# North Somercotes Parish Council

13 March 2024 via email: contact@g-w.nationalgrid.com

National Grid
Grimsby to Walpole
3rd Floor South
49 Carnaby St
London W1F 9PY

Dear Sir/Madam

**National Grid Grimsby to Walpole Pylon and Substation Proposals - OBJECTION**

On behalf of our parish and local communities and the wider communities of Lincolnshire, the North Somercotes Parish Council strongly objects to the ill-conceived, inconsiderate proposals, to irrevocably damage the outstanding natural landscape and wide-open skies that give the Lincolnshire coastal marshes and fens, where they sit at the foot of the Wolds AONB (Area of Outstanding Natural Beauty), their unique historic and cultural identity.

We refer you to the Natural England Landscape Character Assessment of the Lincolnshire Coast and Marshes No. 42 at Appendix 1, which confirm the importance of this landscape at SE04 *"… improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast with its expansive coast and marsh landscape and its coastal features and wildlife, while protecting high levels of tranquillity and the extensive, open views both inland to the Wolds and also out to sea."* Also at page 6 under Description: *The Lincolnshire Wolds Area of Outstanding Natural Beauty covers 3 per cent of the Lincolnshire Coast and Marshes NCA and, while most of this designated landscape falls within the adjacent Lincolnshire Wolds NCA, there are very strong visual, recreational and access links with the coast and marshes.*

The close relationship of the Wolds to the Coast is further endorsed in Appendix 2: 43 - The Natural England Landscape Character Assessment of the Lincolnshire Wolds*: "..Protecting the sense of place by conserving the outstanding views into the adjacent National Character Areas (NCAs), intimate, steep-sided valleys and geological features which provide a sense of inspiration and a tranquil recreational resource…." "Planning for the creation of a strong landscape framework to provide a setting for new and existing development and transport infrastructure, ensuring that the valuable and protected landscape of the Lincolnshire Wolds is not diluted and that its tranquillity is not negatively affected." "Sixty-two per cent of the NCA is designated as an Area of Outstanding Natural Beauty (AONB), which also extends into the Central Lincolnshire Vale NCA and the Lincolnshire Coast and Marshes NCA."*

As noted by Natural England, the inherent high degree of tranquillity that is found in our rural isolated areas originates from the undisturbed flat, low-lying topography and extensive views, as well as the sparse settlement patterns in rural areas, the farmed landscape, inaccessible parts of the coast and sea views.

The very nature of these wide-open skies and panoramic views to and from the coastal plain to the Wolds and the relationship between the Wolds and the Coastal Marshes and Fens cannot simply be carved up as proposed by a 140km string of 420 50m-high pylons, or any pylons at all, without immense and irrevocable negative impact. The very nature of these untouched interconnected natural landscapes means that there is no mitigation that would diminish this act of complete wanton vandalism, that takes absolutely no account of the human, wildlife, social, economic, or environmental cost for generations to come.

Both pylons and huge substations, and the associated projects that are 'waiting in the wings' will present a vast and totally unwelcome intrusion into this natural landscape. It is as if National Grid imagine that there is some invisible corridor between the Wolds and Coast that the pylons and substations can be inserted into; when in fact the pylons will be visible to all, wherever they are, and no mitigation or screening will ameliorate this.

We recognise that there is a need for additional electricity transmission infrastructure, but we do not believe that these intrusive and damaging proposals represent value for money or achieve the necessary balance between that need and the needs of all those who live in and work on or visit this high-quality interconnected natural landscape.

We wholly support the East Lindsey District Council and Lincolnshire County Council Objections to these proposals and would also make the following points:

**1. Lack of proper consultation**

During the parish council's consultation with the public - which has necessarily been of brief duration owing to the short timescales given - it has become very evident that information on the proposals has been provided to only a very small cohort of people, and that hundreds of those who stand to be affected by this scheme, including those within close vicinity of the route, had no idea of what was being proposed.

The parish council considers that such a lack of consultation of all those who would be affected, even taking into account that this is a non-statutory consultation, is wholly inadequate and consequently provides an unsound basis on which to proceed to the statutory consultation phase.

Many individuals have commented to the parish council that the questionnaire was poorly designed as it made no reference to other options and it was too long, especially taking into account the needs of the different members of society, and that many of our elderly population do not use the internet or email for example. We have many anecdotal examples of people trying to submit a completed questionnaire but were unable to do so, even after trying two or three times, receiving a 'bad landing' message or the page timed out, or simply that the server was unavailable/overloaded. In addition, it was not made clear that they then had to look for an email acknowledgement to confirm their submission either.

Furthermore, we believe that the idea of simply presenting a single proposal of overland pylons and substations as a *fait accompli* rather than a list of the possible proposals, including underground and subsea, does not meet the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

**We therefore request and expect National Grid to properly engage with all members of the communities within Lincolnshire, not just the narrow cohort currently contacted, in order to identify a solution which does not industrialise and damage the natural landscape, biodiversity, agriculture, health and wellbeing and economic environment in such a profoundly negative way, as is currently being proposed.**

**2. Deprivation Indices**

National Grid states under its Visual Impact Provision (VIP) Guiding principles that there is a case for the removal of pylons in World Heritage Sites, National Trails, coastal paths and areas of social deprivation.

Much of the proposed area for the pylon route is in areas of high deprivation (Appendix 3), and unemployment is slightly higher than the national mean, average earnings are relatively low and dependence on benefits is high, particularly along the coast where seasonal and temporary employment is common. The impact therefore of the loss of such employment if the visitor economy

as a whole was negatively affected would be of a higher magnitude given the social deprivation already apparent.

**Why is it acceptable to blight the Lincolnshire landscape when such deprivation and unemployment is clearly a prompt for NG to undertake pylon removal elsewhere?**

**3. Tourism, Heritage and Archaeology**

Lincolnshire relies heavily on tourism as one of its sources of revenue, especially those towns and villages all along the Lincolnshire coast. The Greater Lincolnshire's Visitor Economy is currently estimated to be worth over £2.39bn per annum to the Greater Lincolnshire economy and is one area that has long-term growth potential, with Skegness being the UK's fourth most popular holiday resort. There are many visitors who have permanent holiday homes here and those that visit year on year. The proposed pylons are certainly disliked by residents and from interactions with visitors they are certainly disliked by those visiting the area since they come to enjoy and appreciate the natural landscape, the quiet tranquillity, and big open skies of the Wolds and Coast. NG is removing pylons in other areas where tourism is important to the local economy, notably also in areas of deprivation, yet is proposing to potentially irrevocably damage this income stream for the people of Lincolnshire.

As Dr Caitlin R Green (Historian, Archaeologist and Writer: Oxford Post-Doctoral Researcher and currently University of Cambridge Tutor) notes in her publication Land on the Edge – The Landscape Evolution of the Lincolnshire Coastline: *" … heritage and history are major drivers of UK tourism, both domestic and international, with natural heritage visits becoming increasingly popular and heritage tourism accounting for 22% of all tourist spending. Furthermore, it has been found that heritage projects tend to have a positive economic impact on the surrounding area, in terms of both visitor spending and job creation. In this light, there is obvious scope for using heritage tourism as part of wider efforts to economically invigorate the coastal zone, combatting deprivation, and grow Lincolnshire's visitor economy, particularly as whilst coastal trips comprise 27% of heritage tourism visits in the UK, the East Midlands in general underperforms in terms of visits motivated by heritage and history, suggesting that there is potential for significant growth in this area. …."*

This area retains an impressive sense of early history, typified by numerous prehistoric barrows, ancient tracks, scheduled ancient monuments and views of distant medieval church spires and towers. The larger towns and villages serve both a local rural hinterland and a vibrant tourism market. There are a large number of these heritage sites and monuments in Lincolnshire which could be affected by the proposed pylons, and this in turn will impact on the ability of the area to capitalise on and expand visitor numbers to these sites if their environs and ambience is ruined by visual disturbance and land clearance.

**What risk assessments and quantification has NG done to examine the potential loss to small, medium and large businesses that rely on tourism as well as the knock-on effect of loss of trade to the various economic centres comprising small towns and villages as well as the larger tourist destinations?**

**What risk assessments have been done in relation to the potential for archaeological finds and the potential for despoiling the historic buildings and monuments and their environs that will be impacted by the proposed pylons and substations?**

**4. Public Footpaths and Rights of Way**

There are over 35 walking trails in Lincolnshire as described in the Visit Lincolnshire webpage, including 10 coastal walks. In addition, there are many public footpaths and permissive rights of way that are used extensively by both local communities and tourists alike.

Clearing land for pylons will cause long term disruption and destroy many of these walking trails, in addition to the shocking negative visual and habitat impact the pylons will have. As noted above,

there are also many viewpoints along the various paths and walks that would be affected by subsections of pylons, including the expansive vista up to the Wolds from the English Coastal Path at Donna Nook and other locations along the coast for example.

**What assessments has NG done on the duration and impact on these paths and rights of way? What consideration has been given to the health and wellbeing of those using the paths in the future in relation to the EMF exposure, and their inability to use those paths during the construction and recovery phases? How long will that be?**

**5. Bird Life , other wildlife, Landscape character and UNESCO World Heritage Status**

According to the joint study by the Royal Society for the Protection of Birds (RSPB) and BirdLife International (2021), *" … one in six birds have been lost since the 1980s"* and they called for *action to "reduce the threat of extinctions… for the sake of nature and people".* Professor Richard Gregory, the head of monitoring at the RSPB, said: "*Farmland across Europe has become much more inhospitable to bird populations and other wildlife."*

*"The loss of these common and abundant species has cascading effects upon the ecosystem where systems are changing so rapidly that they won't be able to sustain us, they won't be there to provide our food, to regulate our climate. And the birds are that warning signal."*

The government passed the Environment Act into law in 2021, which requires a halt in species decline by 2030, and wildlife experts agree that the decline in bird populations is largely driven by habitat loss, yet NG are proposing to alter the farming and natural landscape beyond all recognition, including removing veteran trees and hedges which would cause further catastrophic cumulative habitat loss.

The east coast flyway is used by 90 million birds each year, covering coastal areas of Lincolnshire, Yorkshire, Norfolk, Suffolk, Essex and Kent. The east coast, including main areas of Lincolnshire, sees over a million birds come over from across the world during winter.

On 11 April 2023 Michael Copleston, RSPB England Director, said: *"We are absolutely thrilled that the global importance of the English east coast has been recognised by the independent panel and that the east coast wetlands will now be part of the UK's Tentative List of World Heritage sites." "The east coast is an essential refuge for over 155 bird species as well as a world-leading example of how we can manage our coastlines in the face of a changing climate, with true value for nature and people." "We're really looking forward to working with partners and communities up and down the coast to develop a bid for UNESCO in the coming years." …… World Heritage Site status would further serve to highlight their outstanding value as places for both wildlife and people at a time when pressures on such sites from development and recreation has never been higher. "*

16th Apr 2023 - Cllr Colin Davie, Executive Councillor for Economy and Place at Lincolnshire County Council, said *"… the nomination for the wetlands to be included in the East Atlantic Flyway was fantastic news for the county. It is not just for the natural environment and the migratory birds that rely on this route but also in terms of tourism because it will allow us to extend the season. Thousands of bird watchers across the globe will put the East Atlantic Flyway on their 'go to' list. Our continued investment in the Coastal Country Park and work with the Lincolnshire Wildlife Trust and the RSPB underlines the need for this important location to be given this designation so it is safeguarded – not just for the birds that use it but for everyone who cares about the natural environment we are so lucky to have as part of our great county."*

Heritage Minister Lord Parkinson of Whitley Bay said: *"Today we are confirming our support for some of the most enchanting heritage sites and breathtaking landscapes in the UK and its Overseas Territories as they bid for UNESCO World Heritage Site status."* The east coast wetlands proposal presents "*a clear and convincing case for the potential to demonstrate Outstanding Universal Value".*

The government says it has a *"vital importance to bird populations and wildlife. The area sees huge transient bird populations pass through every year as the seasons change."*

UNESCO's recognition of Lincolnshire's migratory bird 'superhighway' could change the dynamic of the coast and increasing the ability of the area to attract year-round tourism, which is essential for improving employment prospects and increasing the use of tourist accommodation outside of the summer season. All of which helps to improve the deprivation indices in this area. Introducing 50m high industrialised structures will seriously harm the UNESCO bid for the Flyway, which in turn will harm the ability of the area to grow its tourism offer. This would appear to be in direct contradiction of NGs own stated aims and objectives in relation to UNESCO sites and areas of deprivation.

The 70 km North Sea coastline forms a clearly defined eastern edge to the District with extensive dune-backed salt marshes that form internationally recognised Special Protection Areas, SSSI`s, Ramsar Sites, Special Areas of Conservation (SAC) and National Nature Reserves fronting the Humber Estuary and the Wash. In addition to these special designations, more recently in September 2023 we had the extension of existing Nature Reserves to form the Natural England new Lincolnshire Coronation Coast National Nature Reserve, which is the first in the new King's Series and aims to support nature recovery and connect people with nature - see Appendix 4.

**Where are the ecological reports and environmental impact assessments for the proposed pylons and substations?**

**Given that the coastal area and the Wolds are indivisible in the manner proposed by NGs pylons and substations, what assessments have been done on the impact of these proposals on the Coastal Nature reserves and their anticipated ability, as stated by the King, to increase tourism and improve biodiversity, supporting nature recovery and connecting people with nature?**

Under the DEFRA Environmental Improvement Plan, the government set out clear steps to halt the decline in species abundance by 2030 and improve the status of wild birds and other species which play an important role in our ecosystems.

The landmark 'State of Nature 2023' report confirmed that the pressure on our wildlife and wild spaces is immense, with habitat loss, development, the modernisation of farming, persecution, unsustainable fishing and climate change all having a major impact. Yet NG wants to add to these negative impacts by removing habitat and introducing EMR which is known to interfere with the birds ability to successfully migrate and collisions with powerlines result in death. We believe that there is no mitigation that can be carried out that removes these risks to an acceptable level.

**In what way does removing and destroying bird and other wildlife habitat meet the legal obligation of NG to fulfil the DEFRA Environmental Improvement Plan?**

**How do NGs plans to introduce pylons and substations into the coastal plain and marshes fit with Natural England's assessment of opportunities for *"… conserving and enhancing landscape character and benefiting biodiversity and the historic environment."* Page 23 of 42. Lincolnshire Coast and Marshes refers. (see Appendix 1)**

Similarly, and specifically: SEO2 page 24 - *SEO 2: Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns of the Middle Marsh and Outmarsh and the fishing heritage of the port of Grimsby. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which contribute towards green tourism, enhance green infrastructure links, manage the pressures of flood risk and climate change, and ensure that infrastructure developments, such as offshore wind turbines do not contribute negatively to the character of the area.*

And in 43. Lincolnshire Wolds (Appendix 2) page 21 refers*: SEO 1: Protect, enhance and promote the rolling chalk landscape of the Lincolnshire Wolds with its open plateaux, outstanding long views, enclosed valleys, important habitats and high sense of tranquillity. Improve opportunities to enhance people's access and enjoyment of the Wolds' special qualities and the natural beauty. " … Avoiding development in remote and tranquil areas, in particular protecting the remote qualities of the Area of Outstanding Natural Beauty (AONB) and the wider landscape of the Lincolnshire Wolds. All new development should be well designed, sympathetically located and screened. The dark skies featuring in the more remote areas also need protection…." "..Protecting the sense of place by conserving the outstanding views into the adjacent National Character Areas (NCAs)* (NB this means for example 42.Lincolnshire Coast and Marshes*), intimate, steep-sided valleys and* ***geological features which provide a sense of inspiration and a tranquil recreational resource…." "Planning for the creation of a strong landscape framework to provide a setting for new and existing development and transport infrastructure, ensuring that the valuable and protected landscape of the Lincolnshire Wolds is not diluted and that its tranquillity is not negatively affected."***

**What steps have NG taken to ensure that their proposals do not interfere in any way with the ability of these important landscapes to continue to develop their opportunities of this protected and vitally important tranquillity?**

**What assessments and actions has NG taken to assess the potential risk to all protected species, including Barn Owls for example?**

**There are a number of honey producers in the Lincolnshire area – what measures have been taken to assess these and undertake mitigation measures to prevent the electromagnetic fields which disrupt the bees ability to pollinate, which in turn reduces biodiversity and plant fertilisation in these areas?**

On 19th December 2022 the *'Kunming-Montreal Global Biodiversity Framework* was adopted to provide a global framework for nature's recovery. The Framework is a mission to halt and reverse the loss of biodiversity by 2030 with a commitment to take urgent action to halt extinctions, recover populations, and protect and restore ecosystems by the end of the decade. Specifically, this recognises the urgent need to stop things getting any worse – and very importantly – to also push for recovery.

**The proposal to put pylons across this increasingly important natural Lincolnshire landscape is in total direct opposition to the Framework. How will introducing 140km of 420 50m Pylons and multiple overhead lines, which create an obstruction and represent a danger to wild birds, fulfil these same legal requirements, or the moral and social obligations to our whole communities, or the NPPF of enhancing and improving biodiversity?**

## 6. Loss of Agricultural Land and Food Security

The proposals seemingly ignore the importance and value of Lincolnshire's agricultural economy, which is in direct opposition to the government's key priority for food security. While there are clearly many competing priorities for our land, it remains essential to preserve our most productive agricultural land from long-term loss. According to the CPRE (Council for the Protection of Rural England) in the past 12 years we have lost over 14,000 hectares of prime agricultural land to development, including 287,864 houses — equivalent to the productive loss of around 250,000 tonnes of vegetables and enough to provide nearly two million people with their 5-a-day for an entire year.

The proposed route for the pylons plus the associated substations, transformers, solar farms, battery and hydrogen storage and new gas-fired power stations would see more than 17,000 acres of land consumed.

Executive Summary – CPRE Report Building on our Food Security – July 2022 (see Appendix 5)
*"Maintaining agricultural capacity to deliver significant levels of domestic food production is critical. This must be achieved in the context of addressing and adapting to climate change, reversing the loss of nature and meeting increasing demands on land for other social goods — not least affordable housing and renewable energy. With enough previously developed 'brownfield' land to provide 1.2 million homes, and south-facing rooftops that could meet much of our energy needs, we have a chance to tackle the climate, housing and cost-of-living crises without sacrificing our farmland. Adjusting our farming sector to a post-Brexit model of subsidies should support the necessary move away from damaging intensive farming practices and towards a more multifunctional approach to using land — reconciling food production with better management for natural and cultural heritage, and for public access. Policies that are put in place now will be crucial in ensuring the most efficient use of our land in the face of these challenges."*

The National Planning Policy Framework (NPPF) states that: *Planning policies and decisions should contribute to and enhance the natural and local environment by recognising the intrinsic character and beauty of the countryside and the wider benefits from the natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land.*

The CPRE note: *"How we use our land resource is only going to become more important as the impacts of the climate emergency become evident, with significant areas of BMV* (Best and Most Versatile) *land at risk of permanent flooding. Climatic change, especially rainfall patterns and accumulated temperatures, may also lead to changes in agricultural land quality that will reduce the extent of BMV land. In addition, there is plenty of potentially suitable alternative space for renewable technologies — particularly for solar panels on existing rooftops."*

According to the CPRE, an estimated 212,319 ha of all England's Grade 1 BMV land within flood zone 3 areas — this means 59.8% of all England's Grade 1 BMV land is at the highest risk of flooding. The regional profile of flood risk shows that 75% and 95%, respectively, of the East Midlands and East of England Grade 1 land is at the highest risk of flooding.

The implications of climate change will have severe consequences for the further loss of BMV land and our resulting food security. Therefore, protecting BMV land from permanent development now is vital if we are to maintain a supply of BMV land as climate change progresses, and therefore using that land for pylons and associated substations etc is neither the best use of that land nor in anyone's interest, least of all the inhabitants of Lincolnshire.

**Protecting our BMV agricultural land is a top priority, shared by the government. Have NG carried out site-specific surveys to accurately calculate the loss of BMV Land for the pylons and substations and all associated projects?**

## 7. The Lincolnshire Aquifer and Ground Water Protection Zones

Groundwater is an important resource in the United Kingdom, in terms of both its potential for abstraction for beneficial use and for its interaction with the wider environment. In addition to abstractions for public supply, groundwater is relied upon by many for domestic water supplies from private springs or boreholes.

The Lincolnshire Chalk aquifer system is a valuable resource which has been used for potable and industrial use for the last 200 years. Across the proposed pylon route there are many boreholes (Appendix 6) penetrating limestone and chalk aquifers, and according to the Environment Agency groundwater levels in these boreholes are currently in the exceptionally high range.

The major potential groundwater impacts from civil engineering works were categorised by Preene and Brassington *(PREENE, M and BRASSINGTON, F C. (2001). The inter-relationship between civil*

*engineering works and groundwater protection. Protecting Groundwater. Environment Agency, National Groundwater and Contaminated Land Centre Project NC/00/10, Solihull, pp313–320.).*

These impacts are grouped into five main categories:
1. Abstraction from aquifers.
2. Physical disturbance of aquifers creating pathways for groundwater flow.
3. Physical disturbance of aquifers creating barriers to groundwater flow.
4. Discharges to groundwaters.
5. Discharges to surface waters.

It is universally accepted that construction works often have significant impacts on groundwater Conditions and such impacts range from the derogation of water sources by dewatering works, to the creation of barriers and pathways for groundwater flow, formed by foundations, such as those required by the pylons and substations. The need for accurate baseline groundwater environmental data is therefore well established, along with recommendations and planning of ongoing monitoring programmes. When land is cleared it causes soil erosion that leads to silt-bearing run-off and sediment pollution. Silt and soil that runs into natural waterways turns them turbid, which restricts sunlight filtration and destroys aquatic life.

