Table XX: Alternative Options and Measures to Achieve the Core Strategy Objectives and Broad Based Appraisal of SA/SEA Objective 13

Option is likely to have a positive effect	*Option would have a positive or neutral effect with additional measures / mitigation, negative effects without*	*Option is likely to have no effect / neutral effect*	*Option is likely to have a negative effect*	*Policy effect is uncertain at this stage (could be any of the above)*

Option	Title	13. Positively plan for, and minimise the effects of climate change
		Appraisal Pre-amble It is predicted that climate change will, over time, result in higher sea levels, hotter, drier summers, wetter, milder winters with the possibility of temperature extremes and increased frequency and intensity of storms. These changes are likely to lead to: ▪ *An increase in river and coastal flooding and erosion with increased pressure on sewer systems* ▪ *An increase in storm damage and increased risk of subsidence in subsidence prone areas* ▪ *Habitat and species loss and changes to the landscape* ▪ *Summer water shortages and increased incidence of low river flows* ▪ *Increased thermal discomfort in buildings* ▪ *Increased health risks in summer, but reduced cold-weather illness* ▪ *Less cold-weather transport disruption, but more disruption caused by flooding* ▪ *New economic opportunities* ▪ *Limitation of some existing economic activities* There are two linked but distinct elements to the appraisal of this objective. In this context: (1) Planning for the effects of climate change is regarded as assisting in responding effectively to the change already underway i.e. dealing with the consequences (adaptation). This may include: ▪ *Appropriate location of development (e.g. siting near to existing energy infrastructure) and use of land (e.g. development outside floodplains)* ▪ *Appropriate use of resources e.g. water supply* ▪ *Planning for biodiversity* (2) Minimising the effects of climate change is regarded as an option that helps to reduce emissions of the greenhouse gases that cause climate change i.e. tackling the causes (mitigation). This may include: ▪ *Improving sources of renewable energy* ▪ *The development of all forms of sustainable energy (renewables, energy efficiency and Combined Heat and Power)* ▪ *Stimulation of investment in network infrastructure* ▪ *Reducing the impact of travel on the environment* ▪ *Moving towards more sustainable travel* ▪ *Domestic retrofit* ▪ *New build residential (e.g. the Merton Rule that requires the use of renewable energy onsite to reduce annual carbon dioxide (CO_2) emissions in the built environment)* The appraisal has concentrated on how the options presented will help to adapt to the changes that are already underway as a result of previous emissions and combat rising greenhouse gas emissions primarily from power generation, residential and road transport sectors. The most relevant topics applicable to climate change are considered to be: ▪ *Nature conservation and biodiversity* ▪ *Renewable energy and emissions* ▪ *Development design and location* ▪ *Water efficiency and management* ▪ *Flood risk* ▪ *Transport*
A1	**Unrestrained dispersal**	**Note:** Climate change cuts across most other SA/SEA issues and the above analysis should be read in association with other relevant analytical outputs e.g. SA/SEA Objective 4 ''Avoid the risk of flooding (where possible) and fully mitigate against the impacts of flooding where it cannot be avoided''. **Comments: (1) Planning for climate change** The location of new developments is a fundamental way of adapting to the impacts of climate change. Unrestrained dispersal would potentially reduce future opportunities (existing and new) for effective implementation of climate change adaptation measures such as forms of energy provision and more sustainable water management. For example, larger developments (or urban extensions) (such as options 2, 3, 4, 5, 6 and 7) that are concentrated within the vicinity of urban centres and existing energy infrastructure (e.g. Horncastle, Louth, Mablethorpe and Skegness) may increase opportunities for the provision of economically viable forms of renewable energy to be incorporated and to harness localised energy sources. Larger scale developments may also provide more opportunity for 'landscape scale' opportunities to plan for the maintenance and enhancement of the districts biodiversity resource including connectivity of important habitats and the development of existing and new green infrastructure assets e.g. wildlife may need to migrate within the landscape to stay within their climatic requirements, or risk extinction. Development should minimise impact within areas identified as important for the ability of species to adapt and/or move to more suitable habitats and where possible contribute to these areas. New development areas should ideally be strategically planned and located to ensure that they maximise opportunities to reduce energy and water use and to promote renewable energy and efficient energy and water supplies. This should include taking account of increased temperatures, water constraints and flood risks. Unrestrained dispersal will potentially provide very limited opportunities to effectively plan at the strategic level to ensure the most effective adaptation measures