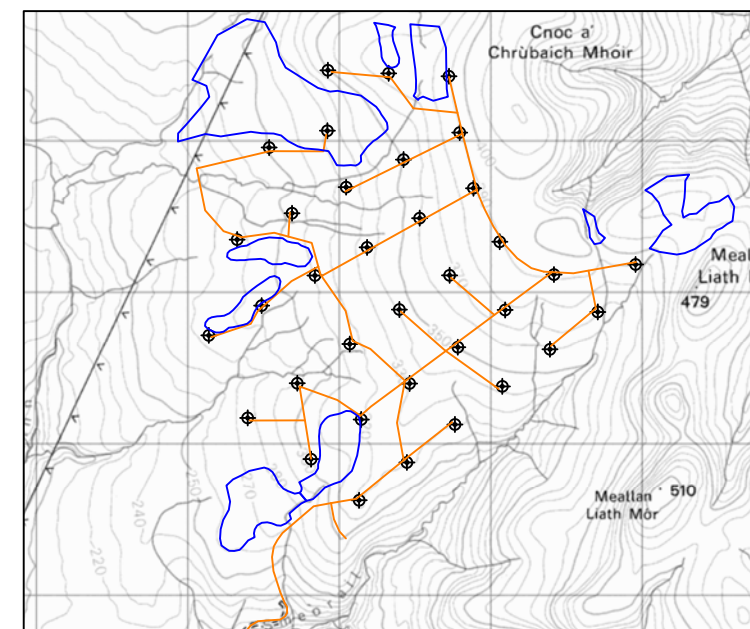
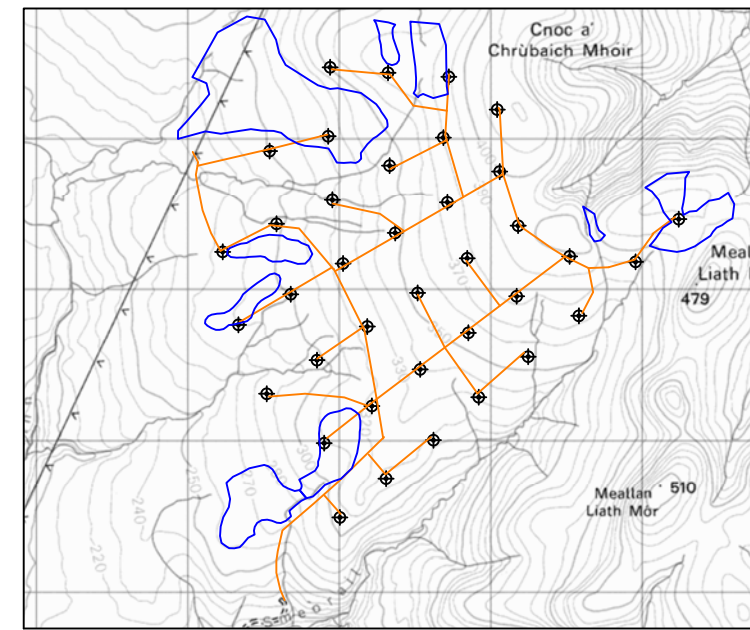
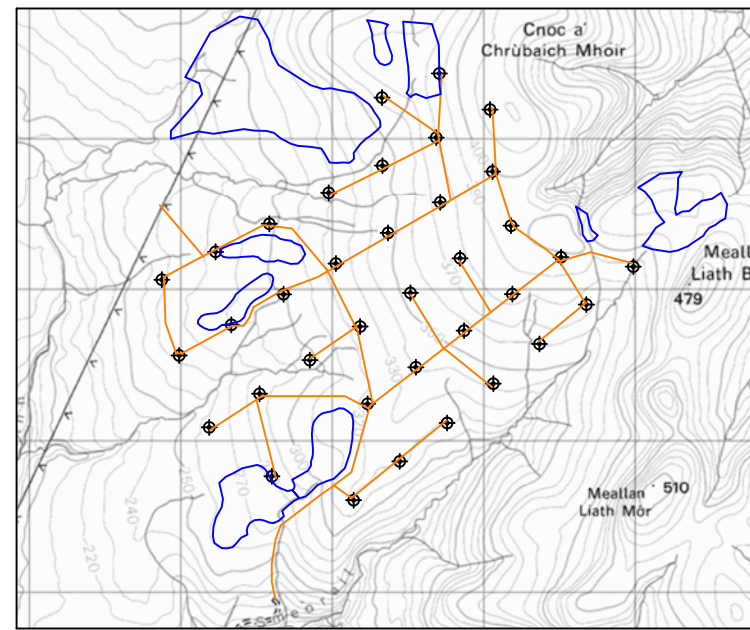
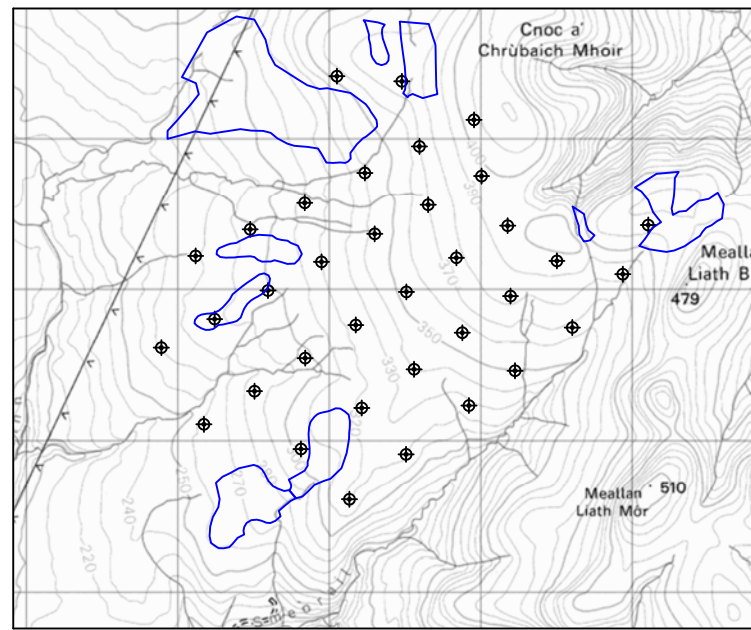