**As each of the pylon sites, as well as the whole project, must therefore be assessed individually, taking into account the nature of the works, the presence and vulnerability of aquifers, and the proximity and sensitivity of nearby water sources, etc. what measures has NG taken to investigate the Aquifer system and boreholes relative to the proposed siting of pylons and substations and other proposed projects?**

**What measures will be taken to prevent pollution and contamination of the aquifer and ground water protections zones both during construction and ongoing effects eg by contamination by leaching of chemicals from concrete and other construction materials to surface water and ground water?**

**Given the unacceptable risk of pollution of our groundwater and groundwater protections zones, and the potential for the proposed works to generate polluting activities, these would need to be strictly controlled or preferably prohibited. What assessments have been made regarding the need for dewatering and any potential unwanted side effects of temporary dewatering?**

The proposed substation at Bilsby is on the highest point in the road between Alford and Asserby so will be elevated and is on land which is already suffering with flooding. Covering that with concrete to house the substation will only add to the flooding issue and cause further run off onto the road and into adjacent land.

**What measures would be planned to mitigate the visual impact on the surrounding landscape in terms of screening, given that it is on higher ground and also what measures will be taken to prevent worsening of flooding to neighbouring land?**

## 8. Airfields and Landing Strips

We believe that others have already written to highlight the existence and importance of these facilities to our economy and social infrastructure, and the risk to life that would occur in the presence of pylons.

## 9. Health and Wellbeing

The electromagnetic envelope of high-voltage overhead cables produces a significant hum, buzz, and crack, which has been shown in some studies to harm health. The stress and anxiety that has been caused to landowners and others affected by the proposed proximity to the proposed pylon route and substations is reprehensible.

**Why is NG undertaking these land surveys at this early stage when this is just the start of consultation? Clearly this relates to our observations above about the failure of this exercise to constitute adequate or meaningful consultation, as NG is behaving as if they are already proceeding with pylons.**

Electromagnetic fields (EMF) are constantly emitted from pylons, as well as from the power lines that connect to pylons. The closer that people are to either power lines or pylons, the more risk there is that potential health dangers can occur. The duration of time spent near these structures can also magnify this and increase the risk.

While the UK Government continues, unreasonably to our mind, be sceptical of emerging evidence of the potential harm from exposure to EMF, the epidemiological evidence continues to mount: *"A doubling of childhood leukaemia risk is seen for average exposures above 0.4 µT. Other health risks refer generally to increased risk around or below 1 µT average exposure. The current ICNIRP exposure guidelines are set at 100 µT, 250 times higher than 0.4 µT where the doubling of childhood leukaemia risk is seen."*

We attach at Appendix 7 the 2010 Letter from Denis L Henshaw Prof of Physics at Bristol University and understand there is more recent evidence that supports these observations which we are currently researching and examining. The potential introduction of noise, electromagnetic effects, and visual disruption would have a significant negatively impact on the mental well-being of our communities and the enjoyment of residential and rural amenity.

**As noted in 4 above, there are many public footpaths and walking routes that will be affected by these proposals, what risk assessments have been done in relation to the power lines and pylons for those with pacemakers, autistic children, female infertility, and those with existing or the potential to develop mental health issues? What about the potential danger of microshocks for those riding bicycles or horses along paths and bridleways?**

**10. Subsea Alternative and use of modern technology for smaller underground trench**

We understand that the pipeline from the wind generation will need to travel some 550km subsea before reaching landfall in the Grimsby area; it is therefore completely non-sensical that this 550km should be used to achieve landfall near Grimsby when that would be a substantial part of the route under the seabed in the direction of where the power will actually be needed, making landfall in The Wash for example.

Everyone we have spoken to accepts that there is ultimately a cost to pay to support the decarbonisation of electricity generation, but the unanimous response has been that they would rather pay more for that infrastructure to be placed in the seabed now, rather than ruin their lives and the lives of their children and grandchildren for years to come.

**Why is there no proper exploration and costings available for an integrated or standalone subsea route? For the subsea options, what is the relative cost of HVDC versus AC? Why doesn't NG consult with those who will actually be affected by the introduction of unsightly industrialised infrastructure that is of no immediate benefit to them?**

**Why are there no details of the option of upgrading of current infrastructure that could be used to transmit this power?**

Sources indicate that the use of HVDC would only need to be c40m wide as the cable can transmit more power over the same diameter of cable when compared to AC (6 cables as opposed to 18).

In addition, this would be

- Much cheaper over long distances
- Reduce Transmission Losses:
- Stability and Control: HVDC systems offer better control over power flow, improving the stability of the network.
- Lower Electromagnetic Fields: Underground HVDC cables produce lower electromagnetic fields compared to AC cables.

We understand that for AC cables, especially when buried underground or laid underwater, the cable capacitance can lead to high reactive power generation. This can necessitate the use of compensating equipment along the route, increasing complexity and cost. HVDC does not have this issue, making it more efficient for both underground and subsea applications.

**Why does the cost and implications of land trenching for a c120m wide trench not take into account the ability to use underground HVDC? With cables this compact why cannot cable ploughing be used to save on land damage and costs? What about the costs of upgrading and reinforcing the road network and who will pay for these to be repaired and replaced?**

The production of concrete destroys natural infrastructure and therefore contributes to the biodiversity crisis – which many scientists believe to be as much of a threat as climate chaos. With over 4 billion tonnes of carbon dioxide annually it is therefore harmful in terms of environmental degradation. According to the National Ready Mixed Concrete Association, each pound of concrete releases 0.93 pounds of carbon dioxide. The cement process industry makes up 8% of overall global carbon emissions. Among materials, only coal, oil and gas are a greater source of greenhouse gases. Half of concrete's CO2 emissions are created during the manufacture of clinker, the most-energy intensive part of the cement-making process. Add to this the resource and CO2 implications for the steel which is proposed to be used for the 50m high pylons and it quickly becomes an unacceptable and outdated way of delivering the infrastructure required, at odds with the whole decarbonisation argument.

**We all have a responsibility to think about all the materials we are using and their wider impact on local, national, and international populations. Why are NG ignoring the importance of limiting the use of natural infrastructure and resources by proposing the use of concrete and steel in these outdated proposals?**

**Summary**

A. In the 2018 East Lindsey Local Plan opportunities were identified to widen the tourism offer through greener, more sustainable tourism – the impact of overground pylons on this would be completely negative and unacceptable. The parish council believes that there is a pressing need to protect agricultural land and local services and facilities which would be lost, with the resultant loss of tourism revenue and visitor income, if these proposals are allowed to proceed.

B. NGs proposals for pylons and substations are at odds with the NPPF and the ELDC Local Plan and have grave negative implications across a number of areas. It is our responsibility to ensure that our natural and historic environment and heritage assets of the district are respected and looked after as it is a fundamental part of ensuring our economy - both rural and urban - is encouraged to grow and flourish. The rural character of East Lindsey and the high quality of its landscape and natural environment, including the unpolluted night skies, should be protected because they contribute to the character of the Wolds and Marshes and have been highlighted as crucial assets. They are a vital component in diversifying the rural economy as well as protecting biodiversity, improving, and extending it.

C. We strongly object to the NG proposed Grimsby to Walpole Pylons, substations and associated projects which would create a permanent industrial disfigurement of the unique Lincolnshire

countryside. Having placed the turbines out at sea to stop the ruination of the landscape, the 2012 decision to underground the link from the Triton Knoll windfarm to the Bicker Fen sub-station was made precisely to protect the landscape characteristics and took into account the various issues raised in this objection, and this proposal is no different. The additional costs incurred in burying cables were a conscious decision essential to mitigating the visual impact. Compromising that investment would be highly illogical by introducing overhead cables in the same areas where there is a long history of no industrial development.

D. We expect National Grid to follow its own Strategic Objectives and Environmental Action Plan as well as its Responsible Business Charter. In which case NG need to do much, much better so that we can maintain and improve our invaluable natural environment which in turn results in healthy people, and a healthy economy.

E. We respectfully request that NG undertake a genuine and widespread consultation process, in line with the Gunning principles, with the communities of Lincolnshire, that looks to achieve a balance that does not destroy our landscape, wildlife, agriculture and socio-economic wellbeing. This consultation should include all options, including an integrated offshore grid, and not just an exclusive pre-determined NG preferred overland option.

F. all options should present a genuine value for money assessment and be costed in accordance with the Treasury Green Book principles to include all costs and benefits, including unmonetised ones - and including any details of the compensation proposed for communities/over what period/how accessed – as this question was evaded during the Teams presentation.

G. Options should look to improved modern methods, for example cable ploughing and the use of HVDC cabling, rather than the old methods of trenching and overbearing pylons, which has all the associated negative impacts of CO2 emissions and use of natural resources used to produce concrete and steel.

Yours sincerely
**On behalf of North Somercotes Parish Council**

Cllr Stephen Brooks
**Chairman**

Copy:
Cllr Colin Davie – Executive Councillor - Economic Development, Environment and Planning, Lincs CC
Cllr Craig Leyland – Leader East Lindsey District Council
Claire Coutinho MP, Secretary of State for Energy Security and Net Zero
Victoria Atkins MP Louth & Horncastle
Stephen Jack, Lincolnshire Wolds Countryside Service Manager, Lincolnshire County Council
Dr Tony Juniper CBE, Chair of Natural England
Mark McAllister, Chair of Ofgem
Charley Cranmer, No Pylons Lincolnshire
Paul Learoyd, Chief Executive of Lincolnshire Wildlife Trust
Campaign to Protect Rural England - CPRE
Environment Agency

**Appendix 1 – Extract from Natural England – National Character Area Profile – 42 Lincolnshire Coast and Marshes – see full copy attached**

National Character Area profile: **42. Lincolnshire Coast and Marshes**

Introduction & Summary | Description | Opportunities | Supporting documents: Key facts and data | Landscape change | Analysis

## Statements of Environmental Opportunities:

- **SEO 1:** Safeguard, manage and enhance the dynamic coastal landscape producing net gains in extent and quality of internationally and nationally important habitats including sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh for the wildlife they support, to increase ecological resilience and to increase the landscape's ability to mitigate flood risk and climate change.
- **SEO 2:** Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns of the Middle Marsh and Outmarsh and the fishing heritage of the port of Grimsby. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which contribute towards green tourism, enhance green infrastructure links, manage the pressures of flood risk and climate change, and ensure that infrastructure developments, such as offshore wind turbines do not contribute negatively to the character of the area.
- **SEO 3:** Ensure sustainable food production while enhancing and strengthening the network of farmland features; manage, expand, create and link habitats within the Outmarsh and Middle Marsh to benefit biodiversity, soil and water quality by promoting farming and forestry practices that are able to adapt to climate change. Manage the rivers, water levels and the provision and quality of water in the whole catchment for human and ecological benefit.
- **SEO 4:** Conserve and enhance the character of the traditional seaside resorts and the long sandy beaches which help to make the area an important tourist destination; improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast with its expansive coast and marsh landscape and its coastal features and wildlife, while protecting high levels of tranquillity and the extensive, open views both inland to the Wolds and also out to sea.

Water vole -a protected species found in the important wetland habitats of the Lincolnshire Coast and Marshes.

**Appendix 2 – Extract from Natural England – National Character Area Profile – 43 Lincolnshire Wolds – see full copy attached**

National Character Area profile: **43: Lincolnshire Wolds**

Introduction & Summary | Description | Opportunities | Supporting documents: Key facts and data | Landscape change | Analysis

## Statements of Environmental Opportunity

**SEO 1: Protect, enhance and promote the rolling chalk landscape of the Lincolnshire Wolds with its open plateaux, outstanding long views, enclosed valleys, important habitats and high sense of tranquillity. Improve opportunities to enhance people's access and enjoyment of the Wolds' special qualities and the natural beauty.**

**For example by:**

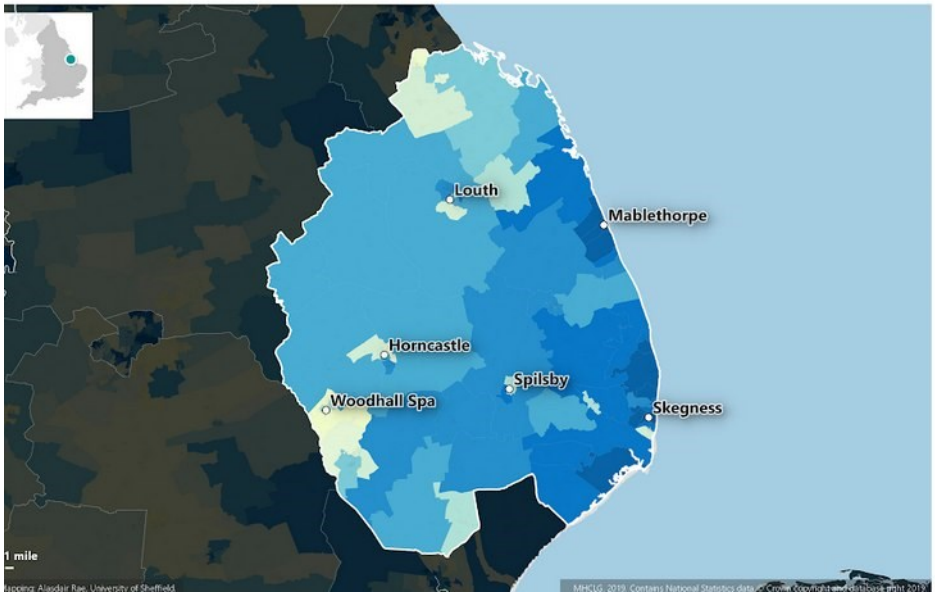
- Protecting the sense of place by conserving the outstanding views into the adjacent National Character Areas (NCAs), intimate, steep-sided valleys and geological features which provide a sense of inspiration and a tranquil recreational resource.
- Planning for the creation of a strong landscape framework to provide a setting for new and existing development and transport infrastructure, ensuring that the valuable and protected landscape of the Lincolnshire Wolds is not diluted and that its tranquillity is not negatively affected.
- Encouraging more people to visit the distinctive open countryside for quiet enjoyment, re-connecting them with the importance of the landscape, geodiversity and biodiversity.
- Providing the necessary recreational infrastructure to meet the significant demand without detriment to the landscape. Improving access across the area and supporting and promoting participation and community engagement.
- Avoiding development in remote and tranquil areas, in particular protecting the remote qualities of the Area of Outstanding Natural Beauty (AONB) and the wider landscape of the Lincolnshire Wolds. All new development should be well designed, sympathetically located and screened. The dark skies featuring in the more remote areas also need protection.
- Working in partnership to implement the Lincolnshire Wolds AONB Management Plan, and ensuring that local plans and policies recognise and support the plan.
- Managing the unique biodiverse assemblage of habitats including calcareous and other species-rich grasslands.
- Protecting the many verges and nature reserves with their species-rich grasslands by involving local communities and volunteers in their care and management.
- Expanding isolated and fragmented woodland where this is not in conflict with remnant grassland areas or important views. Woodland will enhance landscape character and habitat adaptation to climate change.
- Conserving and extending riparian habitats and nationally important wet alder carr woodland along the streams in the south-west valleys.

**Appendix 3 – Deprivation Indices for East Lindsey 2019**

# English Indices of Deprivation 2019

Ministry of Housing, Communities & Local Government

## EAST LINDSEY




### Local deprivation profile

% of LSOAs in each national deprivation decile

MORE DEPRIVED

| | |
|---|---|
| 1 | 16.0% |
| 2 | 19.8% |
| 3 | 16.0% |
| 4 | 17.3% |
| 5 | 6.2% |
| 6 | 6.2% |
| 7 | 9.9% |
| 8 | 3.7% |
| 9 | 4.9% |
| 10 | 0.0% |

LESS DEPRIVED

### What this map shows

This is a map of Indices of Deprivation 2019 data for **East Lindsey**. The colours on the map indicate the deprivation decile of each Lower Layer Super Output Area (LSOA) for England as a whole, and the coloured bars above indicate the proportion of LSOAs in each national deprivation decile. The most deprived areas (decile 1) are shown in blue. It is important to keep in mind that the Indices of Deprivation relate to small areas and do not tell us how deprived, or wealthy, individual people are. LSOAs have an average population of just under 1,700 (as of 2017).

More deprived — Less deprived

Relative level of deprivation

**Appendix 4 – Lincolnshire King's Coronation Coast Nature Reserve**

Natural England's new Lincolnshire Coronation Coast National Nature Reserve is the first in the new King's Series and aims to support nature recovery and connect people with nature.

Natural England has today (Monday 18 September) launched a new National Nature Reserve on the Greater Lincolnshire coast which marks the first in the new King's Series of National Nature Reserves committed to enhancing biodiversity and nature recovery while connecting people with nature.

The Lincolnshire Coronation Coast National Nature Reserve (LCCNNR) covers 33 square kilometres along almost 30 kilometres of the Greater Lincolnshire coast, making it the ninth largest National Nature Reserve in the country. The area contains a rich variety of sand dunes, salt marshes, mudflats and freshwater marshes which are of international importance.

The LCCNNR brings together the existing Donna Nook and Saltfleetby-Theddlethorpe Dunes National Nature Reserves, adding a further 2350 hectares of land managed for nature conservation, supporting many breeding and over-wintering birds, natterjack toads, special plants and insects. The new site is now two thirds larger, making it the ninth largest National Nature Reserve of the 220 in England.

National Nature Reserve status is given to the very best nature conservation sites in England and is recognition that the land is nationally important and will be managed in perpetuity for its wildlife and geology. Many National Nature Reserves are managed – like the LCCNNR - by multiple parties who are committed to working together towards a shared future vision for the nature reserve.

At LCCNNR Natural England will work alongside Lincolnshire County Council, North East Lincolnshire Council, Lincolnshire Wildlife Trust, Ministry of Defence, the Royal Society for the Protection of Birds (RSPB) and the Environment Agency to share skills, knowledge and resources for long term commitment to the site. A range of organisations has joined together to launch the LCCNNR, including the Humber Nature Partnership with a common goal and commitment to nature, science and people by providing access to green space and wildlife.

The percentage of Lincolnshire population with easy access to nature is one of the lowest in the country. The new reserve is close to large urban populations, with Grimsby and Cleethorpes to the north, Mablethorpe and Sutton-on-Sea to the south, and Louth and Lincoln to the west. Some of the 10% most deprived neighbourhoods in England are within walking distance of the reserve.

The LCCNNR will help to unlock more opportunity for local people to access and experience the coastline for their own health and wellbeing, supporting communities to get active, providing education opportunities or learning new skills through volunteering, or to simply recharge in nature.

Tony Juniper, Chair of Natural England, said:

*"Today's declaration of the new Lincolnshire Coronation Coast National Nature Reserve is a landmark moment for nature recovery in England, not just in Lincolnshire but also nationally.*

*"Not only is it a visible demonstration of ambitious targets being translated into practical action, but also a fine example of how broad partnerships can be harnessed for nature recovery at scale.*

*"This area of coastline is of international importance due to habitats that support hundreds of thousands of birds, rare natterjack toads and a host of special insects and plants.*

*"This newly expanded National Nature Reserve will enhance the nature and biodiversity of the Greater Lincolnshire coast making it a bigger, better and more joined up area for wildlife. This*

*reserve also presents opportunities for local people to connect with amazing wildlife while also providing an attractive destination for tourists to visit, bringing benefits to the economy too."*

The Lincolnshire Coast has a range of important habitat for species including birds and mammals. There will be five priority habitats within the National Nature Reserve boundary: intertidal mudflats, coastal saltmarsh, coastal sand dunes, coastal and floodplain grazing marsh, and saline lagoons.

Wildlife benefitting from the reserve include notable winter assemblage of wading birds and wildfowl and a range of breeding species in spring and summer. Special species include redshank, whitethroat, golden plover, natterjack toads, grey seals, and a diverse range of plants and insects such as the marsh moth – one of only two places in the country where they are found. The saltmarsh and lowland wet grasslands are very important in delivering natural solutions to manage climate change.

It is also a popular destination for visitors and the new National Nature Reserve partnership will be promoting responsible access and enjoyment of the sites. The reserve is close to the resort of Cleethorpes and the King Charles III England Coast Path runs through the site. The site will complement the area's already fascinating cultural and historical appeal with its evidence of shipwrecks, medieval landscapes, smuggling and salt making, and its inns and alehouses.

The site is the first in the new King's Series of National Nature Reserves and one of the best places for nature to thrive in England. The series will see the creation of five major National Nature Reserve declarations every year for the next five years - 25 in total.