are developed and implemented alongside future growth. Unrestrained dispersal i.e. a series of many smaller developments across the district (and in many cases away from the main service centres) may lack these opportunities due to their rural location away from key energy infrastructure assets and their potentially smaller scale. In addition, with regard to flood risk, the existing infrastructure within some of the smaller villages may not be capable of providing effective drainage as a result of more intense precipitation events (these events are becoming more common). This option may rely on flood risk mitigation measures rather than being driven by policies to avoid flood risk in the first instance and it is important that development should adapt spatially before considering mitigation measures to deal with the residual impacts of climate change. The spatial relationship between new developments (including the scale of development) and future adaptation opportunities such as links to energy infrastructure should be reflected in resource-efficient settlement patterns. Unrestrained dispersal would be at odds this type of sustainable approach and may lead to ineffective adoption and implementation of climate change adaptations that could adversely impact upon communities, the economy and environmental resources/assets across the district. **Comments: (2) Minimising the effects of climate change** With regard to reducing carbon emissions, dispersed development across the district (in many cases in East Lindsey's rural areas) is unlikely to contribute to reducing the reliance on private modes of transport and may provide limited opportunities to increase the use of other modes of access such as public transport, cycling and walking. It should be noted that East Lindsey residents are heavily reliant on private transport by car due to the very rural nature of the district and that this situation is unlikely to change in the longer term. Therefore, it is unlikely that carbon emissions would be significantly reduced alone by reducing the need to travel and encouraging more sustainable travel. Options need to allow for economically viable development of all forms of sustainable energy (see above for further detail). Unrestrained dispersal may again constrain this type of approach e.g. utilising localised energy sources by the effective planning of developments (e.g. site layouts and orientation) that may provide increased opportunities for maximising solar energy. The Welsh Assembly Government has recently consulted on the following staged approach to development allocations and proposals[1]: ▪ *Maximising design and location opportunities to reduce energy demand*

[1] Welsh Assembly Government (December 2006): Planning for Climate Change – Consultation Document.

Option	Title	13. Positively plan for, and minimise the effects of climate change
		▪ *Considering the use of energy efficient supply measures to meet the reduced demand* ▪ *Incorporating a proportion of on site renewable energy generation* This type of approach may be best adopted and most effectively implemented with larger urban extensions to the main centres than by implementing the option of unrestrained dispersal.
A2	Strong urban focus – rural restraint	**Comments: (1) Planning for climate change** This option would potentially help to maximise future opportunities (existing and new) for effective implementation of climate change adaptation measures such as forms of energy provision and more sustainable water management. For example, larger developments (or urban extensions) that are concentrated within the vicinity of urban centres and existing energy infrastructure (e.g. Horncastle, Louth, Mablethorpe and Skegness) may increase opportunities for the provision of economically viable forms of renewable energy to be incorporated and to harness localised energy sources. New development areas should ideally be strategically planned and located to ensure that they maximise opportunities to reduce energy and utilise new forms of renewable energy. Larger scale developments may also provide more opportunity for 'landscape scale' opportunities to plan for the maintenance and enhancement of the districts biodiversity resource including connectivity of important habitats and the development of existing and new green infrastructure assets e.g. wildlife may need to migrate within the landscape to stay within their climatic requirements, or risk extinction. Development should minimise impact within areas identified as important for the ability of species to adapt and/or move to more suitable habitats and where possible contribute to these areas. This option should also allow for account to be taken of water constraints and flood risks. East Lindsey is one of only a handful of Authorities in England where the land topography and scale and nature of defences is such that climate change induced sea level rise poses a significant long term risk to the coastal zone. This option includes promoting development at Skegness and Mablethorpe. Both of these towns are within rapid coastal inundation zones The need for development in areas of flood risk inland may also be a real possibility. This option may rely on flood risk mitigation measures rather than being driven by policies to avoid flood risk in the first instance and it is