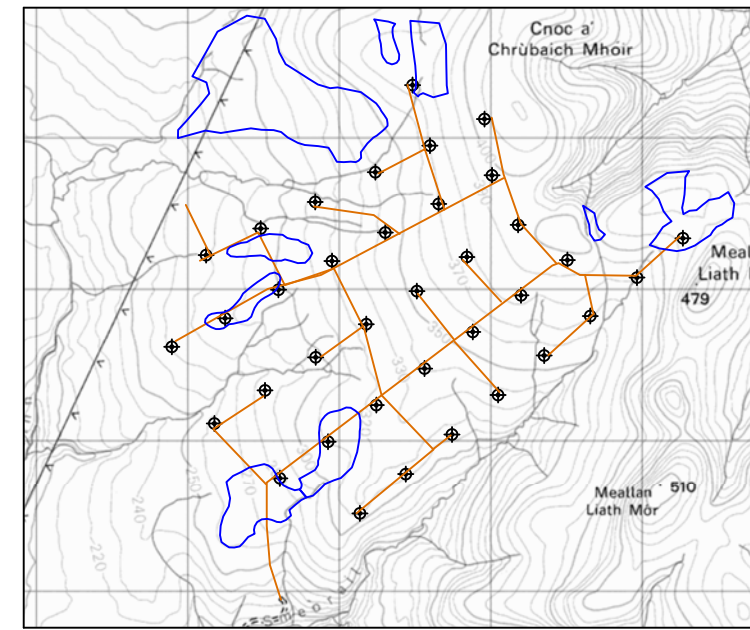
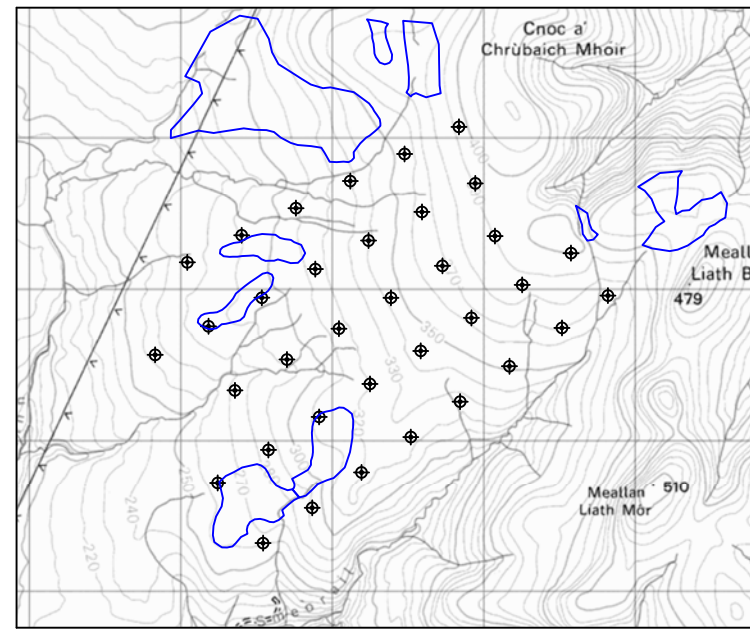
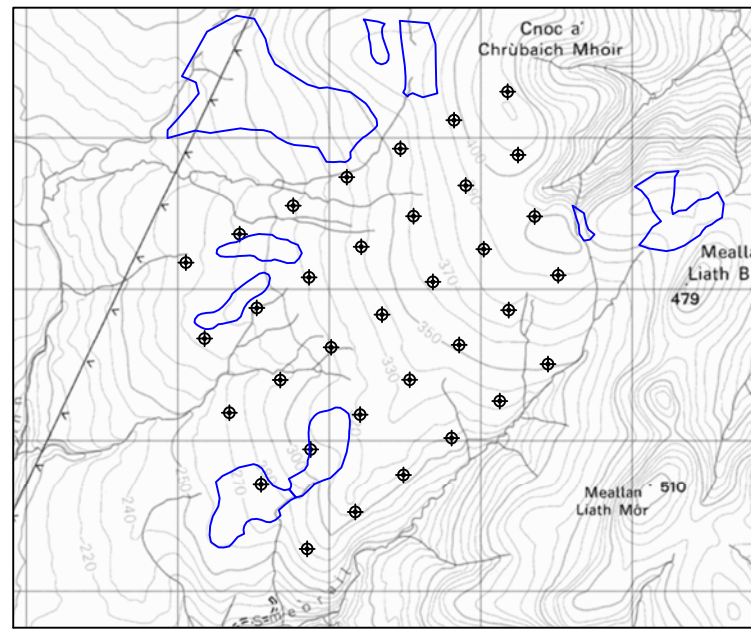