Cllr Colin Davie, executive member for environment at Lincolnshire County Council, said:

*"Lincolnshire is delighted to be home to the first of the new King's Series of National Nature Reserves. By joining up and extending the existing nature reserves to form the vast Lincolnshire Coronation Coast, we're adding to the rich tapestry of conservation projects that line the east coast between the Humber and The Wash. By working together we're not only protecting and enhancing our unique habitats and natural environment, but we're allowing more visitors to discover the unspoilt beauty of this stretch of coastline." Paul Learoyd, chief executive, Lincolnshire Wildlife Trust said:*

*"This exciting new declaration demonstrates what can be achieved by working in partnership across an entire landscape. From the first steps that the Lincolnshire Wildlife Trust made to protect this section of the Lincolnshire coast in the 1950s, working with others has been key. Volunteers are also part of this partnership giving hundreds of hours annually to record wildlife, help manage habitats and engage with the public especially at the Donna Nook grey seal colony."*

**Published:** 18th September 2023

**Appendix 5 – CPRE – Building on our Food Security July 2022 – see attached**

## Appendix 6 – Lincolnshire of Abstraction Boreholes

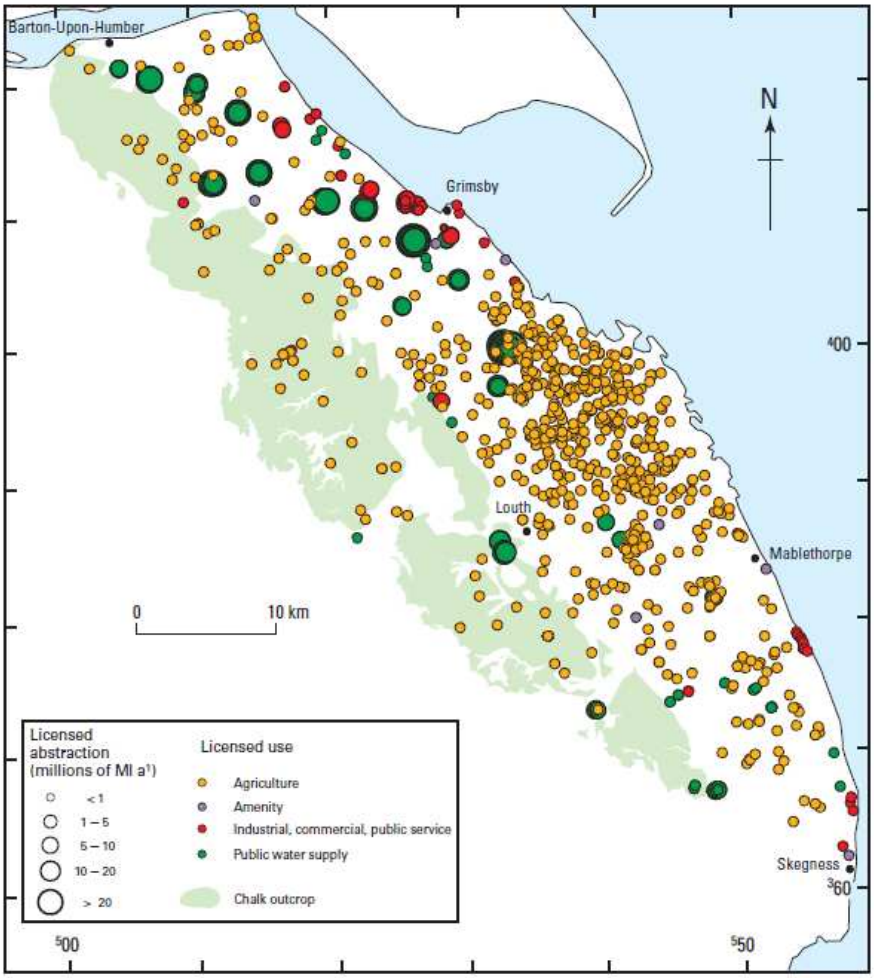



**Figure 5.1** The locations of major present-day abstraction boreholes (2000).

## Appendix 7 – Prof Denis Henshaw Letter 2010 – see attached

**Appendix 8 – ELDC Local Plan extracts**

*Strategic Policy 10 (SP10) – Design*
*Historic Environment*

*Where we want to be*
*The significance of heritage assets of East Lindsey will be key considerations in all relevant development. They will help shape the social, environmental and economic heart of our communities, add to the visitor economy and will be enhanced for the enjoyment of future generations.*

*What it will look like*
*The area has become better known for the quality of its historic environment.*
*New development has taken the opportunity to improve the historic character and quality of its surroundings.*

*Settlements will have retained their strong sense of identity and historic character.*
*The condition of heritage assets 'at-risk' has been improved and their sustainable future secured*.

*4.20 The District's historic environment not only contributes to its character, social, environmental and cultural value but also adds significant benefits to its economic value in the form of tourism to its vibrant market towns and the historic landscapes of the Lincolnshire Wolds AONB and open coast. The cumulative visual impact of development on the historic environment can have a detrimental effect and the Council will guard against such effects on the significance of any heritage asset.*

*Conservation Areas are intended to not only protect individual buildings but also to conserve and enhance the general character and appearance of an area. Conservation Areas cannot be divorced from their surroundings and development adjoining a Conservation Area can have an impact on its setting. The Council does not wish to introduce inappropriate or large-scale uses into unsustainable or sensitive locations in the countryside or the small hamlets where they will detract from the high quality landscape of the Lincolnshire Wolds AONB and rural character of the District.*

National Character Area profile:

# 42. Lincolnshire Coast and Marshes

Supporting documents



www.gov.uk/natural-england

NATURAL ENGLAND

# Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper,[1] Biodiversity 2020[2] and the European Landscape Convention,[3] we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

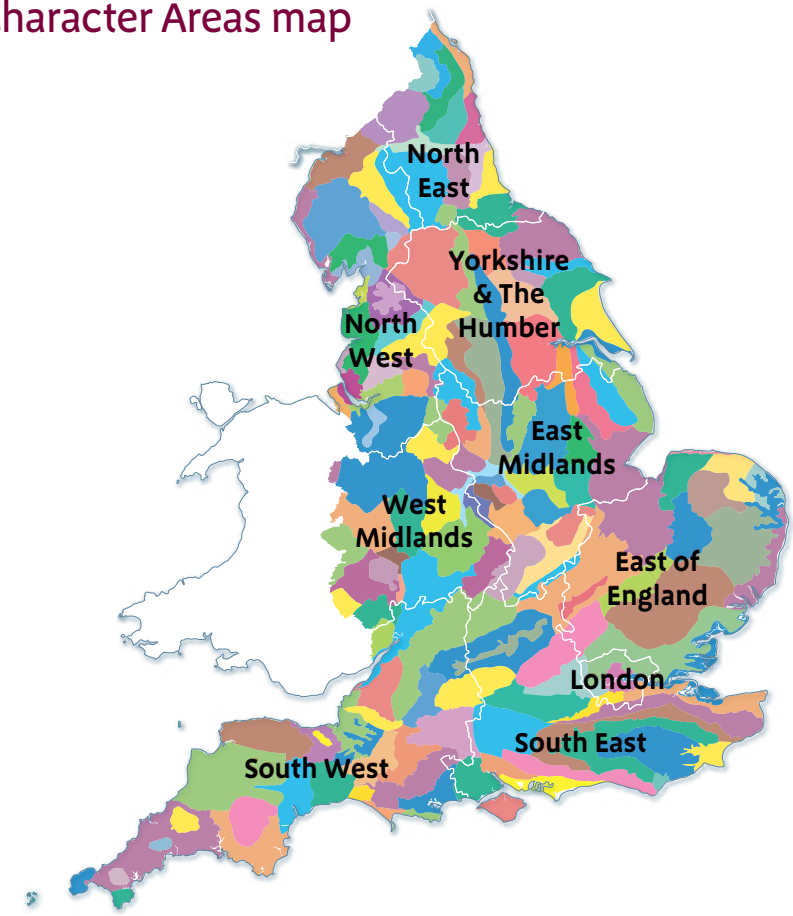
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing ncaprofiles@naturalengland.org.uk.

## National Character Areas map



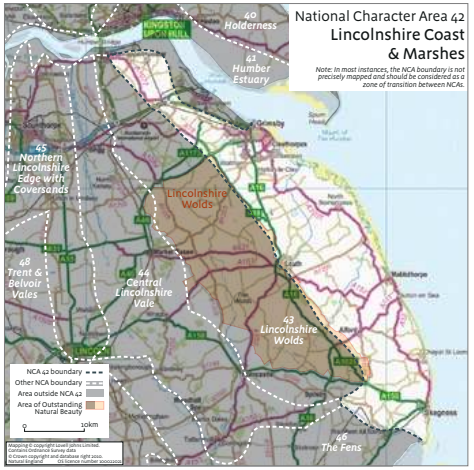

[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)
[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

## Summary

This area is characterised by a wide coastal plain which extends from Barton-upon-Humber in the north, across to Grimsby at the mouth of the Humber and south to Skegness. The area is bounded by the North Sea along its eastern edge and by the Lincolnshire Wolds to the west. The wide coastal plain incorporates three distinctively different but closely interconnected areas which run broadly parallel with the edge of the Wolds. To the west is the Middle Marsh which comprises a softly undulating arable landscape with a greater number of woodlands and hedgerows than other areas. To the east lies the Outmarsh, an open landscape of arable land, mixed with rich pasture divided by narrow dykes. The Outmarsh has changed in character – and was once as grassy as Romney Marsh or the Somerset Levels. It has gradually turned into an area which is predominately arable, particularly since effective pump drainage was introduced in the 2nd half of the 20th century, following the 1953 floods.

Finally, there is the open, wild and ever-changing landscape of the coast itself, which is subject to continuous erosion and accretion. It has extensive stretches of intertidal habitats including salt marsh, coastal dunes and wetlands. To the north, the offshore gradient is so slight that at low tide extensive sand flats and mudflats are exposed. Half of the coast is internationally recognised for its biodiversity and in particular the bird species that it supports. There are adjacent estuaries; to the north the Humber Estuary and to the south, the Wash and the area is of international significance as a Ramsar site, with half of the NCA coast designated as a Special Protection Area for the large flocks of overwintering migratory and breeding birds. Several National Nature Reserves follow this part of the Lincolnshire and some key species exist, including an important breeding colony of grey seals. In the south, Gibraltar Point, at the entrance to the Wash, is internationally designated for its area of dunes, salt marsh and shingle.

Most settlement is concentrated on the coast, around Grimsby and the resorts of Skegness, Mablethorpe and Cleethorpes, whose fine sandy beaches and low rainfall have attracted holiday-makers for generations. The extensive caravan parks, particularly around Skegness, are very distinct from the rest of the area. There are no cities within the NCA; however, the settlement pattern is very built up around Grimsby which is an important trading route at the mouth of the Humber and was once the largest fishing port in the country. Southwards from Grimsby the settlement pattern is




Click map to enlarge; click again to reduce

**Coastal processes in the intertidal areas ensure that the landscape is continually changing.**

dispersed while inland there are nucleated settlement patterns, with many smaller villages and the historic market towns of Louth and Alford.

Much of the agricultural land of the Outmarsh has been reclaimed from the sea over many centuries. Food production is important within the National Character Area (NCA) with cereals, root crops, oilseed and very small amount of vegetables grown. There is also mixed farming and pastoral land grazed by cattle and sheep with areas of grazing marsh.

A complex series of rivers flow slowly east across the plain to the sea, some natural, some manmade, such as the many drains and ditches which combine to form important networks linking with other semi-natural habitats. Several rivers, such as the Great Eau, terminate as raised embanked water carriers. The chalk streams which occur are important for their unique biodiversity. The underlying chalk bedrock acts as a major aquifer, supplying water to homes and industry in the wider region.

The investment in coastal protection has been significant on this part of the east coast and includes hard defences, the Lincshore scheme introduced in 1994 and the maintenance of dunes.

The rising sea levels, when combined with river flooding, can potentially cause major flood events in the low-lying areas and there is a need for combined action in coastal areas to address flood risk. Major flooding has occurred in the area and fluvial flooding is managed by a network of over 30 pumping stations across the NCA. Addressing and understanding the natural coastal processes is a real challenge, particularly where coastal development exists.

## Statements of Environmental Opportunities:

- **SEO 1:** Safeguard, manage and enhance the dynamic coastal landscape producing net gains in extent and quality of internationally and nationally important habitats including sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh for the wildlife they support, to increase ecological resilience and to increase the landscape's ability to mitigate flood risk and climate change.

- **SEO 2:** Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns of the Middle Marsh and Outmarsh and the fishing heritage of the port of Grimsby. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which contribute towards green tourism, enhance green infrastructure links, manage the pressures of flood risk and climate change, and ensure that infrastructure developments, such as offshore wind turbines do not contribute negatively to the character of the area.

- **SEO 3:** Ensure sustainable food production while enhancing and strengthening the network of farmland features; manage, expand, create and link habitats within the Outmarsh and Middle Marsh to benefit biodiversity, soil and water quality by promoting farming and forestry practices that are able to adapt to climate change. Manage the rivers, water levels and the provision and quality of water in the whole catchment for human and ecological benefit.

- **SEO 4:** Conserve and enhance the character of the traditional seaside resorts and the long sandy beaches which help to make the area an important tourist destination; improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast with its expansive coast and marsh landscape and its coastal features and wildlife, while protecting high levels of tranquillity and the extensive, open views both inland to the Wolds and also out to sea.

**Water vole -a protected species found in the important wetland habitats of the Lincolnshire Coast and Marshes.**

# Description

## Physical and functional links to other National Character Areas

The Lincolnshire Coast and Marshes National Character Area (NCA) is a low-lying, broad plain which forms the most easterly NCA in Lincolnshire. Its long eastern coastline is bounded largely by the North Sea with the northerly extent of the coastline joining the large expanse of the Humber Estuary while to the south lies the entrance to The Wash. The area therefore has strong coastal links with the adjoining The Fens and Humber Estuary NCAs. Marine processes strongly influence the physical and biological character of the NCA through sediment transfer. This NCA is within the same sediment cell as the Holderness and Humber Estuary NCAs. Marine sediments are transferred south, originating from the northerly coastlines, especially the Holderness coast, and, through accretion help intertidal habitats to adjust to rising sea levels.

There are long, wide coastal views across this NCA, and also out to adjoining areas. For example, the North Norfolk coast can be seen from the south of the NCA, and in the north there are views across the Humber Estuary to Spurn Head. Inland, the NCA rises to the dip slope of the Lincolnshire Wolds, from where there are long, open views over the coastal plain and marshes. Windfarms on- and off- shore can be found and looking inland, the rising land of the Wolds forms the backdrop to views.

The Lincolnshire Wolds Area of Outstanding Natural Beauty covers 3 per cent of the Lincolnshire Coast and Marshes NCA and, while most of this designated landscape falls within the adjacent Lincolnshire Wolds NCA, there are very strong visual, recreational and access links with the coast and marshes.

Cretaceous Chalk underlies the area and extends into the adjacent NCAs. The Lincolnshire Coast and Marshes, Lincolnshire Wolds and Holderness NCAs share a major chalk aquifer which is used extensively for the supply of water in the region. Covenham Reservoir supplies water locally and a new pipeline has been constructed to provide drinking water to Boston in The Fens NCA.

A number of rivers including the Great Eau and River Freshney rise in the chalk streams in the Lincolnshire Wolds. They then slowly into the North Sea, flowing through the coastal plain via catch water drains and dykes, with the Eau becoming a raised embanked watercourse across the east of the NCA. To the south, the Steeping River drains to the adjoining The Fens NCA and on to the North Sea. A series of catch water drains and dykes are pumped into the Steeping which follows a canalised channel before discharging into the large Wash Estuary, thus providing an important fluvial and ecological link to The Wash.

The Port of Grimsby and Immingham provides an important national and international shipping link to Europe. There are east–west rail passenger and freight lines running through the area, connecting freight with the docks, and bringing in tourists to the holiday resorts. There are several major A roads connecting to the Humber Bridge and out to the M180 which form further transport corridors in the landscape. Offshore wind energy schemes connect to the grid through this NCA and the Theddlethorpe Gas Terminal on the coast is an important infrastructure link with the wider network.

The NCA is an important focus for tourism in the region and attracts people – particularly from Yorkshire and the East Midlands – who travel by rail and road to reach the tranquil environments and the coast's popular sandy beaches.

## Key characteristics

- Flat coastal plain to the east, with dramatic skylines across great distances, rising gradually in the west to more undulating land at the foot of the adjacent Lincolnshire Wolds.
- Cretaceous Chalk underlies most of the area with later Quaternary sand, gravel and clay deposits laid down following glacial activity. Slowly permeable, seasonally waterlogged fine and fertile loamy soils.
- Strong marine influences of accretion and erosion shape the coastline with extensive wide, shallow beaches, vast areas of mudflats, major dune systems, continuous lengths of artificial sea defences, and numerous sandy beaches and nature reserves.
- Important coastal habitats are managed for nature conservation. There are coastal mudflats and a dune complex in Cleethorpes. Extensive dune systems and salt marshes support a wide range of overwintering and migratory seabirds. At Gibraltar Point an ancient calcareous dune system exists and coastal saline lagoons, reedbeds and mudflats are important for their biodiversity.
- Land management has had a fundamental impact on the character of this area, with a clear distinction between the higher ground of the Middle Marsh, where settlement is nucleated, and dispersed settlement relating to drainage in the Outmarsh.
- Inland is a predominantly open, medium-scale agricultural landscape with mixed arable farmland in the Middle Marsh to the west. The Outmarsh, and smaller farm units with traditional pastures and occasional vegetable crops on the Outmarsh - nearer to the coast, also has medium-scale arable agriculture with pockets of traditional pasture.
- Traditional grazing marshes are a nationally threatened habitat with a distinctive landscape and cultural history. They need to be grazed, for example with cattle, and a range of cattle types are used including Lincoln Reds.
- Woodland and hedge cover is sparse but increases westwards towards the foot of the Lincolnshire Wolds with significant ancient woodland on the Middle Marsh. The substantial amount of ancient semi-natural woodland includes a number of Sites of Special Scientific Interest (SSSI) and nature reserves (such as Rigsby, Muckton and Legbourne). More minimal tree and hedgerow cover is found on the lower-lying, open Outmarsh.
- A complex series of rivers and small streams drains eastwards towards the sea. There are some natural watercourses such as the Great Eau and Waithe Beck, as well as a network of many manmade drainage ditches. The disused Louth Canal – a canalisation of the River Lud – extends as far as Tetney Lock.
- Many deserted medieval villages surviving under grass are found in this NCA. Reclaimed marshland and salt marshes contain traces of ridge and furrow (which are permanent pasture) and areas retain important evidence of medieval and later industry (for example, salterns) with evidence of ancient salt works.
- A dispersed settlement pattern is characteristic throughout much of the area with a concentration of larger settlement along the coast including resort towns. The port of Grimsby, once one of the largest fishing ports in the country, now acts as an important international freight link.

- Rural areas have a mix of dispersed and nucleated settlement; the latter concentrated in the Middle Marsh. Rural settlements and market towns are strongly characterised by the use of brick and pantile, as a result of extensive 18th- and 19th-century rebuilding, with some very rare mud and stud buildings. Stone was used in particular for churches and high-status buildings.
- Industrial areas are located in parts of the coastal strip, and there is some discordant development in certain areas, such as holiday resorts of bungalows and very extensive caravan parks. In places offshore and onshore wind turbines are present and distinctive on the skyline.
- The developed seaside resorts attract tourists to the coast. The undeveloped wild coast with inspiring long views, high levels of tranquillity and numerous nature reserves means that this area is important for access, recreation and green tourism.

**Grimsby Dock Tower is a prominent feature on the docks with modern infrastructure now dominating the skyline.**

## Lincolnshire Coast and Marshes today

The Lincolnshire Coast and Marshes National Character Area (NCA) is a long, narrow band of flat, low-lying coastal plain located to the east of the Lincolnshire Wolds, adjacent to the North Sea. It is a predominantly rural, productively farmed area, shaped by modest changes in topography, tree cover and land use, with more dynamic changes associated with its long coastline. Despite a strong overarching character, the NCA can be divided into three distinctive landscapes, strongly shaped by their proximity to the coast – the Middle Marsh, the Outmarsh and the coast itself.

Small plantations provide shelter around the farmsteads and settlements of the Outmarsh. Larger blocks, including some areas of ancient woodland, accompany the settlements and historic parklands of the Middle Marsh. In the west the Middle Marsh is predominantly an arable landscape that gently rises up to the foot of the Lincolnshire Wolds and is more enclosed than other areas, with a significant higher woodland content. East of this, lies the 'Outmarsh', a land of predominantly flat pasture with wide, open views across long distances. Here a more ancient drained landscape exists and there is a relatively high proportion of grass and rough grazing. Traces of ridge and furrow can still be seen and field sizes are smaller. The fields around the Middle Marsh towns are a mixture of small, irregular ancient enclosures immediately adjacent to village cores and larger planned enclosures over the former open fields and commons. Many of the villages expanded during the 18th and 19th centuries, and their cores are characterised by buildings of this date built of red brick and pantile.

**Agricultural landscapes make up much of the Lincolnshire Coast and Marshes NCA.**

East of the Middle Marsh lies the Outmarsh. Here, a more drained ancient landscape exists and there is a relatively high proportion of arable farming, grass and rough grazing alongside occasional vegetable crops Outmarsh settlements are a mixture of straggling linear villages along former east–west drove roads and isolated farmsteads set in 19th-century planned fieldscapes.

More extensive nucleated settlement is concentrated on the coast, formerly based around fishing and coastal industries; several of these settlements have expanded as holiday resorts in more recent times. Many settlements may also represent aggregations of former hamlets which have coalesced through 20th-century ribbon development along main roads. The coast itself comprises a wide, open area of beaches, sand dunes, salt marsh, mudflats and sea bank clay pits with long views and high levels of tranquillity between the holiday resort towns. This coastal area typically experiences constant change resulting from accretion and erosion.

Cretaceous Chalk underlies the NCA with later Quaternary sand, gravel and clay deposits laid down on top following glacial activity. In the Middle Marsh, these glacial tills give rise to seasonally waterlogged, fine loamy soils which are good for cereal production. The marine alluvium deposits of the Outmarsh have produced soils of a deep clay and calcareous nature and these fertile soils are suitable for cereals, vegetables and permanent grassland. Mixed with the clay and tills are more localised areas of outwash gravels. Occasional blow wells occur where sand and gravel lenses allow water from the Chalk to reach the surface.

The coast is characterised mainly by wide beaches backed by extensive salt marshes and dunes. At low tide vast sand flats are a key feature, arising because of the very slight gradient of the beaches in places. Artificial sea defences have been created along much of the coastline, for instance at Grimsby and between Mablethorpe and Skegness .The Environment Agency's Lincshore[4] (flood defence) scheme combats the decrease in sand levels and increased flooding risk caused by erosion of the Beaches and clay foreshore.

Between Cleethorpes and Mablethorpe, accretion has produced a wide shore of shingle banks. Here salt marsh occurs on the open shore between the sea and the dunes as a result of the offshore Sand Haile Flats which provide protection from the full force of the sea. The dunes are stabilised by marram grass, allowing plants such as bird's-foot trefoil, pyramidal orchid and viper's bugloss to become established. These in turn support an array of bees and butterflies, with the smaller insects hunted by dragonflies and robberflies that patrol the dunes. Sea buckthorn, hawthorn and elder cover much of the dunes and are an important habitat on this coastline for birds including dunnock and wren, for which they provide cover and nesting sites, as well as for summer visitors including whitethroat and willow warbler. In winter, visiting fieldfare and redwing feed on the berries.

The Lincolnshire Coastal Country Park is being developed between Sandilands and Chapel St Leonards to give better protection for wildlife through habitat creation, restoration and linkages, and enhanced facilities for visitors, providing a year-round green tourism destination.