important that development should adapt spatially before considering mitigation measures to deal with the residual impacts of climate change. Whilst we are fully aware of the principle of a joint strategy for the regeneration of the Lincolnshire Coast (i.e. an initiative to help local communities and government work in partnership to address social inequality, improve the coastal economy and recognise environmental limits to achieve sustainable development) the outputs of study (which will include the coastal Lincolnshire authorities of East Lindsey, Boston and South Holland, along with a number of other local and regional partners) will not be available until 2010 and therefore at this stage cannot be taken into account in this appraisal. The spatial relationship between new developments (including the scale of development) and future adaptation opportunities such as links to energy infrastructure should be reflected in resource-efficient settlement patterns. A strong urban focus would most likely compliment this type of sustainable approach and may lead to more effective adoption and implementation of climate change adaptations that could help avoid or reduce adverse impacts upon communities, the economy and environmental resources/assets across the district. **Comments: (2) Minimising the effects of climate change** With regard to reducing carbon emissions, the concentration of development into the towns would most likely provide the best opportunities for promoting sustainable modes of travel and reducing (at least locally) the use of private cars. This option of larger scale and strategically planned developments may also allow for economically viable forms of sustainable energy (see above for further detail), particularly local energy networks through low carbon micro-generation at a local scale and utilisation of localised energy sources e.g. small scale community energy schemes that could incorporate measures to provide small combined heat and power (CHP) plants in urban locations, supplying district heating networks and electricity, using energy crops and waste. Other possible opportunities may arise through the development of distributed energy schemes, as presented in the latest Government Energy Review (DTI, July 2006), which seeks to generate energy near to the source of demand, and can potentially lower greenhouse gas emissions. The Welsh Assembly Government has recently consulted on the following staged approach to development allocations and proposals[1]. ▪ *Maximising design and location opportunities to reduce energy demand* ▪ *Considering the use of energy efficient supply measures to meet the reduced demand* ▪ *Incorporating a proportion of on site renewable energy generation* This type of approach may be best adopted and most effectively implemented with larger urban extensions to the main centres.
A3	Louth and Skegness-led hierarchy	
A4	Four town-led hierarchy	
A5	Settlement hierarchy with coastal regeneration	
A6	New sub-regional growth points	
A7	New Town	
B1	Urban extensions	
B2	Dispersed sites within a settlement boundary	
B3	Criteria-led development	**Comments:** The effects of this option require further investigation.
C1	By allocating land specifically for affordable housing	**Comments:** Option is not likely to have an effect.
C2	By requiring a percentage of general housing developments to be for affordable housing	**Comments:** Option is not likely to have an effect.
C3	By allowing "exceptions" sites to be developed for affordable housing where general market housing would not normally be permitted	**Comments:** Option is not likely to have an effect.
C4	By direct provision by a Housing Association (or Registered Social Landlord)	**Comments:** Option is not likely to have an effect.
C5	By the re-use of vacant properties	**Comments:** Option is not likely to have an effect.
D1	Define town centre roles	**Comments:** Option is not likely to have an effect.
D2	Free-market town centres	**Comments:** Option is not likely to have an effect.
E1	Protecting town centre vitality and viability by restricting out of town centre retail development	**Comments:** Whilst this option may have a positive effect at a very local level in helping to reduce the need to travel by private modes of transport and encouraging more sustainable travel i.e. keeping businesses etc within the town centre, the option on its own is considered to have no effect with regard to climate change.

Option	Title	13. Positively plan for, and minimise the effects of climate change
E2	Permitting out of town centre retail development in a strategic location	**Comments:** Whilst this option may have a negative effect at a very local level by potentially discoursing growth within town centres where the use of sustainable modes of transport can be encouraged, the option on its own is considered to have no effect with regard to climate change.
F1	Giving community safety the highest priority	**Comments:** Option is not likely to have an effect.
F2	Designing out crime	**Comments:** Option is not likely to have an effect.
G1	Reinforcement of land allocated for employment	**Comments:** Land allocated for employment purposes is considered to be integral to options A2 to A7 and B1 and B2 and therefore the effects of climate change and implications for spatial planning are as documented above.