Figure A

Appendix 8.1 **Water Vole and Otter Survey Report**

(Note: for Figure 1 see Figure 8.1 in Chapter 8 of the ES, and for Figure 2 see Figure 8.2)

OTTER AND WATER VOLE SURVEY FOR THE GORDONBUSH WINDFARM

Report to: Dr Fiona Simpson
Land Use Consultants
37 Otago Street
Glasgow
G12 8JJ

15th May 2003

1. INTRODUCTION

This report presents the results of a mammal survey carried out for the proposed windfarm at Gordonbush, by Brora during four days of fieldwork extending from 31st April to 3rd May 2003. The target species were otter and water vole with incidental attention paid to the status of badgers.

All three species are legally protected with otters and water voles also included on the Local Biodiversity Action Plan. All three mammals are also vulnerable to human impacts which have led to recent (otter) and continuing (water vole) nationwide declines.

a) Otters

Otters are currently widespread around Brora and appear to have largely avoided the organochlorine-pollution induced decline which affected much of Britain in the 1960s. National otter survey records for Sutherland in general and for Gordonbush in particular are consistently high with 100% of sites surveyed in National Grid 10km square NC81 revealing signs of this species across two surveys in 1977-79 and 1991-94. These records included two sites within the current windfarm survey area – on the Allt a Mhuilinn at NC828120 and on the Allt Smeorail at NC848107. The results for square NC81 compare favourably with the Scottish averages for the two surveys at 73% and 88% respectively.

Despite these high percentages the actual numbers of otters involved will be modest due to an extensive and largely solitary lifestyle devoted to the exploitation of a limited resource – freshwater occupies only about 5% of the Scottish landmass. The adult population of the Scottish mainland is now probably in excess of the 3600 individuals estimated for the mid 1980s but will still be far smaller than equivalents for other large land carnivores such as foxes or badgers.

Individual home ranges in freshwater vary from 16-20km of watercourse for a female otter to 40+km for a male, albeit with some overlap between and within the sexes. The otter also has a low breeding potential due to a small litter size (c.2 cubs) and a short breeding lifespan (sexual maturity is not attained until c.2 years of age). Consequently, the population is capable of rapid decline when exposed to new, negative impacts but has limited potential for recovery. For this reason it is classified as vulnerable on the Red List of Threatened Species compiled by the World Conservation Union.

b) Water Voles

Whilst the status of the otter is improving the water vole is currently regarded as the fastest declining land mammal in Britain, largely as a result of habitat modification and predation by feral mink. Historical data suggests that some two-thirds of the Scottish distribution was lost before the first national survey of 1989-90 whilst an even more rapid decline between then and a second survey in 1996-98 has reduced water vole presence to less than 10% of Scottish survey sites.