Specific areas of the coast are protected and managed for wildlife, notably at Donna Nook between Saltfleetby and Theddlethorpe and at Gibraltar Point. Together, the sand, mud and salt marsh here provide food and refuge for the many birds that visit the shores from the Arctic over winter. Ringed plover and

[4] Environment Agency Lincshore Scheme

sanderling eat the small sandhoppers and shellfish found at the sea's edge, while curlew probe the mud for lugworms, Brent goose graze the salt marsh grass and flocks of twite and snow bunting feast on the seeds of the salt marsh plants.

**An important grey seal colony within the NCA at Donna Nook National Nature Reserve.**

Other species include water shrew, natterjack toad and common lizard. A colony of grey seals is one of the largest in the country and this is an important area for breeding grey seals. South of Saltfleet Haven an ancient calcareous dune system contains freshwater marsh and maritime fen. South of Skegness at Gibraltar Point there is another series of extensive dunes and salt marshes.

The coast is in places internationally designated for nature conservation. Ramsar, Special Area of Conservation (SAC) and Special Protection Area (SPA) sites partly or entirely within the NCA include the Humber Estuary, Gibraltar Point, Saltfleetby and Theddlethorpe Dunes, The Wash and the North Norfolk Coast SAC. These areas are designated for their sand dunes, salt marsh and intertidal flats and reedbeds and for the large numbers of overwintering birds and significant colonies of breeding terns. The sites are also important for waders during the spring and autumn passage.

The underlying Chalk geology contains the large Lincolnshire chalk aquifer, the primary source of water in east Lincolnshire. A complex series of rivers and small streams drains slowly east across the plain towards the sea. Some are natural watercourses, for example the Great Eau and Waithe Beck, while others are heavily modified, such as the many drains and ditches and the Louth Canal. A number of 'soke dykes' are saline.

The Covenham Reservoir provides storage for times of low aquifer recharge and can be used to prevent saline intrusion. The reservoir attracts waterfowl and is used for recreation, such as water sports.

There is very little woodland in this NCA. A few large blocks of woodland exist, with some shelterbelts around farmsteads and broadleaved woodlands

with increased woodland cover towards the Lincolnshire Wolds. The Middle Marsh comprises regular rectilinear fields bounded by occasional hedgerows.

Cereal and cereal cropping predominates. Two areas of wooded open farmland persist, firstly around Claythorpe, and most noticeably around Brocklesby where the Wolds slide imperceptibly down to the clay drift landscape. Ancient woodlands are located on the Wolds Edge including at Rigsby, Muckton and Legbourne, while plantations are found elsewhere, such as on the Brockelsby estate. The arable farmland of the NCA supports an assemblage of birds including a number of declining farmland birds, mainly grey partridge, skylark, barn owl, corn bunting, yellowhammer, linnet and tree sparrow. The birds benefit from habitats such as the fragmented patchworks of grasslands, ditches, small copses, hedgerow trees and hedgerows, which are becoming increasingly well-managed. Woodland in the Outmarsh is almost non-existent except around farmsteads and settlement edges. Towards the centre of the Outmarsh field sizes are smaller and a more ancient drained landscape exists. There is a relatively high proportion of grass and rough grazing intermixed with large arable fields.

Towards the centre of the Outmarsh field sizes are smaller and a more ancient drained landscape exists and there is a relatively high proportion of grass and rough grazing.  On the Outmarsh pastoral grazing marsh landscape was once common. Today the area includes some important grazing marsh but there has been a loss of permanent wet grassland and ridge and furrow.  The Lincolnshire grazing marshes and pastoral grazing marsh are important landscapes providing resilient areas tolerant of some flooding and are a refuge for wildlife, including wading birds and water voles. Evidence of past land use is evident in the landscape with traces of ridge and furrow still visible, especially in the Outmarsh.

Much of the coast is undeveloped and is managed as nature reserves and is under agri-environment schemes – Tetney Marshes, Donna Nook, Saltfleetby-Theddlethorpe, Sea Bank Clay Pits, Huttoft Marsh, Anderby Marsh, land between Wolla Bank and Chapel Six Marshes, and Gibraltar Point.

The Lincolnshire Coastal Country Park is an extensive area covering the land from Sandilands to Chapel St Leonards.

In the Middle Marsh, Gunby Hall, Well Vale Hall and Brocklesby remain as large houses with surrounding parklands and there are several fine houses in the suburbs of Cleethorpes, reflecting the wealth produced by the fishing industry. Three windmills remain in working order at Alford, Burgh le Marsh and Waltham.

Historic market towns include Alford, Burgh le Marsh and most notably Louth, which all retain their historic character. Louth is located at the foot of the Wolds and its parish church is notable for its Lancaster stone and 100-metre spire. Churches are prominent throughout and a number of particularly isolated churches can be found in the landscape.

More extensive nucleated settlement is concentrated on the coast, formerly based around fishing and coastal industries before expanding as holiday resorts and here the extent of 20th-century settlement has been considerable. Grimsby, famous for its fishing heritage, docks and prominent dock tower, expanded as the docks thrived and absorbed outlying villages.

Today, Greater Grimsby is home to one of the largest concentrations of food manufacturing, research, storage and distribution in Europe. The freight port

of Grimsby and Immingham remains important with its associated industry; The docks and oil refinery at Immingham, although in the adjacent Humber Estuary NCA dominate the skyline for miles and create a major intrusion on the flat Outmarsh. On the coast, Cleethorpes, Mablethorpe and Skegness developed as tourist centres for holiday makers from the East Midlands over the last century or so. The Victorian and Edwardian villas of the towns have been added to during the 20th century by clusters of caravans, mobile homes, holiday camps and theme parks along much of the coastline. Most of the built coastline between Mablethorpe and Skegness is now protected by concrete sea defence walls built following numerous floods. This stretch of coast includes the Lincolnshire Coastal Country Park.

The area is popular for its recreational opportunities and has seasonal visitors- particularly along the coastal strip. The area provides opportunities for swimming, relaxation and inspiration and its beaches are busy, especially during the summer months. A collection of extensive nature reserves attract people -especially for bird watching during the bird migrations and seal watching is also popular.

New development and infrastructure, such as around the Port of Grimsby and Immingham has impacted on this very open landscape. Grimsby and Immingham combine to form the UK's largest port by tonnage, handling 50 million tonnes of cargo annually. There are also passenger ferries to Europe from the port. Although retaining strong traditional connections to the fishing and food industry, Grimsby's major focus is on the handling of imported cars. Investment has been made in the development of the Grimsby Riverside Terminal. There has been a growth in infrastructure in relation to the operations and maintenance of the renewable energy industry.

The docks and oil refinery at Immingham, although in the adjacent Humber Estuary NCA, noticeably dominate the skyline for miles and create a major intrusion on the flat Outmarsh. New development and infrastructure, such as around the Port of Grimsby and Immingham, have impacted on this very open landscape. Modern wind turbines are also very noticeable on the skyline in the open landscape. Individual turbines are found and also groups of them, particularly on the coast where the various offshore wind farms are very prominent.

Further south on the coast, Cleethorpes, Mablethorpe and Skegness developed as tourist centres for holidaymakers from the East Midlands from the early 20th century. There are Victorian and Edwardian villas in the seaside towns, giving a strong sense of historic character. During the 20th century development around towns (especially Skegness) included caravan parks, mobile homes, holiday camps and theme parks. Most of the built coastline is protected by concrete sea defence walls which have been built following numerous floods such as those in 1953.

The coastal area is popular for its recreational opportunities and has seasonal visitors. The coastal strip provides opportunities for walking, swimming, relaxation and inspiration. Resort beaches are busy, particularly in peak season, but others along the undeveloped coast are quiet. Numerous extensive nature reserves attract visitors along the coast, especially for bird watching during migration, and seal watching is also popular. In addition to the National Nature Reserves (NNRs), there are areas such as the Lincolnshire Coastal Country Park which is being created as an area for people and wildlife along the undeveloped coast.

## The landscape through time

In geological terms, the coastal plain is relatively recently established, having been formed predominantly through glacial processes over the last 2 million years. Cretaceous Chalk underlies the whole area and is deeply buried beneath Quaternary sand, gravel and clay deposits which thicken towards the coast.

The area was subject to two major glaciations. The first was the Anglian Glaciation 450,000 years ago, which covered the entire area in ice. As temperatures rose and this ice sheet retreated, the rise in sea level cut a coastline along the eastern edge of the Wolds. The original cliff-line can be found along the Lincolnshire Wolds, over 20 km inland from the current coast. The second occurred about 115,000 years ago with the start of the Devensian ice age and once more the NCA's ice cover was limited to the east by the Lincolnshire Wolds, which remained exposed in a tundra environment. Again, warming led to the retreat of the ice, leaving extensive deposits of glacial clay, sand and gravel. Melting water led to flooding and the development of the present low-lying coastline and associated peat, marsh and marine deposits during the Holocene.

As the ice melted, glacial tills were deposited across the outwash plain, forming the Middle Marsh. As the last ice sheet to cover the land left the area, some 15,000 years ago, it left behind vast swathes of glacial deposits and, as sea levels rose, deposits that lay on the seabed were re-worked and moved landwards. By contrast, the Outmarsh is composed of marine alluvium and it is of a similar character to most of the central fens, being created by higher sea levels following the ice age. Until the 13th century, the coastline was most likely protected by a line of offshore islands of moraine from the retreating ice sheet. These barriers of glacial tills gave relief from coastal erosion and allowed the development of extensive lagoons and marshes.

The influence of the North Sea on the landscape has affected the use of the land for many centuries. Early settlement took place on the higher ground of the Middle Marsh, with evidence of prehistoric and Roman salt-making found throughout the area. Grazing and salt-making have long characterised the Outmarsh, which prior to the spread of wetland areas from the Bronze Age consisted of lakes, marshes, islands and woodland. Wetland areas spread inland as sea levels rose and the climate cooled over the Bronze Age. Remnants of the petrified forest of Wolla Bank can be found today.

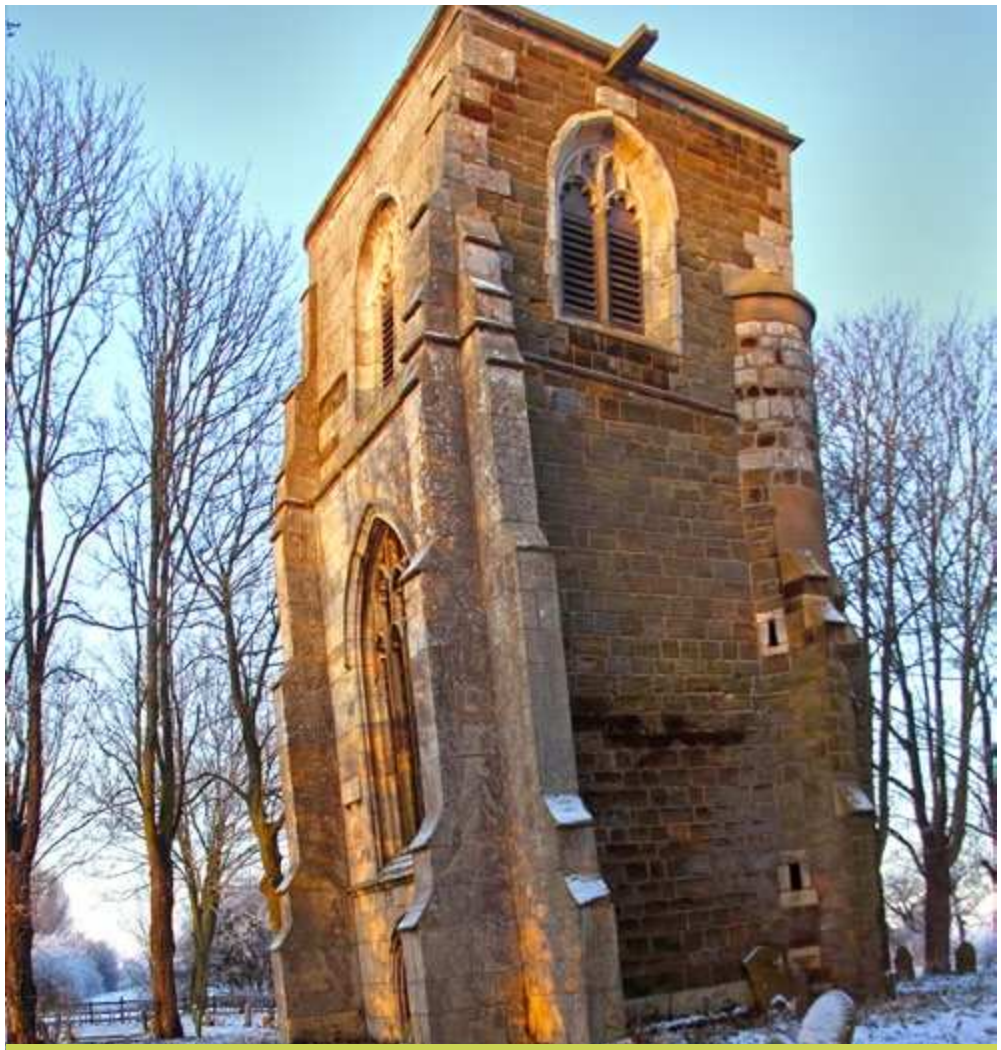
The earliest settlers found the elevated land of the Middle Marsh more attractive than the coast and a string of villages formed along the Townlands Ridge on the ancient boundary between dry land and coastal wetlands. Village names ending in 'by', as in Thoresby, and 'thorpe', as in Grainthorpe, indicate that the Danes were the main settlers. Much of the evidence relating to the prehistoric use of the land remains buried under the silts that have subsequently been deposited across the landscape. In Roman, medieval and post-medieval periods, the settlers began to drain and reclaim the land from the sea, establishing significant coastal salterns and improving the land to create rich pasture fields to fatten livestock from the Wolds. Today's network of narrow ditches and dykes along the Outmarsh, as well as the ancient irregular field patterns, are testament to these past improvement works.

The earliest phase of reclamation that can be seen is the result of medieval salt making along the former coastlines. The process of salt-making created large quantities of spoil, made up of sand and silt, which was disposed of

on large mounds. As the saltern mounds grew in size and number, so the sea receded, and new settlements were founded, such as between North Somercotes and Saltfleet. Medieval and post-medieval salt workings are found at Tetney and Somercotes, and in locations exposed by dyke clearance works which date from earlier periods. Other remaining evidence of medieval settlement includes the earthworks of religious houses such as Louth Abbey, Hagnaby Abbey and Markby Priory, as well as moated sites marking the locations of manors, homesteads, farms and granges.

In the 12th century the coastline south of Grimsby was several kilometres further inland. However, settlers slowly drained and reclaimed the land for common grazing on the marshes and this period into the 13th century saw the expansion of reclaimed farmland along the Outmarsh zone, including numerous holdings often still termed 'grange' related to the area's abbeys and priories. The area retains a high percentage of small, mainly pastoral fields related to the historical practice of fattening of cattle. There was considerable wealth in the region and at the height of the wool trade in the 14th century many fine churches were built in local stone, such as Lower Cretaceous Spilsby Sandstone.

The marshland of the Lincolnshire coast provides excellent grazing during the summer months, and allowed fattening of large numbers of cattle and sheep. This was exploited both by the farmers of the Middle Marsh and by those from further afield, including flocks from Scotland and Ireland. Land in the marsh was often rented or purchased by farmers from the Lincolnshire Wolds, who would drive livestock down from the hills to the coast. Thus there is a close cultural connection between the Wolds and the Lincolnshire coast and marshes, most clearly seen in the arrangement of drove roads which run east–west through the area.



**Churches such as this leaning example at Skidbrook, are one of many historic assets giving character to the NCA.**

Saltmarsh habitats such as these near Cleethorpes are valuable and relatively undisturbed.

Since the 18th century, the agricultural landscape has become more complex, supporting mixed cereal, vegetable and some root cropping as well as pasture. Large-scale re-organisation of the fieldscapes of the Middle Marsh took place in the 18th and 19th centuries, along with the rebuilding of the area's settlements and the relocation of farmsteads to new sites among newly enclosed fields. Land and salt marsh have continued to be reclaimed over time with the areas that are now Saltfleet and Somercotes reclaimed in the 19th century. There are several active and relict sea banks in the area aligned parallel to the coast, showing that settlements along the coastline have long been defended. The marshes, along with other areas of rough grassland on the seaward side of the defences, have traditionally been grazed.

Much of the coast is still made up of salt marsh and dune systems which are well preserved. The Sandhills Act of 1932 effectively controlled the expansion of built development on the coast at Gibraltar Point and Saltfleetby and much preservation can be attributed to the presence of the Royal Air Force bombing ranges along the coast and, more recently, to the establishment of a number of nature reserves. Much of the built coastline, such as between Mablethorpe and Skegness, is protected by massive concrete sea walls following the floods in 1953.

In terms of the local vernacular, bricks have largely replaced the once prevalent mud and stud, with the occasional reed thatch surviving, such as at Alford. Links to the brick-making industry can be found with local clay pits within the NCA making this an important centre for clay pantile production in the 18th century. Traditional building materials are brick and pantile, and result from extensive rebuilding in the 18th century. For example, Louth still retains the elegant red-brick Georgian town houses of Westgate which cluster

around its church, small squares and market hall. A few traditional windmills can also be found, for instance at Alford, Burgh le Marsh and Waltham.

The Louth Canal – now disused – is a heavily modified water body with its distinct embankments; it was built in the 18th century as a canalisation of the River Lud, linking the more inland areas, including the historic market town of Louth, to the coast near Tetney to transport coal and corn to the coast.

The development of holiday resorts at Skegness, Mablethorpe and Cleethorpes led to the Lincolnshire coast becoming a renowned tourist destination. North Somercotes and Saltfleet were encouraging sea bathing by the 1790s and at Mablethorpe sea bathers are recorded from the early 19th century, when it was described as a fashionable 'watering place'.

The wealth of the fishing industry was very important on this coast and expanded quickly. The first true fish dock opened in Grimsby in 1856 and from then on the town was at the forefront of the development of the fishing industry. By 1900, a tenth of the fish consumed in the United Kingdom was landed at Grimsby. The town quickly became known as 'Great Grimsby', with its rapid development and the arrival of the railway in 1848. Grimsby's port boomed, importing iron, timber, wheat, hemp and flax, and exports included coal. Its docks were some of the busiest in the world and with its good rail links to London, 'Grimsby fish' gained renown nationwide.

The fishing industry focused on fresh catches such as cod and herring and later the frozen fish industry developed and remains important. Grimsby now also specialises in smoked fish and its fishing heritage is well recognised today.

Throughout the 20th century increased production and an intensification of farming led to a predominance of cereal crops in the landscape and newer crops such as oilseed and maize, particularly in the Middle Marsh. The ploughing and draining of land intensified and has resulted in some significant damage to buried archaeological artefacts as well as the characteristic historical landscape features such as ridge and furrow. Areas of historic parkland decreased significantly during the 20th century, although there are important areas remaining at Gunby Hall, Well Vale Hall and Brocklesby under favourable management.

First and Second World War anti-invasion defence works were constructed along the Lincolnshire coast. Remains include concrete pillboxes, tank traps, searchlight batteries and gun emplacements. Many installations survive largely unaltered today, creating a strong sense of history along the coastline.

The extent of 20th-century settlement has been considerable along the coast and there is new infrastructure. There has been infill development in relation to the coastal resorts including many bungalows along the built-up areas of the coastal strip such as around Skegness and/ Ingoldmells and at Trusthorpe. However, the greatest development has occurred around Grimsby with industrial expansion around the seaport and developments in connection with the port of Immingham. The expansion of the frozen food industry has been dramatic and the town has experienced great change and also periods of decline. More recent developments include the offshore wind farms which have impacted on the area as have onshore wind turbine installations and gas terminal and pipeline infrastructure.

## Ecosystem services

The Lincolnshire Coast and Marshes NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Lincolnshire Coast and Marshes NCA is contained in the 'Analysis' section of this document.

### Provisioning services (food, fibre and water supply)

- **Food provision**: Extensive areas of fertile soils support arable farming systems, with cereal production forming the greatest land use. Of the soils only 4 per cent is Grade 1, with 16 per cent Grade 2 agricultural. This land is found mainly on the lower slopes of the Wolds along the western edge. Some 71 per cent of the area is Grade 3 land, some of which is farmed to produce vegetables and root crops as well as a mix of arable crops including oilseed.

  This is a landscape dominated by arable production – wheat and oilseed rape – followed by grassland or root crops. It is a producer of beef, lamb and milk with small beef and dairy herds. Lincoln Red cattle, the native breed of Lincolnshire, are adapted to coastal grazing marshes.

- **Water availability:** The chalk aquifer underlies the NCA and is one of the most important sources of water for the Yorkshire and Humber and East Midlands regions. It used extensively by businesses and agriculture and for public and private water supply. The groundwater is, however, over-abstracted as there is a high demand for water to irrigate crops.

  There are a number of rivers in the NCA including the Great Eau, the Steeping and the River Freshney which rise in the adjacent Lincolnshire Wolds. The rivers have an over-abstracted status and where Catchment Abstraction Management Strategy (CAMS) assessments have been undertaken their status is assessed as having 'no water available'.

### Regulating services (water purification, air quality maintenance and climate regulation)

- **Climate regulation:** Long-term storage of carbon is provided by areas of salt marsh, mudflats and coastal marine sediments, reedbeds, permanent grassland and grazing marshes. There is relatively little woodland in the NCA and there is low soil carbon content throughout most of it, especially where there is extensive arable cultivation.

- **Regulating water quality:** The majority of rivers within the NCA have been assessed for surface water status. For their ecological class, 48.3 per cent of waterbodies are classified as moderate, 30.3 per cent as good, 19.6 per cent as poor and 1 per cent as bad. (The remaining areas had not been assessed.)

  In terms of the Water Framework Directive, the transitional waters and coast have been assessed and are classed as moderate. The lake at Chapel Pit was classified as good while Covenham Reservoir was classified as poor. All the coastal bathing waters, including those at Humberston Fitties, meet the Bathing Water Guideline.

  Some 82 per cent of the NCA falls within a nitrate vulnerable zone and the main factor affecting water quality is high nitrate levels leaching into the water, the causes of which include agriculture, industry and sewage disposal systems (private).