G2	Coastal Regeneration	**Comments:** Land allocated for employment purposes concentrated within Skegness and Mablethorpe and is considered to be integral to options A3 to A5 and therefore the effects of climate change and implications for spatial planning are as documented above.
G3	Prestige Employment Locations	**Comments:** The focus of the development would be in one specific area e.g. a science park on the western edge of the district linked to Lincoln University. The effects of climate change and implications for spatial planning are as documented above for options A2 to A7 and B1 and B2.
G4	Diversification	**Comments:** Whilst opportunities for domestic / business retrofit of farm buildings would be encouraged to ensure that buildings become more energy efficient, this option alone is unlikely to have an effect with regard to climate change.
G5	Working from home	**Comments:** Whilst this option may have a positive effect at a very local level in helping to reduce the need to travel by private modes of transport, the option on its own is considered to have no effect with regard to climate change.
H1	Develop a spatial tourism theme strategy	**Comments:** There is a degree of uncertainty with regard to the effects of climate change on or from tourism, sport and recreation. At this stage therefore, the effects of this option are considered to be uncertain. However, with regard to spatial planning, it is most likely that there will be no effects.
H2	Develop a tourism activity strategy	**Comments:** There is a degree of uncertainty with regard to the effects of climate change on or from tourism, sport and recreation. At this stage therefore, the effects of this option are considered to be uncertain. However, with regard to spatial planning, it is most likely that there will be no effects.
J1	Reducing the need to travel to access services	**Comments**: The locations of major new development would be primarily driven by accessibility of sustainable modes of transport. Whilst the links associated with promoting travel by public transport, cycling and walking and reductions in carbon emissions are clear (assuming such an option would reduce transport by private car), the significance of any carbon emission reductions would probably be minimal and would not be addressed by this option alone. The very rural nature of the district is unlikely to see significant numbers of its residents avoiding car use. This option may contribute to the development of sustainable communities but is unlikely to have an effect on climate change.
J2	Catering for the essential use of the car	**Comments:** See comments for J1. Option is not likely to have an effect.
J3	Developing cluster services	**Comments**: Clustering services would promote reductions in long or multiple trips and perhaps increase travel by public transport, cycling and walking, particularly in the larger urban centres. The links with such initiatives and reductions in carbon emissions are clear. However, the significance of any carbon emission reductions would probably be minimal and would not be addressed by this option alone.
K1	Identifying a specific site or sites for Traveller and Gypsy accommodation	**Comments:** Option is not likely to have an effect.
K2	Identifying an area of search for Traveller and Gypsy accommodation	**Comments:** Option is not likely to have an effect.
K3	Applying a criteria-cased policy	**Comments:** Option is not likely to have an effect.
L1	District-wide Landscape Strategy	**Comments:** The landscapes of East Lindsey are varied are composed of many elements, both-living and non-living, natural and man-made. Climate is one of a suite of drivers of change operating both directly and indirectly. For example, direct impacts of climate change on landscape character include flooding events, longer growing seasons or low river flows. Although climate change impacts such as increased summer temperatures may not influence landscape character directly, there could be downstream effects on landscape components such as agricultural land use. In some cases the resultant change in landscape will be dramatic such as the loss of whole landscapes through rising sea levels, whilst in other cases the change will be more subtle and gradual[2]. This option will aid the conservation of valued landscapes within the East Lindsey district and should take full account of the additional stresses that climate change may have on landscapes that area already under pressure from a range of uses (e.g. renewable energy projects such as wind farms). There is still a high degree of uncertainty and lack of knowledge with regard to the impacts that climate change may have upon landscapes at the local or landscape scale and any strategy should take account of research undertaken to date e.g. the University of East Anglia have undertaken research in on visualising the potential impacts of climate change on Norfolk's landscapes. This project is investigating the practicalities of reinterpreting the available climate change impacts information from existing research (frequently at the national scale, or related to specific sectors) at a scale more useful to local stakeholders/policy makers (expressed as visualisations of potential future landscapes).
L2	Promoting market town themes	**Comments:** Option is not likely to have an effect.
L3	Balancing Landscape Promotion and Protection	**Comments:** See comments for L1.