- **Regulating soil quality:** Glacial tills across the Middle Marsh on the western side give rise to permeable, seasonally waterlogged, fine loamy soils. To the east, the Outmarsh's marine alluvium deposits produce soils of deep clay and fertile soils of a calcareous character. However, slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils may suffer compaction and/or capping as they are easily damaged when wet. In turn, this may lead to increasingly poor water infiltration and diffuse pollution as a result of surface water run-off. Management measures on cultivated land that increase organic matter content can help to reduce these problems.

  Similarly, the slightly acid, loamy and clayey soils with impeded drainage are easily poached by livestock and compacted by machinery when the soil is wet. Any weak topsoil structures can easily be damaged.

  Careful timing of activities is required to reduce the likelihood of soil compaction as well as adopting cultivation practices such as increasing the organic content of soils, introducing fallow into rotations and overwinter stubbles, and avoiding overstocking or using machinery where it would lead to the compaction of vulnerable soils.

- **Regulating water flow:** The NCA is mainly low lying. The Environment Agency flood risk maps[5] indicate that the majority of the NCA is at high risk of river and/or coastal flooding. Flood control is a key issue for most of the NCA, particularly since the major flooding events in 1953 and the surges and flood warnings in 2013.

  Settlements are offered some protection by flood defences. However these give rise to coastal squeeze' whereby intertidal habitats are lost between the rising sea levels and the flood banks. This can be addressed by managed realignment to enable the continued expansion of intertidal habitats.

  Flooding can affect properties, businesses, transport, infrastructure and farming. The agricultural productivity of the area is dependent on pumped drainage as it would be naturally waterlogged for much of the time.

  The managed realignment of modified watercourses, for example the development of Washlands at Manby and more recently reconnecting the Great Eau with its floodplain on land near Saltfleetby.

- **Regulating coastal flooding and erosion:** Important coastal processes occurring within the NCA and beyond involving accretion and coastal erosion are taking place. Sediments from the North Sea are drawn in and out and this process needs to be maintained. The process contributes to habitats along the coast – formed of mudflats, salt marshes, sand dunes and which provide internationally important habitats as well as important natural sea defences, backed by manmade coastal defences.

  The Environment Agency has been running major coastal flood defence schemes to reduce flood risk to homes and businesses on the Lincolnshire coast.

  Sea level rise and more frequent storm events may exacerbate coastal erosion and increase the scale of flood events. Climate change presents a challenge to how we regulate and/or change the balance.

[5] Environment Agency flood risk maps. The Humber Flood Risk Management Strategy, Environment Agency (March 2008)

### Cultural services (inspiration, education and wellbeing)

- **Sense of history:** The open character of the area, with its distinctive boundaries and range of natural and historic features, including the characteristic salterns, retains a strong sense of having been reclaimed from the sea.

  Medieval and post-medieval features are present on the marshes. Monastic sites and granges and moated sites with some deserted settlements bear witness to 12th–13th-century reclamation and land use, and the subsequent contraction of settlement. Similarly, 18th–19th-century farmsteads and fieldscapes bear witness to later agricultural improvement.

  Historically, the coastal salt industry was very important and influenced the historic routes across the coastal areas. The sediments themselves contain a record of ancient landscape and climates, with the currently wasting peat revealing well-preserved remains of prehistoric landscapes with especially rich archaeology. Archaeological features are present beneath the clays and silts and at high tides, and evidence of ancient forests in exposed intertidal areas has been found.

  The coast with its anti-invasion defences provides a sense of history during the two World Wars and contributes to our understanding of the area and its recent history.

- **Tranquillity:** The highest scores for tranquillity are found in the more rural, isolated areas away from settlements and transport networks. Strong contributors to tranquillity include the flat, low-lying topography and extensive views, sparse settlement patterns in rural areas, the farmed landscape, inaccessible parts of the coast and sea views.

  The proportion of areas that are disturbed remains low, with tranquillity reduced around expanding urban settlements and main transport corridors. Grimsby and Cleethorpes have the lowest scores for tranquillity. Louth, Alford, Mablethorpe and Skegness also have comparatively greater disturbance than more rural areas.

- **Recreation:** A variety of recreational opportunities exist here including walking, fishing, water sports, kitesurfing, sea fishing, cycling, bird watching and, in the summer, sunbathing and swimming. The area hosts many 'Blue Flag' beaches on its popular coast (including those at Cleethorpes, Skegness, Mablethorpe and Sutton on Sea). The Lincolnshire Coastal Country Park is a popular tourist destination and there are increasing opportunities for green tourism.

  Public rights of way are limited and only 1.4 per cent per cent of the NCA is publicly accessible. New national coastal access routes are planned and there are opportunities to develop local walks to build on existing routes.

  The settlements of the north Lincolnshire coast have a number of sites with recreational opportunities and limited public access routes. Where there are pockets of deprivation (as measured by the Index of Multiple Deprivation), more greenspace, recreational opportunities and improved access to greenspace can help to improve the health and wellbeing of the local community.

- **Biodiversity:** This NCA is particularly important for its biodiversity and has coastal areas designated as Ramsar sites for their internationally important bird populations.

  Areas have been designated as SAC and SPA owing to their varied coastal habitats and for the large numbers of wintering wildfowl and nationally important and diverse range of bird species on the Humber Estuary and The Wash. The area is also home to an important colony of grey seals and supports common seals

  Many different habitats including saline lagoons, mudflats, salt marshes and sand dunes support important populations, for example the Cleethorpes sand dune complexes, Gibraltar Point and various NNRs.

  The area is important in terms of the wetland habitats and associated species – for instance, it is a key area for protected species including water vole[6] and rare wetland plants. Other species of note are present in the NCA, including natterjack toad.

  The grazing marshes hold valuable habitats and support waders and ground-nesting birds. The NCA also contains arable habitats that are valuable for supporting nationally important farmland bird populations – bird species found here include the Arable Assemblage for the East Midlands.

- **Geodiversity:** The wealth of geodiversity interest in the NCA is in part linked to its location on the coast and in particular its geomorphology and complex patterns of erosion and accretion. The Lincolnshire Coast and Marshes NCA falls within the Flamborough Head to The Wash sediment cell and is within the same sediment cell as the Holderness and Humber Estuary NCAs. The mouth of the Humber is important for its associated sands and mudflats and shifting geomorphology. The more recent Holocene deposits along the coast, notably at Chapel Point to Wolla Bank Site of Special Scientific Interest, provide a lot of information about the recent rise and fall of sea levels and the associated environmental change.

  Gibraltar Point is a very dynamic part of the East Coast and, in contrast with many parts of eastern England, it is still accreting. The innermost part of its pair of almost parallel dune systems separated by salt marsh is believed to be at least 300 years old.

  Clay pits occurring in the area, for example at Goxhill, have traditionally provided an important centre for clay pantile production since the 18th century. There are also borrow pits formed when defences reinforced post 1953 floods particularly Sea Bank Clay Pits SSSI.

[6] Regional Water Vole Key Areas 2006–2010, Wildlife Trust

# Statements of Environmental Opportunity

**SEO 1: Safeguard, manage and enhance the dynamic coastal landscape producing net gains in extent and quality of internationally and nationally important habitats including sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh for the wildlife they support, to increase ecological resilience and to increase the landscape's ability to mitigate flood risk and climate change.**

**For example, by:**

- Protecting intertidal habitats and dune formations (among the best of their type anywhere in the UK) including saline lagoons, and ensuring that they are adequately managed.
- Seeking opportunities to increase the extent of sand dune habitats and manage them for their species, in particular ensuring that they are adequately protected.
- Seeking opportunities to increase the extent of intertidal habitats – including salt marsh, reedbeds and mudflats – to provide effective defences against wave energy and to protect and enhance biodiversity value.
- Enabling the natural and dynamic coastal and estuarine processes to continue, so that the coastline and estuary can respond to the constantly changing patterns of accretion and erosion.
- Enabling sand dunes such as those in the National Nature Reserves (NNRs), including Gibraltar Point, to evolve as naturally as possible with limited intervention, maintaining access to key facilities with minimal interruption to natural coastal processes.
- Providing access to sites of geological or geomorphological interest and providing interpretation, to raise awareness and improve understanding of the dynamic processes under way.
- Monitoring and researching natural and man-influenced coastal processes to improve understanding and working with partners to find ways of helping these dynamic processes to ensure no net loss of features.
- Responding to rising sea levels by seeking opportunities to realign flood defences or provide soft flood defences, thus allowing the development of intertidal habitats to compensate for any losses arising from coastal squeeze, maintaining their role in storing carbon and ensuring that new sites are managed to enhance the biodiversity value of the coast and estuary and contribute to its expansive landscape character.
- Working in partnership, informed by the Shoreline Management Plan,[7] to ensure that dynamic coastal processes continue and to conserve the range of coastal and wetland habitats that contribute to landscape character and support the wide range of wildlife.
- Conserving and managing the nationally significant coastal and marsh landscape, implementing strategies to adapt to coastal change and sea level rise.
- Planning for the effects of coastal change: allowing the operation of natural coastal processes and the creation of new habitats, to maintain and enhance local landscape character and biodiversity; improving the sustainability of current management practices; and reducing flooding in built areas.

[7] Flamborough Head to Gibraltar Point Shoreline Management Plan: Humber Estuary Coastal Authorities Group (2009)

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- Seeking opportunities to develop joint strategies in relation to the delivery of the Shoreline Management Plan and Catchment Flood Management Plans, ensuring that flood risk and waterways are managed effectively to protect settlements.
- Encouraging natural coastal processes to allow dynamism and natural sediment movement so that habitats and species can naturally extend and adapt in order to help them to become resilient to natural coastal processes. In appropriate areas along the coastline, allowing essential sediment transportation to create intertidal habitats and natural sea defences and enhance the landscape character of the coast.
- Ensuring that managed realignment sites and new flood storage areas are managed to create wetland habitats that contribute to landscape character and biodiversity, with some public access.
- Safeguarding the geological and current geomorphological processes, particularly along the internationally important coastline. Where possible, allowing the unimpaired operation of natural coastal processes, resulting in the creation of new habitats, conserving and enhancing landscape character and benefiting biodiversity and the historic environment.
- Raising awareness of the importance of the roosting and feeding areas for birds around the coast, ensuring that these areas are adequately protected and managed.
- Working in partnership to accommodate large numbers of overwintering birds and significant colonies of breeding terns. The feeding and wintering habitats are required for internationally important numbers of birds and waders during the spring and autumn passage periods. Many of the birds essentially feed outside the Special Protection Area in nearby waters and roost and feed inland at high tide.

**Wading birds, such as lapwing (green plover), will breed in the Outmarsh.**

**SEO 2: Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns of the Middle Marsh and Outmarsh and the fishing heritage of the port of Grimsby. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which contribute towards green tourism, enhance green infrastructure links, manage the pressures of flood risk and climate change, and ensure that infrastructure developments, such as offshore wind turbines do not contribute negatively to the character of the area.**

**For example, by:**

- Raising awareness of the historic environment and character of the area and how it results from millennia of human and natural factors.
- Conserving and enhancing the heritage features and assets of rural areas and towns, from prehistoric sites to the fishing heritage of Grimsby.
- Working in partnership with landowners and farmers to conserve and enhance the landscape and protect the heritage assets and landscape features in the environment of the coast and the marsh.
- Addressing past losses of grazing marsh by providing incentives for retaining remaining habitat and restoring and creating additional areas to ensure habitat is available for breeding and wintering wetland bird populations and populations of other species which benefit from a pastoral landscape.
- Managing, expanding, buffering and linking the existing ancient woodlands on the border of the Wolds and Middle Marsh.
- Conserving and managing the few remaining species-rich lowland meadows in the area.
- Managing watercourses to provide clear biodiversity benefits for wetland species such as water voles for which this area is a national stronghold.
- Managing the historic environment for its contribution to local character and sense of identity and as a framework for habitat restoration and sustainable development.
- Supporting the strategic approach to assimilating new industrial development, in particular on the coast, to ensure co-ordination of changes so that the internationally significant biodiversity is protected and enhanced.
- Seeking opportunities to establish strategic habitat mitigation areas to ensure that the impact of future growth and development on the estuary is appropriately managed and compensated for. Seeking opportunities for biodiversity offsetting.
- Carefully planning new industrial complexes and structures so that they are integrated into local landscape character, by retaining key views, landscape features and sites of nature conservation value, and creating new habitats, thus ensuring that industrial sites have areas that are 'permeable' and can link with networks of connected habitats.
- Halting the expansion of intrusive caravan sites within the open/undeveloped coast which impact on the character of the area.
- Ensuring that planning decisions adequately address the vital role that areas landward of the flood defences play in supporting the

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internationally important bird populations, and that new wetlands and grasslands are established to form effective corridors and stepping-stone habitats which extend the resources available to wildlife and enable species movement.

- Encouraging nature conservation management and the conservation of geological features.
- Seeking to enhance and extend habitats, creating a sustainable network for wildlife. Enhancing the simple patterns of fields, woodlands, ditches, rivers and tributaries and their strong links to past land use and settlement. This will bring benefits in terms of reducing soil erosion, improving soil quality and water availability, regulating water flow, promoting the interpretation of the historic environment, enhancing biodiversity and supporting pastoral farming.
- Seeking opportunities where appropriate to plant trees and create small areas of woodland to reduce flood flows. Such woodland areas and semi- natural areas will assist in reducing rapid run off of water during high rainfall.
- Protecting the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) and working in partnership to implement the adopted Lincolnshire Wolds Management Plan 2013–2018 (a small part of the Lincolnshire Wolds AONB is located in the National Character Area (NCA)).
- Protecting the Lincolnshire chalk streams and associated habitats which are important in terms of Biodiversity 2020.
- Protecting the flat, open, low-lying Outmarsh for its remote and tranquil character which is enjoyed by walkers, its archaeological assets which provide a link to the past, and its drained pasture fields.
- Adopting the area's traditional and historic architecture and its distinctive patterns of settlement to plan for and inspire new development, using appropriate local building materials and vernacular styles in restoring buildings and structures.
- Enhancing green infrastructure links within the area, especially within and beyond the towns, ensuring that there are places to benefit people and wildlife.
- Exploring opportunities for and encouraging green tourism.
- Improving access to the coast for walking, cycling and disabled people through the sustainable use of old railway lines, tracks and paths and encouraging reduced car use. Securing opportunities for the public to enjoy the natural environment through the implementation of the England Coast Path while ensuring appropriate protection of it.
- Ensuring promotion of access opportunities educates people about the vulnerability of the coastal habitats in the NCA and encourages visits of a low-impact nature which avoid any adverse impacts on agricultural management, landscape, habitats and wildlife.

**SEO 3: Ensure sustainable food production while enhancing and strengthening the network of farmland features; manage, expand, create and link habitats within the Outmarsh and Middle Marsh to benefit biodiversity, soil and water quality by promoting farming and forestry practices that are able to adapt to climate change. Manage the rivers, water levels and the provision and quality of water in the whole catchment for human and ecological benefit.**

**For example, by:**

- Promoting sustainable but productive farming practices that are able to adapt to changing agricultural economics and climate change including maintenance of remaining permanent pasture. Important not only for wildlife but also carbon storage and also historical environment where there is ridge and furrow.
- Working in partnership to ensure that water levels are carefully managed to provide multiple benefits such as protecting wetlands and watercourses which are vulnerable to abstraction, reducing flooding, vegetation succession and altered land management. Managing and expanding the wetland habitats, including wet pasture, fens and reedbeds and, where appropriate, wet woodland. Creating washlands and wetland priority habitats within them, where appropriate.
- Seeking opportunities to maintain and improve water quality and provision from the chalk aquifer by working with farmers and land managers to adopt practices that improve filtration into the ground and reduce nutrient run-off.
- Managing the priority habitats such as the chalk streams and blow wells and associated adjacent areas.
- Creating buffer zones and other measures to reduce erosion and pollution of the wider environment. Reducing the use of pesticides and other chemical/nutrient inputs, resulting in less diffuse pollution. Complying with regulations on nitrate vulnerable zones which cover the majority of the NCA.
- Conserving productive soils for continued agricultural production while ensuring that the agricultural landscapes make a greater contribution to wildlife, especially farmland birds, and avoiding or reducing cultivation where there are archaeological features.
- Creating, expanding and linking habitats to benefit biodiversity, including grazing marsh.
- Conserving, managing and expanding semi-natural habitats that reveal the influence of underlying soils and hydrological conditions.
- Encouraging agricultural practices such as planting winter cover crops, infield grass areas to prevent run-off, permanent grassland with low inputs and buffer strips on cultivated land adjacent to uncultivated land.
- Enhancing the network of habitats and farmland features: managing hedges, hedgerow trees, watercourses and farm ponds. Encouraging linear habitats and sympathetically managing boundary features as corridors and stepping-stones. Hedge planting as well as restoration should be encouraged – especially where many of the older small grass fields are surrounded by hedges.
- Planning for new woodland planting only at appropriate locations, especially where this would be beneficial in creating new green infrastructure routes or integrating new development into the landscape. Woodland planting would be restricted mainly in the western edge of the Middle Marsh where woodland forms part of the existing landscape character.

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- Planting individual trees in the Outmarsh rather than woodland in order to avoid changes to the existing landscape character and to retain the open views.
- Carefully managing historical assets including areas of ridge and furrow in the environment.
- Creating a mosaic of productive land, with healthy ecological networks of semi-natural and managed habitats, which can meet food supply demands without the loss of associated species.
- Restoring and creating habitats, with appropriate traditional management techniques in place – especially using more traditional breeds of livestock.
- Encouraging partnership work and, benefiting from the experiences of the Lincolnshire Coastal Grazing Marshes Project and which has concentrated on target areas in the southern part of the NCA. Retain and manage remaining areas, increasing of wet grassland and redress recent losses by providing incentives to increase the amount of wet grassland and grazing marsh as lowland meadows have been lost to alternative farming systems and wildlife-rich and pastoral grassland is an important element of Greater Lincolnshire's biodiversity.
- Managing natural rivers for water quality, water availability and biodiversity. Managing the network of catchment drains, dykes and canals for improved water quality, water availability and their contribution to biodiversity.
- Managing the reservoirs through reducing saline intrusion, aiding aquifer recharge, and developing these for recreational opportunities.
- Protecting the mosaic of terrestrial habitats for birds' roosting, feeding and breeding.

**Cattle grazing on the marshes, here with rig and furrow.**

**SEO 4: Conserve and enhance the character of the traditional seaside resorts and the long sandy beaches which help to make the area an important tourist destination; improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast with its expansive coast and marsh landscape and its coastal features and wildlife, while protecting high levels of tranquillity and the extensive, open views both inland to the Wolds and also out to sea.**

**For example, by:**

- Working in partnership with landowners and farmers to achieve mutually satisfactory objectives, managing and promoting opportunities for sustainable access and outdoor recreation.
- Implementing strategies to adapt to coastal change and sea level rise, while improving people's enjoyment of the area through enhancing its unique assemblage of coastal habitats and increasing opportunities for sustainably managed access.
- Developing initiatives to encourage access to and engagement in local greenspace and the wild coast, providing recreation and health benefits. Incorporating greenspaces into any new developments to ensure a connection with semi-natural habitats in order to benefit wildlife while providing opportunities for recreation – such as in Grimsby, Cleethorpes, Mablethorpe and Skegness.
- Retaining the open character of the landscape with its expansive views and big skies. Protecting areas with a strong sense of remoteness, wildness and tranquillity and dark skies.
- Conserving quiet rural areas by encouraging sensitive development, respecting long and open views and enhancing the character of rural settlements and traditional buildings.
- Improving opportunities to enhance people's enjoyment of the open, expansive coast and marsh landscape and its coastal features and wildlife, extending the traditional visitor season, while protecting high levels of tranquillity.
- Raising awareness of the important sensitive habitats and the wildlife that the coastal environment supports such as coastal dunes, tern, and common and grey seals.
- Offering opportunities for improved health and wellbeing by providing public access to the natural environment from the urban areas and coastal resorts and improving the rights of way network and links to the countryside and coastal resorts. Exploring opportunities for coastal access and improving links to and engagement with the coastal country parks and other countryside sites.
- Protecting open views and the simple, open character of the landscape and seascape, enhancing access to and interpretation of the wealth of natural and heritage assets, and recreational opportunities, throughout the area (including the NNRs, the Lincolnshire Coastal Country Park and AONB).
- Developing a continuous stretch of coastal habitat behind the dunes between Chapel Point and Sandilands via the Lincolnshire Coastal Country Park.
- Planning for new development in larger settlements to be in keeping with existing character, well designed and sited to reduce visual intrusion. Adopting the area's traditional and historic architecture

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and its distinctive patterns of settlement to plan for and inspire new development. Using appropriate local building materials and vernacular styles in restoring buildings and structures.

- Seeking opportunities to improve green infrastructure links to the AONB which overlaps the adjacent Lincolnshire Wolds NCA and working in partnership to implement the adopted Lincolnshire Wolds Management Plan 2013–2018.
- Recording, managing and protecting the cultural and historic landscape associated with the area and also understanding and exploring the related key communication and trading routes. Improving heritage education opportunities and interpretation, working with and through local partnerships and communities.
- Protecting the important and accessible 'Blue Flag' beaches on the coast which are essential to tourism. Ensuring that the coastal dunes are conserved and protected from damage resulting from recreational pressure, through the development of a strategy for coastal public access management.
- Conserving and enhancing the remaining character of the East Coast seaside towns and resorts to improve them for the local community and to increase their attractiveness as tourist destinations.

**The coast is particularly popular and many visitors enjoy the beaches for example at Mablethorpe.**

# Supporting document 1: Key facts and data

Total area: 88,201 ha

## 1. Landscape and nature conservation designations

Around 3 per cent of this NCA lies within the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB).

Management plans for the protected landscape can be found at:

- www.lincswolds.org.uk/

**Source: Natural England (2011)**

### 1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

| Tier | Designation | Designated site(s) | Area (ha) | Percentage of NCA |
|---|---|---|---|---|
| **International** | Ramsar | Humber Estuary; Gibraltar Point | 2,480 | 3 |
| **European** | Special Protection Area (SPA) | Humber Estuary SPA; Gibraltar Point SPA; | 2,480 | 3 |
| | Special Area of Conservation (SAC) | Humber Estuary Saltfleetby – Theddlethorpe SAC; Dunes and Gibraltar Point SAC; The Wash and North Norfolk Coast SAC | 2,570 | 3 |
| **National** | National Nature Reserve (NNR) | Donna Nook NNR; Saltfleetby-Theddlethorpe NNR; Gibraltar Point NNR | 1,095 | 1 |
| **National** | Site of Special Scientific Interest (SSSI) | A total of 15 sites wholly or partly within the NCA | 2,706 | 3 |

**Source: Natural England (2011)**

**Please note: (i) Designated areas may overlap (ii) all figures are cut to Mean High Water Line, designations that span coastal areas/views below this line will not be included.**

There are 199 local sites in the Lincolnshire Coast NCA covering 2,113 ha which is 2 per cent of the NCA.

**Source: Natural England (2011)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched at: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- Maps showing locations of statutory sites can be found at: http://magic.defra.gov.uk – select 'Designations/Land-Based Designations/Statutory'

#### 1.1.1 Condition of designated sites

| Condition category | Area (ha) | Percentage of SSSI land in category condition |
|---|---|---|
| **Unfavourable declining** | 0 | 0 |
| **Favourable** | 2,103 | 78 |
| **Unfavourable no change** | 0 | 0 |
| **Unfavourable recovering** | 603 | 22 |

**Source: Natural England (March 2011)**

- Details of SSSI condition can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

## 2. Landform, geology and soils

### 2.1 Elevation

Elevation ranges from just below sea level to a maximum 87 m as the land rises westwards across the Middle Marsh to the foot of the Lincolnshire Wolds. The average elevation of the landscape is 11 m above sea level.

**Source: Natural England 2010**

### 2.2 Landform and process

The wide coastal plain can be divided into three sub-areas which run broadly parallel with the edge of the Wolds. To the west is the Middle Marsh which comprises a softly undulating arable landscape that gently climbs up to the foot of the Wolds at the ancient Barton Street. To the east lies the Outmarsh, a land of rich pasture, including some remnants of ridge and furrow divided by narrow dykes with brackish water. Thirdly, the coastline itself is an area subject to continual erosion and accretion and, as a result, is vulnerable to high water and flooding.

**Source: Lincolnshire Coast and Marshes Countryside Character Area Description**

### 2.3 Bedrock geology

This NCA is underlain by Cretaceous Chalk, with later Quaternary sand, gravel and clay deposits laid down following glacial action.

**Source: Lincolnshire Coast and Marshes Countryside Character Area Description**

### 2.4 Superficial deposits

Glacial tills were deposited across the Middle Marsh. Marine alluvium characterises the Outmarsh, created by higher sea levels following the last ice age. Areas of dune sand and marine shingle at Gibraltar Point and North Somercotes are important for wildlife.

**Source: Lincolnshire Coast and Marshes Countryside Character Area Description**

### 2.5 Designated geological sites

| Tier | Designation | Number |
|---|---|---|
| National | Geological Site of Special Scientific Interest (SSSI) | 1 |
| National | Mixed interest SSSI | 2 |
| Local | Local Geological Site | 8 |

**Source: Natural England (2011)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm

### 2.6 Soils and Agricultural Land Classification

Glacial tills across the Middle Marsh give rise to slowly permeable, seasonally waterlogged fine loamy soils supporting cereals. The coastal Outmarsh's marine alluvium deposits produce soils of a deep clay and calcareous character – fertile soils for cereals, vegetables and pastures.

**Source: Lincolnshire Coast and Marshes Countryside Character Area Description**

The main grades of agricultural land in the NCA are broken down as follows (as a proportion of total land area):

| Agricultural Land Classification | Area (ha) | Percentage of NCA |
|---|---|---|
| Grade 1 | 3,702 | 4 |
| Grade 2 | 13,864 | 16 |
| Grade 3 | 62,486 | 71 |
| Grade 4 | 129 | <1 |
| Grade 5 | 0 | 0 |
| Non-agricultural | 3,066 | 3 |
| Urban | 4,567 | 5 |

**Source: Natural England (2010)**

- Maps showing locations of statutory sites can be found at: http://magic.defra.gov.uk - Select 'Landscape' (shows ALC and 27 types of soils)

## 3. Key waterbodies and catchments

### 3.1 Major rivers/canals

The following major rivers/canals (by length) have been identified in this NCA.

| Name | Length in NCA (km) |
|---|---|
| Great Eau | 21 |
| Louth Canal | 19 |
| River Freshnay | 8 |
| Wainfleet Haven or Steeping River | 8 |
| Steeping River | 7 |

**Source: Natural England (2010)**

**Please note: other significant rivers (by volume) may also occur. These are not listed where the length within the NCA is short.**

Occasional 'blow wells' occur where sand and gravel lenses allow water from the Chalk to reach the surface. A complex series of rivers and small streams drain slowly east across the plain towards the sea – some relying on numerous man-made drains.

### 3.2 Water quality

The total area of Nitrate Vulnerable Zone is 72,145 ha, forming 82 per cent of the NCA.

**Source: Natural England (2010)**

### 3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies at: http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

**The Great Eau river is one of the main waterbodies in the NCA.**

## 4. Trees and woodlands

### 4.1 Total woodland cover

The NCA contains 2,122 ha of woodland (2 per cent of the total area), of which 493 ha is ancient woodland.

**Source: Natural England (2010), Forestry Commission (2011)**

### 4.2 Distribution and size of woodland and trees in the landscape

Woodland is generally limited. Important concentrations of woodland occur on heavy boulder clay spanning the border between the Middle Marsh and the Wolds, mainly old hazel and ash coppice. The largest block is 177 ha but most are less than 20 ha in size. Coniferous plantation is present on areas of dune sand at Gibraltar Point and North Somercotes – including a block of 36 ha. Sparse woodland on the Outmarsh is limited to small patches around settlements, farmsteads and recent planting around caravan sites.

**Source: Lincolnshire Coast and Marshes Natural Area Profile**

### 4.3 Woodland types

A statistical breakdown of the area and type of woodland found across the NCA is detailed below.

Area and proportion of different woodland types in the NCA (over 2 ha).

| Woodland type | Area (ha) | Percentage of NCA |
|---|---|---|
| Broadleaved | 666 | 1 |
| Coniferous | 153 | <1 |
| Mixed | 278 | <1 |
| Other | 164 | <1 |

**Source: Forestry Commission (2011)**

Area and proportion of ancient woodland and planted ancient woodland within the NCA:

| Woodland type | Area (ha) | Percentage of NCA |
|---|---|---|
| Ancient semi-natural woodland | 320 | <1 |
| Ancient re-planted woodland (PAWS) | 173 | <1 |

**Source: Natural England (2004)**

## 5. Boundary features and patterns

### 5.1 Boundary features

Occasional hedgerows occur on the Middle Marsh. Drainage ditches bound fields on the Outmarsh.

**Source: Lincolnshire Coast and Marshes Countryside Character Area description; Countryside Quality Counts (2003)**

### 5.2 Field patterns

Large scale, rectilinear cereal and vegetable fields are common on the Middle Marsh dating back to 18th and 19th century reorganisation. Ancient, irregular pasture fields are found on the Outmarsh, particularly around settlements. Some areas of ridge and furrow indicate past arable farming.

**Source: Lincolnshire Coast and Marshes Countryside Character Area description; Countryside Quality Counts (2003)**

## 6. Agriculture

The following data has been taken from the Agricultural Census linked to this NCA.

### 6.1 Farm type

Cereals are the dominant farm type in this area with 271 holdings. Grazing livestock, mixed and general cropping holdings make up the mixed agricultural character. Trends between 2000 and 2009 show a 43 per cent decrease in the number of dairy farms (from 23 to 13 farms), they also show a 16 per cent increase in the number of 'other' holdings (likely to be smallholdings - up to 116 in 2009).

**Source: Agricultural Census, Defra (2010)**

### 6.2 Farm size

189 holdings are over 100 ha in size, accounting for 83 per cent of the land farmed in the NCA (59,915 ha). The second most numerous size of holding is between 5 and 20 ha, with 160 holdings, although this only accounts for 2 per cent of the farmed area.

**Source: Agricultural Census, Defra (2010)**

### 6.3 Farm ownership

2009: Total farm area = 72,272 ha; owned land = 45,601 ha
2000: Total farm area = 69,566 ha; owned land = 46,753 ha

**Source: Agricultural Census, Defra (2010)**

### 6.4 Land use

Cereal crops are the dominant land use accounting for more than 51 per cent of the farmed area (36,535 ha) followed by grassland with 20 per cent or 14,127 ha. Since 2000 there has been a 93 per cent increase in the area used to grow oilseed crops (5,481 to 10,549 ha).

**Source: Agricultural Census, Defra (2010)**

### 6.5 Livestock numbers

Pigs (49,100) are the most numerous livestock, followed by cattle (22,900) and then sheep (13,700). The number of pigs fell by 23 per cent between 2000 and 2009, with 15,000 fewer. The number of cattle and sheep also fell during this period.

**Source: Agricultural Census, Defra (2010)**

### 6.6 Farm labour

The number of principal farmers (owner managers) fell by 10 per cent or 100 between 2000 and 2009, to 879. The numbers of full time and casual workers also fell during the same period by 49 per cent (249 full time workers) and 24 per cent (50 casual workers).

**Source: Agricultural Census, Defra (2010)**

**Please note: (i) Some of the Census data are estimated by Defra so may not present a precise assessment of agriculture within this area (ii) Data refers to commercial holdings only (iii) Data includes land outside of the NCA where it belongs to holdings whose centre point is recorded as being within the NCA.**

## 7. Key habitats and species

### 7.1 Habitat distribution/coverage

Salt marsh, sand dunes and saline lagoons occur between Cleethorpes and Mablethorpe. Extensive dunes and salt marshes are found at Gibraltar Point. Important calcareous sand dune system with freshwater marsh and maritime fen are found south of Saltfleet Haven. Neutral and wet grassland are present, including important areas at Lindsey Outmarsh. In addition the NCA contains important arable habitats. These support nationally important assemblages of arable birds.

**Source: Lincolnshire Coast and Marshes Natural Area Profile**

### 7.2 Priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at; http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx

The NCA contains the following areas of mapped priority habitats (as mapped by National Inventories). Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

| Priority habitat | Area (ha) | Percentage of NCA |
|---|---|---|
| Coastal sand dunes | 632 | 1 |
| Reedbeds | 349 | <1 |
| Coastal and flood plain grazing marsh | 172 | <1 |
| Fens | 29 | <1 |
| Lowland calcareous grassland | 38 | <1 |
| Lowland meadows | 39 | <1 |
| Purple moor grass and rush pastures | 17 | <1 |
| Mudflats | 14 | <1 |
| Saline lagoons | 10 | <1 |

**Source: Natural England (2011)**

Maps showing locations of priority habitats are available at

- http://magic.defra.gov.uk select 'Habitats and Species/Habitats'

### 7.3 Key species and assemblages of species

- Maps showing locations of some key species are available at: http://magic.defra.gov.uk select 'Habitats and Species/Habitats'
- Maps showing locations of S41 species are available at: http://data.nbn.org.uk/

## 8. Settlement and development patterns

### 8.1 Settlement pattern

Dispersed settlement throughout agricultural areas is mainly concentrated at the foot of the scarp. The NCA includes historic market towns including Alford, Burgh-le-Marsh and Louth – reputedly with the tallest parish church spire in England. Windmills at Alford, Burgh-le-Marsh and Waltham break up the skyline on the coastal plain. Extensive urban development at the fishing port of Grimsby and resort centres at Cleethorpes, Mablethorpe and Skegness spread out from their nucleated centres. Docks and oil refinery structures at Immingham dominate the skyline of the coastal plain (in the Humber Estuary NCA).

**Source: Lincolnshire Coast and Marshes Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.2 Main settlements

The main settlements within the NCA are; Grimsby 87,574 and Skegness 18,910. The total estimated population for this NCA (derived from ONS 2001 census data) is: 242,169.

**Source: Lincolnshire Coast and Marshes Countryside Character Area description; Countryside Quality Counts (2003), Natural England (2012)**

### 8.3 Local vernacular and building materials

Traditional building materials are brick and pantile, resulting from extensive rebuilding in 18th century and later. Some reed thatch survives from the previously common buildings constructed from mud, stud and plaster walls with thatch. Some surviving examples of mud and stud buildings survive particularly in the Outmarsh area. Spilsby sandstone has been used in the construction of the area's churches.

**Source: Lincolnshire Coast and Marshes Countryside Character Area description; Countryside Quality Counts (2003)**

## 9. Key historic sites and features

### 9.1 Origin of historic features

There are a number of medieval and post-medieval features on the marshes for example at Tetney and Somercotes. Earlier activity from the Iron Age and Roman periods is often buried under the silts. The artificial watercourse of Louth Canal with marked embankments, built in the 18th century, is a feature in the landscape. The Saltfleetlby Second World War anti-invasion defence works are a rare example where the wartime deployment of gun emplacements and other installations survives within a largely unaltered landscape. The industrial heritage of the Grimsby fishing industry is notable in the north. Parklands and gentry houses are found in the Middle Marsh, including Gunby Hall, Well Vale Hall, Brackenborough and Brocklesby. There are several deserted mediaeval villages and moated sites as well as sites such as Markby Priory and Hagnaby Abbey and the remains of Thornton Abbey.

**Source: Draft Historic Profile, Countryside Quality Counts, Countryside Character Area description**

### 9.2 Designated historic assets

This NCA has the following historic designations:

- 4 Registered Parks and Gardens covering 537 ha.
- No Registered Battlefields.
- 60 Scheduled Monuments.
- 957 Listed Buildings.

**Source: Natural England (2010)**

- More information is available at the following address: www.english-heritage.org.uk/caring/heritage-at-risk/
- www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

## 10. Recreation and access

### 10.1 Public access

- 1.4 per cent of the NCA, 1,274 ha, is classified as being publically accessible.
- There are 693 km of public rights of way at a density of 0.8km per km2.
- There are  no National Trails within the NCA.

**Source: Natural England (2010)**

The following table shows the breakdown of land which is publically accessible in perpetuity:

| Access designation | Area (ha) | Percentage of NCA |
|---|---|---|
| National Trust (Accessible all year) | 0 | 0 |
| Common Land | 0 | 0 |
| Country Parks | 63 | <1 |
| CROW Access Land (Section 4 and 16) | 34 | <1 |
| CROW Section 15 | 2 | <1 |
| Village Greens | 1 | <1 |
| Doorstep Greens | 1 | <1 |
| Forestry Commission Walkers Welcome Grants | 3 | <1 |
| Local Nature Reserves (LNR) | 72 | <1 |
| Millennium Greens | 1 | <1 |
| Accessible National Nature Reserves (NNR) | 837 | <1 |
| Agri-environment Scheme Access | 63 | <1 |
| Woods for People | 264 | <1 |

**Sources: Natural England (2011)**

**Please note:  Common Land refers to land included in the 1965 commons register; CROW = Countryside and Rights of Way Act 2000; OC and RCL = Open Country and Registered Common Land.**

**Skegness Pier.**

## 11. Experiential qualities

### 11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) it appears that the lowest scores for tranquillity are associated with the conurbations of Grimsby and Cleethorpes. The highest scores for tranquillity are found in the more rural isolated areas away from the settlements and transport networks.

A breakdown of tranquillity values for this NCA are detailed in the table below:

| Tranquillity | Score |
|---|---|
| Highest value within NCA | 125 |
| Lowest value within NCA | -78 |
| Mean value within NCA | 5 |

**Sources: CPRE (2006)**

- More information is available at the following address: **www.cpre.org.uk/resources/countryside/tranquil-places**

### 11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows a similar pattern to the Tranquillity Map, with the main areas of disturbed land around the developed centres of Grimsby, Cleethorpes, Louth, Alford, Mablethorpe and Skegness, as well as along the A16 road corridor. A breakdown of intrusion values for this NCA is detailed in the following table.

| Intrusion category | 1960s (%) | 1990s (%) | 2007 (%) | Percentage change (1960s-2007) |
|---|---|---|---|---|
| Disturbed | 14 | 23 | 33 | 19 |
| Undisturbed | 82 | 71 | 61 | -21 |
| Urban | 4 | 4 | 6 | 3 |

**Sources: CPRE (2007)**

Notable trends from the 1960s to 2007 are an increase in the area of disturbed/intruded land of 19 per cent, matched by a decrease in the areas of undisturbed/un-intruded land by 21 per cent.

- More information is available at the following address: **www.cpre.org.uk/resources/countryside/tranquil-places**

**Saltfleetby Theddlethorpe Dunes National Nature Reserve.**

## 12. Data sources

- British Geological Survey (2006)
- Natural Area Profiles, Natural England (published by English Nature 1993-1998 )
- Countryside Character Descriptions, Natural England (regional volumes published by Countryside Commission/Countryside Agency 1998/1999)
- Joint Character Area GIS boundaries, Natural England (data created 2001)
- National Parks and AONBs GIS boundaries, Natural England (2006)
- Heritage Coast Boundaries, Natural England (2006)
- Agricultural Census June Survey, Defra (2000,2009)
- National Forest Inventory, Forestry Commission (2011)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)

Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100 per cent. The convention <1 has been used to denote values less than a whole unit.

# Supporting document 2: Landscape change

## Recent changes and trends

### Trees and woodlands

- Woodland as a proportion of the landscape has been increasing and there has been an increase in the area of woodland managed under the Woodland Grant Scheme.

- There are 2,122 ha of woodland covering 2 per cent of the area; 1,544 ha is broadleaved woodland which has increased substantially since 2009.

### Boundary features

- Data from March 2011 shows a dramatic increase with 1,480 km of boundary features under Environmental Stewardship options, mainly through the Entry Level Scheme, resulting in tightly cropped hedges filling out and becoming taller and wider. Stewardship Agreements for hedge management, planting and restoration have increased and the estimated boundary length is 3,971 km.

- More hedgerows and hedgerow trees are found inland from the coast which fits in with the landscape character of the area.

- Irregular ditches, streams and dykes are important features in the NCA which are reliant on water level management. Wetland habitats reduce in distribution and size and contain important wetland plant species of increasing scarcity for example wetland plants including priority species such as the ribbon-leaved water-plantain.

### Agriculture

- Arable intensification and farm amalgamation has taken place, particularly of smaller farms on the good quality soils of the Outmarsh towards the coast.

- The total farmed area has shown signs of increasing while farm ownership reduced between 2000 and 2009. There has been a loss of medium-sized farm enterprises which have largely been edged out.

**Manor Herd of Lincoln Red cattle - a rare breed developed in Lincolnshire.**

- Oilseed crops and maize have increased and large-scale cropping patterns have impacted upon the landscape. Field and cropping patterns have also been influenced by the growth of the refrigerated food industry in neighbouring settlements, for example Grimsby.

- Livestock numbers have changed in the area and since 2000 there has been a 43 per cent per cent decrease in the number of dairy farms. Pig farming has also changed and pig numbers have reduced noticeably. Mixed and general cropping has been reduced, as has horticulture.

- The area of grazing and hay meadows has been in decline but since the mid-2000s the Lincolnshire Coastal Grazing Marsh Project has provided advice to farmers and landowners within target areas in East Lindsey around Burgh-le-Marsh, Saltfleetby and Anderby/Huttoft covering some 9,000 ha. This has helped slow the continuing loss of permanent grassland and has resulted in some habitat restoration and creation.

### Settlement and development

- During the period 1999 to 2003 there was a moderately high rate of change arising from development, with some evidence of expansion of urban areas and Industrial sites, especially around Grimsby (and Immingham).

- Since 2003, industry and port development has continued to expand with recent applications for extension of port handling and storage, and sites for turbine construction to supply off-shore wind farms. There are an increasing number of proposals for renewable energy schemes, including wind turbines. Development of infrastructure has taken place including a new water pipeline to link Covenham Reservoir to Boston (within The Fens NCA).

- Artificial defences are being renewed from Immingham to Cleethorpes, recognising the need to protect industry and housing that have developed along the coastline.

- The NCA has seen an increase in holiday homes, caravans and theme parks; although overall rates of development are moderate, the increase is significant particularly along the coastal strip.

**Many of the coastal roads are bordered by holiday caravans.**

## Semi-natural habitat

- Semi-natural habitats are important in the NCA but are limited to the coastal area, with 3 per cent nationally designated for nature conservation. Habitat creation is underway between Sandilands and Chapel Point within the Lincolnshire Coastal Country Park.

- Of the SSSI, 78 per cent are in favourable condition and 22 per cent are in unfavourable, recovering condition.

- Some farmland features have declined including winter stubble, uncropped field margins, ditches and hedgerows. There is a need to incorporate farmland habitats and develop networks of linked habitats to help retain farmland features and enhance habitats for wildlife, particularly farmland birds.

- Many of the field boundaries on lower-lying areas are ditches and narrow dykes, however data from Countryside Quality Counts shows that Environmental Stewardship agreements were for hedge management, planting and restoration.

- The loss of wet grassland pasture is particularly evident. Pasture and older grassland survives principally on the roadside verges and ridge and furrow but also elsewhere in the NCA.

## Historic features

- English Heritage's annual 'Heritage at Risk' register indicates heritage assets that stand to be lost through neglect, inappropriate cultivation methods or through dewatering. Ancient earthworks, agricultural buildings such as historic farmhouses and barns, as well as pumping and military structures are typical relicts in this NCA.

- Traces of ridge and furrow can be found. This is under increasing threat from cultivation and a loss of ridge and furrow is evidenced due to cropping, such as on the Outmarsh along the coast.

- Two per cent per cent of the NCA is historic parkland and this is supported by historic parkland grants and agri-environment schemes.