M1	Protect and conserve the District's existing biodiversity	**Comments:** This option should allow appropriate spatial planning to aid the protection, conservation and enhancement of the districts biodiversity resources. Connectivity of habitats at a landscape scale will be key to ensuring that species can adapt to climate change by allowing migration and dispersal. M1 and M2 are inextricably linked and both options should form the basis for future policies. A key component of any new development if it is to be truly sustainable will be to enhance existing / create new important Green Infrastructure for biodiversity (type will be dependent on locally important habitats and species) and to ensure connectivity between sites of nature conservation value. Principles such as those published in 'Biodiversity by Design' should be taken into account. The need for a Green Infrastructure strategy for the district should be reviewed that will provide robust direction for growth with GI across the district.
M2	Protect, enhance, expand and promote the District's biodiversity	
N1	Phased re-location of communities from areas of greatest flood risk	**Comments:** The shift inland of Mablethorpe, Trusthorpe and Sutton on Sea to avoid future flood risk will be an important consideration in how the district (and coastal communities) plan to adapt to climate change and the potential of the increased risk of flooding associated with changing climatic conditions (particularly from the sea). This option would be the most sustainable in the very long term and would avoid the need to continue capital and maintenance spend on flood risk measures along the coast.
N2	Improved sea defences to permit coastal regeneration	**Comments:** The continuation of providing sea defences may be effective in ensuring the viability of coastal settlements in the short and medium term (?) (i.e. it may help minimise the effects of climate change with regard to flooding) but this may be at a significant cost and may not constitute truly sustainable development compared with option N1 (i.e. long term planning and adaptation to the effects of climate change).
N3	Restrict development in areas at risk from fluvial or flash flooding	**Comments:** Measures to avoid or reduce further development within floodplains or coastal inundation zones would be considered a positive adaptation measure to avoid the increasing risk of flooding associated with climate change.
P1	Reducing carbon energy use	**Comments:** With regard to reducing carbon emissions and minimising the effects of climate change, this option would require all new development to meet specified energy-saving targets, through its location, design and operation. Options for larger scale and strategically planned developments may also allow for economically viable forms of sustainable energy, particularly local energy networks, through low carbon micro-generation at a local scale and utilisation of localised energy sources e.g. small scale community energy schemes that could incorporate measures to provide small combined heat and power (CHP) plants in urban locations, supplying district heating networks and electricity, using energy crops and waste. Other possible opportunities may arise through the development of distributed energy schemes, as presented in the latest Government Energy Review (DTI, July 2006), which seeks to generate energy near to the source of demand, and can potentially lower greenhouse gas emissions. The Welsh Assembly Government has recently consulted on the following staged approach to development allocations and proposals[1].

[2] The Countryside Agency and Scottish Natural Heritage, 2002): Landscape Character Assessment: Guidance for England and Scotland. Topic paper 9 'Climate change and natural forces - the consequences for landscape character'

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		▪ *Maximising design and location opportunities to reduce energy demand* ▪ *Considering the use of energy efficient supply measures to meet the reduced demand* ▪ *Incorporating a proportion of on site renewable energy generation*
P2	**Promoting and developing sustainable renewable energy sources**	**Comments:** See comments for P1 above.
P3	**Restricting sustainable renewable energy development**	**Comments:** The need to address the effects of climate change (whether through adaptation measures or minimising impacts) is essential. This option may constraint the development of renewable energy projects in core locations where they would be best suited as a result of other influencing factors such as biodiversity, landscape etc.
P4	**Promoting the development of a nuclear power station**	**Comments:** A nuclear power station would have significant positive impacts in reducing carbon emissions and would most likely provide a secure energy source in the long term. It is assumed that a nuclear power station would most likely be located along the districts coastline and would therefore be within both the fluvial flood zone and the coastal rapid inundation zone. The location of such a large scale energy project would need careful consideration taking into account predicted sea level rises combined with isostatic tilt.
Q1	**Planning Obligations applied consistently across the county**	**Comments:** Option is not likely to have an effect.
Q2	**Planning Obligations to meet the needs of East Lindsey**	**Comments:** Option is not likely to have an effect.