**Fine examples of historic buildings in the Lincolnshire Coast and Marshes include Gunby Hall.**

### Coast and rivers

- There were tidal surges and flood warnings along the east coast in 2013/14. There is a changing, dynamic system of accretion and erosion along the coastline, creating intertidal and subtidal mudflats and salt marsh and changing deposition and erosion of sand and sand dunes along the North Sea coast. This is most marked with the constantly shifting form of the Gibraltar Point. The reclamation of salt marsh for agriculture and consequential squeezing of intertidal mudflats has had a significant impact on character.

- Abstraction levels from the majority of rivers and water courses in this NCA are above those needed to achieve good status in line with the Water Framework Directive, so there are potential issues with deterioration due to over-abstraction.

- The area of coast lies within Flamborough Head to Gibraltar Point and a shoreline management plan (SMP) which considers the potential risk of flooding and coastal erosion. The SMP recommends the policy option to 'hold the existing line of defence' – maintenance of the existing line of defence with upgrades to counter climate change and sea level rise.

- Coastal protection works have been undertaken, formerly by major engineering and currently by beach nourishment along parts of the coast. To counter erosion, since 1994 the Environment Agency has undertaken a major scheme (Lincshore) along the entire coast between Mablethorpe and Skegness. Along this stretch of coastline, the defences provide flood protection for land which is low-lying for several kilometres inland. This has been carried out at places of greatest erosion, for example, Sutton on Sea, Mablethorpe, Trusthorpe, Boygrift, Wolla Bank/Chapel Six Marshes, Trunch Lane and Ingoldmells. New flood defences have been created near Grimsby/Cleethorpes.

- The bathing waters along the coastline remain at a good standard with the main resorts of Cleethorpes and Skegness, Mablethorpe and Sutton on Sea holding 'Blue Flag' awards. This is likely to be maintained through partnership work.

- Abstraction levels from the majority of rivers and water courses in this NCA are above those needed to achieve good status in line with the Water Framework Directive, so potentially there are issues with deterioration due to over-abstraction.

### Minerals

- The Aggregates Mineral Resources map shows that a small number of active quarries exist.

- Clay has historically been extracted in this NCA but otherwise there is no significant extraction of minerals here. Clay pits formed in response to the 1953 floods can be found; several are now managed as nature reserves conservation projects such as Sea Bank Clay Pit SSSI.

- Aggregate dredging takes place offshore in licensed zones and there are a number of such sites located in the Humber Estuary.

- The Lincshore Scheme, a beach re-nourishment initiative whereby sand is pumped from licensed offshore sites onto 20 km of beach. The Environment Agency project plays a vital role in helping to reduce flood risk to coastal communities.

## Drivers of change

### Climate change

Climate change is likely to result in:

- More extreme weather events, in particular storm surges leading to increased flooding, both from higher tides, increasing the flood risk for adjacent land and causing significant alterations to patterns of erosion and deposition, particularly impacting on sand dune habitats.
- Rise in sea levels, which when combined with the existing flood defences will result in the further loss of intertidal habitats and other habitats such as reed bed, floodplain grazing marsh, brackish and fresh water.
- The possibility of subsequent changes to erosion and accretion of sediments, due to the rise in sea levels, resulting in significant changes.
- Changes in coastal habitats, which may affect feeding opportunities for birds on the mudflats, impacting on the SPAs. Changes in migration patterns as a result of climate change are already impacting on current species assemblages.
- Increased frequency and duration of heavy rain events, which will increase the risk of river flooding.
- Increased vulnerability of soils due to their impermeable nature particularly in periods of either drought or flooding, with subsequent implications for farming.
- A longer growing season potentially leading to double cropping and warmer winters leading to new crops.
- Increasing demands for water, for both domestic use and irrigation, leading to possible depletion of aquifers and implications for wetland habitats such as reed beds and wetlands linked to the current network of drainage ditches.

### Other key drivers

- There is pressure for development and increasing demand for wind farm sites and renewable energy schemes and infrastructure, potential combined heat and power plants, onshore turbines and construction facilities for offshore turbines. Grid connections for large offshore wind farms may affect the area.
- There is a growing role for Grimsby port to provide operations and maintenance support to the offshore renewables sector and this area is receiving significant investment.
- The coastal landscapes are dynamic and constantly changing. These processes need to be monitored to ensure that, for example, Gibraltar Point remains as a naturally-evolving geomorphological feature. The Shoreline Management Plan (SMP) policies will be key drivers for managing future coastal change – there may be opportunities for biodiversity if coastal change occurs. There will always be challenges in managing and responding to coastal change, working with partners and with stakeholders.
- The chalk aquifer underlying the NCA is used extensively for public water supply, industry and agriculture. Protection of water resources is required

as the aquifer is over-abstracted, with 'no water available' in some areas. 82 per cent of the NCA is designated a nitrate vulnerable zone (NVZ) and the chalk aquifer is affected as well as water quality. Opportunities to address water quality issues include; delivering catchment sensitive farming initiatives and encouraging good practice and ensuring adequate maintenance of private sewage treatments.

- A number of settlements, especially towards the coast and particularly during high tides, may be vulnerable to frequent flooding from rivers and the sea and surface water due to the low-lying topography.

- Farmland features have declined including winter stubble, uncropped field margins, ditches and hedgerows. There is a need to incorporate farmland habitats and develop networks of linked habitats to help retain farmland features and enhance habitats for wildlife, particularly farmland birds.

- Green tourism opportunities and The Lincolnshire Coastal Country Park are important to the area.

- Flood risk management assets are constantly assessed by the Environment Agency for value for money and adaptation to climate change. Partnership working with a range of organisations and land managers to manage flood risk effectively, including accessing appropriate funding mechanisms, should be sought.

- There is likely to be an increased need for infrastructure in relation to policies to optimise the use of ports and waterways, such as improving road and rail networks. In addition to the legal requirements to find compensation sites for any loss of biodiversity, a more strategic planned approach to accommodating further industrial expansion may open up opportunities for enhancing biodiversity.

- The Marine and Coastal Access Act 2009 provides opportunities to protect the marine environment while ensuring access to all parts of the coast by working in partnership with landowners.

- Grimsby and the coastal resorts of Skegness, Mablethorpe and Cleethorpes are important settlements for recreation and green tourism and further opportunities should be explored.

- Along the coast, existing First and Second World War pill boxes and beach defence emplacements are at risk from coastal erosion and should be recorded.

- Continued expansion of industry and housing in urban areas and along route corridors will increase pressure on land and at night, increase light saturation of dark skies. Opportunities for incorporating accessible green infrastructure and use of local vernacular for construction of buildings should be sought.

- Further development of mineral/aggregates extraction should include conserving interesting geological features exposed by mineral workings and creating opportunities for biodiversity enhancement through restoration schemes from minerals planning.

- Nationally important gas supplies 138 km off the Lincolnshire coast are transported to the Lincolnshire coast through a network of pipelines which comes ashore at Theddlethorpe Gas Terminal.

# Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

**Big skies and open views are characteristic of the NCA.**

| Statement of Environmental Opportunity | Ecosystem Service | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Food provision | Timber provision | Water availability | Genetic diversity | Biomass provision | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Regulating coastal erosion | Sense of place / Inspiration | Sense of history | Tranquillity | Recreation | Biodiversity | Geodiversity |
| **SEO 1:** Safeguard, manage and enhance the dynamic coastal landscape producing net gains in extent and quality of internationally and nationally important habitats including sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh for the wildlife they support, to increase ecological resilience and to increase the landscape's ability to mitigate flood risk and climate change. | ↗ * | ↑ ** | ↗ ** | ↗ *** | ↗ ** | ↑ *** | ↗ *** | ↗ *** | ↗ ** | ↗ ** | ↗ ** | ↗ * | ↑ ** | ↗ ** | ↗ ** | ↗ * | ↑ *** | ↗ ** | ↗ * |
| **SEO 2:** Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns of the Middle Marsh and Outmarsh and the fishing heritage of the port of Grimsby. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which contribute towards green tourism, enhance green infrastructure links, manage the pressures of flood risk and climate change, and ensure that infrastructure developments, such as offshore wind turbines do not contribute negatively to the character of the area. | ↗ *** | ↗ ** | ↗ *** | ↗ *** | ↔ * | ↗ * | ↗ *** | ↗ ** | ↗ *** | ↗ * | ↗ * | ↗ *** | ↗ ** | ↗ *** | ↑ ** | ↗ * | ↑ *** | ↗ *** | ↗ ** |
| **SEO 3:** Ensure sustainable food production while enhancing and strengthening the network of farmland features; manage, expand, create and link habitats within the Outmarsh and Middle Marsh to benefit biodiversity, soil and water quality by promoting farming and forestry practices that are able to adapt to climate change. Manage the rivers, water levels and the provision and quality of water in the whole catchment for human and ecological benefit. | ↗ * | ↗ * | ↗ ** | ↗ ** | ↗ ** | ↗ * | ↗ * | ↗ *** | ↗ * | ↗ * | ↗ * | ↗ *** | ↗ ** | ↗ *** | ↔ ** | ↔ ** | ↗ ** | ↗ *** | ↔ * |
| **SEO 4:** Conserve and enhance the character of the traditional seaside resorts and the long sandy beaches which help to make the area an important tourist destination; improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast with its expansive coast and marsh landscape and its coastal features and wildlife, while protecting high levels of tranquillity and the extensive, open views both inland to the Wolds and also out to sea. | ↔ ** | ↗ ** | ↗ ** | ↔ ** | ↔ ** | ↗ ** | ↗ *** | ↗ *** | ↗ * | ↔ *** | ↗ * | ↔ *** | ↔ * | ↗ *** | ↗ *** | ↗ * | ↑ *** | ↗ *** | ↗ ** |

Note: Arrows shown in the table above indicate anticipated impact on service delivery: ↑ = Increase ↗ = Slight Increase ↔ = No change ↘ = Slight Decrease ↓ = Decrease. Asterisks denote confidence in projection (*low **medium***high) ° symbol denotes where insufficient information on the likely impact is available.

National Importance; Regional Importance; Local Importance

## Landscape attributes

| Landscape attribute | Justification for selection |
|---|---|
| **A dynamic landscape of a mosaic of intertidal areas and terrestrial habitats and a coast of sediments with some designated sites of geological interest and biodiversity.** | ■ Gibraltar Point is an important and changing area with geomorphological interest and is designated as a Special Protection Area (SPA).<br>■ The designations of SPA and Special Area for Conservation (SAC) covering the Humber Estuary reach into this NCA – the estuary is also a Ramsar site.<br>■ A coastline with its narrow sandy beaches and also larger mudflats and intertidal habitats.<br>■ Rare saline lagoons exist on this coast.<br>■ Donna Nook National Nature Reserve (NNR) and Saltfleetby-Theddlethorpe NNR are both located in the area. |
| **Medium-scale arable farming and some livestock production with fields bounded by drainage ditches and some hedgerows on higher ground and pasture land.** | ■ Past management has responded to the underlying soil and drainage conditions, resulting in subtle variations in landscape character.<br>■ This is a predominantly open, medium-scale agricultural landscape. Mixed arable farmland is predominant in the Middle Marsh to the west of the area, where glacial tills give rise to slow permeable, seasonally-waterlogged fine, loamy soils supporting cereals. Smaller farm units with traditional drained pastures and some vegetable crops are common in the Outmarsh.<br>■ Pastoral land use close to settlement centres and often associated with ancient enclosures, such as in the Lincolnshire Coastal Grazing Marshes Project[8] (Conservation Action Plan).<br>■ The network of ditches makes a significant contribution to the landscape character, as well as providing important wetland habitats for potential improved connectivity.<br>■ Arable farmland supports a number of birds whose numbers have been on the decline. |
| **Strong sense of undeveloped and sparsely settled rural areas with villages and the inland historic market towns such as Louth. An area featuring greater development on the coastal strip with larger settlements of Grimsby, Cleethorpes and Skegness.** | ■ The settlements are dispersed and linear and local vernacular is generally characterised by red brick and pantile.<br>■ Modern infill development on the coastal strip.<br>■ Coastal character in many prominent resorts of Cleethorpes, Mablethorpe and Skegness, edged by large-scale caravan parks.<br>■ The popular medieval market town of Louth has historic character.<br>■ Expansion of road, retail and housing development outside larger settlements of Grimsby.<br>■ Theddlethorpe Gas Terminal and pipelines extending offshore may impede coastal processes and impact on views.<br>■ Offshore wind farms visible from the coast.<br>■ Onshore wind farms/wind turbines along the coastal strip. |

[8] Lincolnshire Coastal Grazing Marshes Project (Conservation Action Plan)

| Landscape attribute | Justification for selection |
|---|---|
| **An open landscape - predominantly flat towards the North Sea. Steeper slopes to the west in the Lincolnshire Wolds. Open rural views over the area from the Wolds with sea views along the eastern side.** | ■ Distant views inland and out to the east coast.<br>■ An open landscape with open skies – particularly along the coast.<br>■ There is generally sparse tree and cover which increases to the west in the Wolds Foothills where the landscape includes numerous hills and dry valleys and sinuous narrow woodland.<br>■ The Lincolnshire Wolds dominate and overlook the NCA.<br>■ Churches are prominent in the open landscape and a few are distinctive. |
| **The area has a wealth of ancient routes and settlements.** | ■ Use of the area began with seasonal grazing, salt making and transportation. The linear character of settlement reflects the early medieval driveways used as routes to move livestock.<br>■ A number of settlements are mentioned in Domesday Book. There are extensive surviving settlement earthworks surrounding shrunken settlements.<br>■ Scheduled Ancient Monuments exist.<br>■ A number of priories and historic remains of ecclesiastical structures exist.<br>■ There is good survival of ridge and furrow earthworks which generally respect the alignment of old enclosure. Surviving planned enclosure indicates planned marshland reclamation in the 18th–19th centuries.<br>■ Many fields have been consolidated since the Second World War. |
| **The network of public rights of way is limited and there is very little open access land so that access for recreation from urban areas to the countryside and coast is poor. Access to the coast by road provides hot spots for recreation.** | ■ Early medieval droveways used as routes to move livestock now form many of the modern routes and these often have grass verges.<br>■ Although there is a relatively limited network of footpaths, those routes that do exist provide some good views and experiences of remote and rural countryside.<br>■ The NNRs and country parks provide some good quality public access, education and enjoyment. Coastal access is limited in places.<br>■ There are promoted routes, green infrastructure strategies and development of coastal access and new links to existing rights of way.<br>■ The public access around the Fish Docks in Grimsby is poor while the People's Park in Grimsby is a registered park.<br>■ High levels of multiple deprivation on parts of the coast, with associated health issues in the community, such as in the Grimsby area.<br>■ Rural lanes in the NCA are quiet routes, popular for cycling and walking.<br>■ Horse riding is popular in the NCA and on the open beaches, as appropriate. |

| Landscape attribute | Justification for selection |
|---|---|
| **Sparse woodland is restricted mainly to a number of woodlands, particularly on estates and high ground and linked to ancient forests. Small pockets of deciduous woodland and shelter belts.** | ■ Copses and woodland spread throughout the farmland of the AONB in the Lincolnshire Wolds –Brocklesby/Claythorpe.<br>■ Ancient woodland forms a relatively high proportion of the woodland cover.<br>■ Sparse woodland cover has been typical of the general area but wooded character is enhancing. |
| **Widespread evidence of reclamation and drainage history with extensive network of ditches, dykes, canals and rivers with flood banks and pumping stations. Chalk streams drain into the NCA and watercourses.** | ■ The watercourses play a key role in draining the low-lying surrounding farmland.<br>■ Watercourses such as the River Lud feed into the Louth Canal.<br>■ Covenham Reservoir provides an important supply of domestic water and also recreation/visual amenity.<br>■ Clay pits, such as along the coast at Wolla Bank, form a series of manmade open water features with associated marginal habitats valuable for wildlife as well as recreation opportunities.<br>■ Several water features such as chalk streams are designated SSSI and support important species. 'Blow wells' are also found associated with the Chalk, for example Tetney Blow Well. |
| **A rich historic rural time depth including a maritime past, traditional coastal seaside towns and grazing marshes contribute strongly to sense of place providing associated recreation and tourism opportunities.** | ■ Many settlements were established during the medieval period and traces of ancient enclosure can be found. Traditionally, there was seasonal salt production and marsh grazing occurred on reclaimed marsh revealing the connection of farmed land and its reclamation.<br>■ Sites of medieval interest include several deserted medieval villages.<br>■ Fishing heritage associated with the area, for example Grimsby Docks.<br>■ Market town of Louth located at the edge of the Lincolnshire Wolds with its historic environment and access opportunities to the AONB. Burgh-le-Marsh and Alford retain a distinctive historic settlement core with traditional windmills and occasional traditional thatched buildings showing their importance as market towns.<br>■ Various country house properties are found including Gunby Hall with its well- preserved parkland and important visitor attraction.<br>■ Coastline with visible evidence of military sea defences dating from the Second World War.<br>■ Popular seaside resorts and caravan parks include Cleethorpes, Humberston, Mablethorpe, Ingoldmells and Skegness.<br>■ Developments including offshore wind farms impact on sea views and may affect coastal processes. There is significant opportunity for renewable energy such as wind, tidal and biomass.<br>■ Visitors are attracted to the area's nature reserves and the sea life such as the seal population at Donna Nook and Gibraltar Point.<br>■ Dog walking is very popular – especially on the promenades and shore.<br>■ Seaside art and events, for example Anderby Creek. |
| **The habitats of the area and its nature reserves support birds and mammals, which also depend on adjacent areas.** | ■ Seabirds from adjoining NCAs with SPA designations (for example The Wash and The Humber) forage in the area, particularly on the sediments.<br>■ Mammals including the grey seal breed within the NCA. The common seal breeds here and in adjacent NCAs (and in The Wash). |

## Landscape opportunities

- Retain the open character of the landscape with its expansive views and big skies. Protect areas with a strong sense of remoteness, wildness and tranquillity and dark skies at night, for example NNRs and AONB.
- Protect the nationally and internationally significant coastal habitats in the area including the areas of salt marsh, mudflats, sand dunes and arable pasture land which support large numbers of protected species and provide opportunities for people to enjoy access to nature.
- Conserve, manage and expand semi-natural habitats that reveal the influence of underlying soils and hydrological conditions.
- Protect the flat, open, low-lying Outmarsh for its remote and tranquil character which is enjoyed by walkers, its archaeological assets which provide a link to the past, and its drained pasture fields which support bird species such as the golden plover and pink-footed goose.
- Manage the water table levels so that existing wetland habitats are retained. Manage and expand the wetland habitats, including wet pasture, fens, reedbeds and where appropriate wet woodland.
- Ensure that managed realignment sites and new flood storage areas are managed to create wetland habitats that contribute to landscape character and biodiversity, ideally with some public access.
- Protect the areas of existing woodland, hedgerows and hedgerow trees in the Middle Marsh which are characteristic of the landscape contrast between inland and coastal marshlands.
- Plan for new woodland planting at appropriate locations, especially where this would be beneficial to creating new green infrastructure routes or integrating new development into the landscape.
- Plan to allow for the predicted impact of climate change, including sea level rise, coastal erosion and flooding, by using appropriate mitigation and adaptation principles.
- Plan to allow natural coastal processes to continue in appropriate areas along the coastline to allow essential sediment transportation, to create other intertidal habitats and natural sea defence and to enhance the landscape character of the coast.
- Conserve the productive soils for continued agricultural production while ensuring that the agricultural landscapes make a greater contribution to wildlife, especially to farmland birds, by avoiding or reducing cultivation on the steepest slopes (in the Lincolnshire Wolds foothills) and where there are archaeological features.
- Plan opportunities to provide links between the larger settlements to the surrounding countryside so that people can enjoy the tranquillity of rural areas, its history and the coast and include the development of more green spaces in towns such as Grimsby.

- Plan to extend coastal access where feasible by working in partnership. Manage access, recreation and tourism facilities through the character area and where appropriate, support the creation of new facilities to increase people's enjoyment of the landscape. Seek opportunities to interpret the particular landscape character and history and provide opportunities for more people to understand the area and enjoy the landscape, biodiversity, geodiversity and archaeological assets.

- Conserve quiet rural areas by encouraging sensitive development, respecting the long, open views and the strong rural character and local vernacular of the area. New development in urban areas should be in keeping with existing character and should be well-designed and sited to reduce visual intrusion. Adopt the area's traditional and historic architecture and its distinct patterns of settlement to plan for and inspire new development. Use appropriate local building materials and vernacular styles in restoring buildings and structures.

- Manage, enhance and restore the network of watercourses by working with land managers to improve biodiversity and water quality. Reduce flood risk while enhancing these landscape features by creating or maintaining marginal habitats around watercourses and creating buffer strips of wet grassland.

- Manage, enhance and restore declining farmland features such as grasslands, networks of ditches, small copses and hedgerows. Provide roosting and feeding areas for farmland birds including the barn owl, corn bunting and tree sparrow.

- Manage the historic environment for its contribution to local character and sense of identity and as a framework for habitat restoration and sustainable development.

**Waltham windmill.**

## Ecosystem service analysis

The following section shows the analysis used to determine key Ecosystem Service opportunities within the area. These opportunities have been combined with the analysis of landscape opportunities to create Statements of Environmental Opportunity.

Please note that the following analysis is based upon available data and current understanding of ecosystem services. It does not represent a comprehensive local assessment. Quality and quantity of data for each service is variable locally and many of the services listed are not yet fully researched or understood. Therefore analysis and opportunities may change upon publication of further evidence and better understanding of the inter-relationship between services at a local level.

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | Productive agricultural land<br><br>Soils<br><br>Livestock<br><br>Fishing | Food production is key to the NCA. The area is dominated by rich, loamy, clayey soils which support intensive arable cultivation such as wheat, oilseeds, and root crops -with the remainder put down to grass or uncropped.<br><br>In the Middle Marsh an expansion of arable coupled with intensification has occurred with a decline in mixed and general cropping.<br><br>The agricultural areas of the Outmarsh adjacent to the coast have smaller field sizes and a more ancient drained landscape exists. There is also a higher proportion of grass and rough grazing. A number of small beef and dairy herds are supported by the area's pastures and grazing marshes.<br><br>Some crops from the area are used in the frozen food industry at Grimsby where the fishing industry has declined. A fishing port remains at Grimsby and there is fishing and trawling along the Lincolnshire coast. | Regional | Food provision is an important service.<br><br>Although there is scope for increasing food provision there are issues around water resource, the long term viability of soils, the loss of soil quality and the issue of flooding.<br><br>The grazing marshes, for example Lincoln Red cattle, one of the oldest of the UK's native beef cattle breeds.<br><br>The marshes along with other areas of rough grassland on the seaward side of the defences are used for grazing by local cattle farmers with beef cattle grazing on the salt marsh.<br><br>This area of the southern North Sea forms an important focus for fishing activity which needs to be sustainable. | Work with land managers and the farming community to continue to support the production of food.<br><br>Develop stronger branding of locally produced food, such as rare breed Lincoln Red cattle thus maintaining and strengthening farming and its associated cultural landscapes and the wildlife it supports.<br><br>Seek opportunities to promote links between the landscape and soil management practices and high quality foods through initiatives to enhance marketability of products through high environmental standards. Ensure that soils are managed to enable continued agricultural production.<br><br>Address demand for water through providing more on-farm water storage.<br><br>Seek opportunities to promote sustainable fishing and raise awareness about links between the coast and the marine areas. | **Food provision**<br><br>**Water availability**<br><br>**Regulating water flow**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history** |

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| **Timber provision** | Woodland | A very limited supply of timber exists. With a woodland cover of only 2 per cent (2,122 ha) this NCA offers very little in the way of commercial timber production.<br><br>An important concentration of woodland occurs on heavy glacial tills overlapping with the AONB and the Lincolnshire Wolds NCA.<br><br>Wooded open farmland is present around Brocklesby and Claythorpe. Some scattered woodland blocks occur and span the border between the Middle Marsh and the Wolds. These mainly consist of old hazel and ash coppices and are important for their biodiversity, some being ancient woodland. | Local | There are fewer large blocks of woodland in the area.<br><br>Woodland on the Outmarsh is restricted - except around farmsteads and settlement edges.<br><br>There is a need to maintain existing ancient woodland for its biodiversity.<br><br>New woodland planting should occur without restricting any long and open views. There may be potential for woodland planting to reduce flood flows downstream.<br><br>Extensive woodland planting should be restricted to areas with existing woodland cover towards the Lincolnshire Wolds to enhance landscape character. | Only seek opportunities to create new woodland in appropriate locations such as extending existing woodland areas towards the Lincolnshire Wolds.<br><br>Actively manage ancient woodland to enable natural regeneration.<br><br>Seek opportunities to bring existing woodland into management.<br><br>In the Middle Marsh explore opportunities to plant linear woodlands alongside watercourses and in flood plains to slow flood flows and ensure the new plantations will not affect areas which are prized for their long and open views.<br><br>Plant mainly individual trees in the Outmarsh. | **Timber provision**<br><br>**Climate regulation**<br><br>**Regulating soil erosion**<br><br>**Regulating water quality**<br><br>**Regulating water flow**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history** |

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| **Water availability** | Chalk aquifer<br><br>Network of watercourses including Great Eau, River Freshen, Waithe Beck and Louth Canal<br><br>Semi-natural habitats<br><br>Reservoir | A major chalk aquifer underlies this NCA supplying water to the Humber and East Midlands for industry, agriculture and drinking water.<br><br>Covenham Reservoir primarily serves the water needs of Grimsby and Cleethorpes. It is a supply feed for Louth/ Mablethorpe/Skegness and the reservoir can be supplemented by water from the Great Eau and Long Eau. A new water pipeline from the Covenham Reservoir will serve Boston (within the Fens NCA).<br><br>In the Grimsby area and the Humber Estuary NCA, no consumptive abstractions are granted in order to prevent saline intrusion.<br><br>Groundwater levels are considered to be over-licensed, with no surplus available for additional supply. For example, Laceby/ Kirky Beck have 'no water available' for additional abstraction.<br><br>Currently the farmed environment covering much of the NCA is lacking in a network of semi-natural habitats and these are fragmented. | Regional | The majority of the chalk aquifer (which also underlies the adjoining Lincolnshire Wolds NCA) is classified as 'no water available', with part of the north-eastern area of the Chalk being over-licensed.<br><br>Water storage capacity on farms should be increased to enable farms to reduce water abstraction.<br><br>There is a risk of growing salinity within groundwater, especially close to the coast, due to over-abstraction.<br><br>The Great Eau headwaters are spring-fed from the chalk aquifer and sedimentation of the streams/river affects spawning areas of freshwater fish.<br><br>Soils in the area could be improved to reduce rapid runoff with scope to increase semi-natural habitats throughout the farmed environment as these aid infiltration and slow down runoff. | Employ sympathetic land management to improve the sustainable use of water.<br><br>Work with agricultural businesses along the coastal fringe to ensure sustainable rates of groundwater extraction and to lessen the risk of saline intrusion and safeguarding agricultural land use in the future.<br><br>Adopt land management practices that improve soil infiltration.<br><br>Rainwater harvesting opportunities should be explored. Encourage the expansion of water storage capacity on farms to enable farms to reduce the volumes of water abstraction from surface and groundwater sources.<br><br>Restore and increase areas of semi-natural habitats to increase infiltration, such as arable field margins.<br><br>Retain and expand grassland/wet grassland in the coastal marshes.<br><br>Recreate low input flood plain grazing marsh grassland benefiting landscape, habitat and aquifer re-charge, water quality, soil erosion as well as limiting flood risk. | **Water availability**<br><br>**Food provision**<br><br>**Regulating water flow**<br><br>**Regulating water quality**<br><br>**Regulating soil quality**<br><br>**Biodiversity**<br><br>**Climate regulation** |

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| **Genetic diversity** | Lincoln Red cattle<br><br>Lincoln Longwool sheep | The original stock of Lincoln Red Cattle is a rare breed according to the Rare Breed Survival Trust (RBST).<br><br>Cattle are an important aspect of agriculture particularly in the wetter, low-lying areas adjacent to the coast. There are also (more commonly) non-rare breeds of Lincoln crosses which make up some of the beef cattle numbers in the NCA.<br><br>Various sheep breeds were developed in the area including the Lincoln Longwool – today a breed prized for their lustrous long wool. | Local | Sources of genetic material for use in breeding improved types of plants and animals for agricultural purposes. Sources can arise from existing traditional varieties or breeds.<br><br>Lincoln Red cattle which were developed in this area using indigenous draught- cattle of the region.<br><br>Lincolnshire sheep breeds, for example Lincoln Longwools, were once important in the area -and traded in, for example Burgh le Marsh sheep market. | Explore opportunities and encourage partnership of farmers, land managers and organisations that are committed to promoting the benefits of genetic diversity.<br><br>Seek opportunities to recreate low input grazing marsh – providing sites for traditional rare breeds for viable stock farming and help to protect rich historic environments such as ancient ridge and furrow.<br><br>Explore and maximise the use of best practice Lincolnshire Grazing Marshes Project and the Grazing Animals Project partnership (part of the RBST). | **Genetic diversity**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Sense of history**<br><br>**Food provision** |
| **Biomass provision** | Existing woodland | There is limited scope for biomass production from existing woodland as coverage is sparse –only 2 per cent.<br><br>The area offers medium potential yields for short rotation coppice (SRC) and high potential yields for miscanthus throughout the area according to Defra's biomass potential map. | Local | A limited woodland cover offers little potential for providing wood fuel. There is a small supply of locally-sourced wood from existing woodland.<br><br>Extensive biomass crops are unlikely as much of the land is used for productive arable cropping.<br><br>The Outmarsh has smaller fields and less regular field pattern, with boundaries either as dykes or not present.<br><br>On the Middle Marsh – with its rectilinear fields and occasional hedgerows biomass planting could be accommodated.<br><br>There are some limited opportunities for planting biomass crops in association with new developments but this would introduce unwelcome change to the very open, flat landscape of the Outmarsh.<br><br>Biomass crops would need to be appropriately located to avoid impacting on feeding or breeding areas for waders, blocking key views or reducing the expansive character of the landscape.<br><br>Avoid planting SRC and miscanthus close to NNRs. | There are opportunities for using woodland resources sensitively by thinning or coppicing providing woodland owners with a diversified income stream.<br><br>Biomass planting could be carried out in places on the Middle Marsh. In the Outmarsh avoid planting within 5km of the NNRs, or on ridge and furrow and where this could lead to further loss of grazing marshes.<br><br>Explore opportunities to use energy crops to screen development around small settlements.<br><br>SRC and miscanthus should be carefully sited around existing woodland and should be monitored for intrusive development in coastal locations. | **Biomass provision**<br><br>**Climate regulation**<br><br>**Regulating water flow**<br><br>**Regulating water quality**<br><br>**Regulating soil quality** |

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| **Climate regulation** | Soils<br><br>Grazing marsh<br><br>Mudflats /salt marsh<br><br>Woodland | Significant carbon storage will be provided by the grazing marsh, reedbeds, mud flats and marine sediments, all of which store high levels of organic matter.<br><br>Some of the soils of the coastal flats may have more organic-rich soils that will be important to conserve. Away from the coast the soils in this NCA generally have a low carbon content reflecting the dominance of mineral soils.<br><br>The woodland cover is relatively low at only 2 per cent of the NCA. The larger blocks to the north are managed while smaller more fragmented woodland is more often un-managed.<br><br>Tidal flooding, exacerbated by rising sea levels, combined with high river flows and rainfall, represents a high flood risk.<br><br>Continuing coastal squeeze will be likely which will require managed realignment of flood defences to enable intertidal habitats to shift and expand. | Regional | There is some variation along the coast – with more organic-rich topsoils including the soil of the salt marshes where the marine sediments can have elevated organic matter levels. Some of these may be lost through sea level rise.<br><br>Salt marsh and mudflats have an important role in climate regulation due to carbon lock-in and they have important roles in coastal defence due to, for example, their absorption of wave energy. Their retention and expansion represents a cost-effective flood defence strategy, as well as providing habitat. Managed realignment may also subsequently affect adjacent fresh and brackish water habitats.<br><br>The main soil types of this NCA are mineral soils with low carbon content.<br><br>The addition of organic matter can enhance soil structure and may also increase carbon storage. The mineral soils may have potential for carbon sequestration by increasing organic matter inputs and by reducing the frequency/area of cultivation/shallow ploughing. | Adopt cultivation practices that retain and increase the organic content of soils, such as overwintering stubble, and include fallow in rotations. Where possible increase the area of grassland.<br><br>Conserve, expand and increase carbon storage areas of grazing marsh, reedbeds, salt marsh and mudflats.<br><br>Seek opportunities to move flood defences back to provide space for the development of new intertidal habitats.<br><br>Ensure that realignment sites are managed to develop their full potential to support and enhance the biodiversity, interest and characteristic landscape of the coast.<br><br>Seek opportunities to link fragmented habitats with other semi-natural habitats such as well- managed ditches and grasslands to enable species to move in response to changing sea levels.<br><br>Seek opportunities to plant broadleaved woodland where this fits with existing landscape character, for example around the wooded areas of Brocklesby.<br><br>Working in partnership with the South Humber Bank Ecology Group to secure areas of strategic habitat mitigation. | **Climate regulation**<br><br>**Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Regulating water flow**<br><br>**Biodiversity**<br><br>**Sense of place/ inspiration** |

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| **Regulating water quality** | Permanent grassland<br>Semi-natural habitats<br>Reedbeds and other wetlands | The area is drained by a network of rivers, many modified as part of land drainage schemes within the Lincolnshire Coast and Rivers Priority Catchment.<br>82 per cent of the NCA is within a Nitrate Vulnerable Zone.<br>The Water Framework Directive (WFD) Nitrates -pressure is 70 per cent while the WFD phosphates failure is at 20 per cent.<br>Excess nitrates, phosphates and pesticides from sewage and, to a lesser extent, from agriculture, have led to pollution and eutrophication in watercourses while sedimentation in rivers is a priority issue within many catchments.<br>The Anglian River Basin Management Plan indicates that the ecological status of rivers and waterways in the NCA are either 'good' or 'moderate'.<br>Excess chemicals from arable and horticultural food production are identified as issues in intensively managed areas on the Grade 1 and 2 soils.<br>2012 Water Framework Directive (WFD) interim classification data shows that the Steeping is currently at overall 'moderate' ecological potential.<br>The Great Eau is also at overall 'moderate' ecological potential; the Long Eau is classed at 'poor'.<br>The Lud/Louth Canal is at 'good' potential, although some of the tributaries are 'moderate'.<br>The Laceby Beck/Freshney catchment is 'poor' ecological potential.<br>Throughout the rest of the area there are two water bodies currently at bad ecological potential, the Barrow Beck (upper end) and the Buck Beck, and two at 'poor' status.<br>The Seven Towns North and South Eau, Trusthorpe Pump Drain, Anderby Main Drain, Boygrift Drain, Ingoldmells Drain and Cow Bank Drain are classed as 'good' potential, with the remaining WFD water bodies classed as 'moderate'. | Regional | Reasons for the water bodies in the area failing to meet the target of Good include diffuse pollution from both urban and rural areas, point source effluent discharges and lack of habitat and diversity associated with the heavily modified nature of many of the channels.<br>Within the Lincolnshire Coast and Rivers Catchment there is a targeted area for Catchment Sensitive Farming in North Lincolnshire.<br>Excess nitrates and phosphates are particularly an issue in the north of the NCA and in the coastal settlements.<br>There is a risk of nitrates entering the groundwater land across the catchment. The application of fertilisers and manures spread for agricultural benefit can increase nutrient levels in the groundwater.<br>There is a Drinking Water Protected Area within the Grimsby Louth Chalk Ground Water Body.<br>There is a risk of growing salinity within groundwater, especially close to the coast, due to over-abstraction.<br>Excess nitrates, phosphates and pesticides have led to pollution and eutrophication in water courses. In addition, sedimentation of water courses including chalk streams is identified as an issue in streams such as the Laceby Beck/Waithe Beck. Management that reduces soil compaction and run-off will help to reduce water pollution.<br>The ecological quality of most of the surface water is 'moderate', with some watercourses, such as the Great Eau, classified as 'poor'. | Manage farmland in accordance with the principles established by the England Catchment Sensitive Farming Delivery Initiative.<br>Encourage the establishment of areas of semi-natural habitat such as reedbed and washland, which slow the passage of water through the hydrological system and help purify the water.<br>Habitats including reedbeds, fens and wet grassland will help to enhance water quality.<br>New areas of permanent grassland could be established in areas where current practices generate high risk and where soil erosion and diffuse pollution occur.<br>Work in partnership with the Environment Agency to look at ways of reducing leakage of nitrates into the catchment.<br>Work in partnership with the farming community to share best practice:<br>Encourage good soil management, optimum nutrient management, and rainwater harvesting.<br>Reduce fertiliser inputs while also reducing current expenditure of farm businesses. | **Climate regulation**<br>**Regulating soil erosion**<br>**Regulating soil quality**<br>**Regulating water quality**<br>**Biodiversity** |

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| **Regulating water flow** | River Steeping, Great Eau, Long Eau and the River Led/Louth Canal and Freshney<br><br>Semi-natural habitats<br><br>Extensively-grazed permanent grasslands/ washlands<br><br>Deep clay soils | Flood control is a key issue for much of the NCA and a major flooding event occurred in 1953. Increased storm frequency is leading to higher flood flows coming downstream.<br><br>The topography of the area is generally low-lying with many coastal areas only a few metres above sea level and flooding a potential issue.<br><br>The Environment Agency (EA) Flood Risk Map indicates a high risk of river and/or coastal flooding, especially the areas close to the North Sea (but also at Louth near the Lincolnshire Wolds). During periods of high spring tides, flooding may extend up the river floodplains.<br><br>Coastal flooding (to a width of up to 10 km around villages, for example North Somercotes). Coastal settlements of Grimsby, Mablethorpe, Chapel St Leonards and Skegness are affected.<br><br>The area is drained by a dense network of rivers, most of them modified as part of land drainage schemes. Flood risk is currently managed in coastal locations through the maintenance of watercourses, raised embankments and pumping stations. (Inland Drainage Boards). | Local | The area adjacent to the coast is low-lying and increases in the intensity of precipitation events associated with climate change may lead to an increase in flooding.<br><br>Coastal grazing marshes provide increased lag time in water flow and assist in water storage, while also providing agricultural land use and wildlife habitats particularly for waders and farmland birds.<br><br>Storage of flood waters has been an effective mechanism along main rivers to benefit both biodiversity and to provide flood alleviation such as at Saltfleet where outflows are dependent on tidal cycles.<br><br>Drought resilience is also beneficial and increasing the distribution of semi- natural habitats can assist, for example reedbeds, other wetland areas, grasslands and small woodlands.<br><br>Along the flood plain upstream of Louth and Saleby may reduce the risk of downstream flooding in Louth and Mablethorpe respectively.<br><br>Most measures to address river flood issues, for example encouraging extension of flood storage areas, slowing the flow of watercourses through restoring natural routes and planting, would be more effective when applied to rivers and streams upstream, especially in the Lincolnshire Wolds NCA.<br><br>The current flood storage capacity in the NCA needs to be maintained and increased, particularly where there is the likelihood of high tide and high run-off/river flow combinations. A flood risk management strategy exists to assess flood risk variant across the area and is the best approach to managing this risk in the future.<br><br>Most settlements are offered some protection from flooding by man-made defences on the coast and main rivers.<br><br>Historically the area has been heavily managed to reduce the probability of flooding. Flood risk is expected to increase in the future. Short-term, existing flood defences can be maintained at existing levels – this is current policy. Future flooding is expected to become more intense, so protection given by these defences may decline. | Manage the network of ditches and drains to ensure that while operating effectively to drain the land, they also make a positive contribution to the landscape and to biodiversity, and act as links between other semi-natural habitats.<br><br>Increase the current flood storage capacity by creating sizeable areas of lowland fen, reedbeds and flood plain grazing marsh.<br><br>Flood storage along the main rivers through provision of flood fields and reinstatement through Higher Level Stewardship and local initiatives.<br><br>Implement the recommendations from the EA Anglian Habitat Restoration Programme.<br><br>Develop a sustainable, integrated and long-term flood risk management approach.<br><br>Combine objectives for rewetting areas/ flood plains for biodiversity and for flood risk management. This aims to store winter floodwater.<br><br>Recreate flood storage areas in partnership and with guidance from the Environment Agency. These may benefit both wildlife and flood alleviation at the coast (for example Saltfleet) where outflows are dependent on tidal cycles. | **Regulating water flow**<br><br>**Biodiversity**<br><br>**Regulating coastal erosion and flooding**<br><br>**Biodiversity**<br><br>**Regulating water quality**<br><br>**Regulating soil erosion**<br><br>**Food production**<br><br>**Recreation**<br><br>**Sense of history** |

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| **Regulating soil quality** | Fertile soils<br><br>Slowly permeable and seasonally wet soils<br><br>Naturally high groundwater<br><br>Grassland and other semi-natural habitats | The majority of soils are Grade 3 (71 per cent). Grade 2 covers 16 per cent and Grade 1, 4 per cent.<br><br>There are seven main soils. Four of these are:<br><br>■ Slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils, covering 45 per cent of the NCA.<br><br>■ Loamy and clayey soils of coastal flats with naturally high groundwater (39 per cent per cent).<br><br>■ Slightly acid, loamy and clayey soils with impeded drainage (5 per cent per cent).<br><br>■ Saltmarsh soils (2 per cent). | National | The slowly permeable, seasonally wet may suffer compaction and/or capping as they are easily damaged when wet. In turn, this may lead to increasingly poor water infiltration and diffuse pollution as a result of surface water run-off. Management measures that increase organic matter levels can help reduce these problems.<br><br>The loamy and clayey soils of coastal flats have a high agricultural potential; dependent on the continued ability to pump, drain and protect the soils from sea flooding/saline intrusion. Some soils at risk of structural damage where drained. The soils are increasingly under threat of loss from sea level rise although they will help protect other inland soils from these issues. Where there is a high silt/fine sand content compaction or capping may be an issue.<br><br>The soils have naturally high groundwater and high agricultural potential but this is dependent on the continued ability to pump, drain and protect the soil from sea flooding /saline intrusion.<br><br>Where there is high silt/fine sand content and/or poor drainage, capping may occur, which can be reduced by increasing the organic matter content.<br><br>In seasonally wet conditions, compaction of the clayey soils may occur, particularly with the use of heavy machinery. | Encourage the adoption of the Defra Code for Good Agricultural Practice (2009)[9] and Environment Agency's 'Think Soils' manual (2008)[10] to maintain good soil structure.<br><br>Adopt cultivation practices that increase organic content of soils, such as introducing fallow into rotations, over-winter stubbles, direct drill and grass leys.<br><br>Increase storage of water on farm to prevent saline intrusion and damage to soils.<br><br>In slowly permeable, seasonally wet but base-rich loamy and clayey soils of coastal flats with the potential for compaction /capping will be improved through increasing soil organic matter. | **Regulating soil quality**<br><br>**Food provision**<br><br>**Regulating soil erosion**<br><br>**Climate regulation**<br><br>**Regulating water flow**<br><br>**Regulating water quality**<br><br>**Geodiversity**<br><br>**Biodiversity** |

[9] Defra Code for Good Agricultural Practice (2009)
[10] Think Soils,, Environment Agency (2008); URL: https://publications.environment-agency.gov.uk/skeleton/publications/ViewPublication.aspx?id=222ae15f-1725-44d3-83f7-3a1113983987)

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| **Regulating soil erosion** | Fertile soils<br><br>Semi-natural habitats<br><br>Extensively-grazed permanent grassland<br><br>Soils with high organic matter<br><br>Trees and woodland | The main soil types covering the majority of this NCA are at low risk of soil erosion. Around 7 per cent per cent of the soils are prone to soil erosion.<br><br>The soils of the salt marshes will help protect inland soils from loss through coastal erosion and sea level rise. Nevertheless, the smaller areas of lighter soils have an enhanced risk of soil erosion such as on moderately or steeply sloping land where cultivated or where bare soil is exposed.<br><br>There is also the potential for wind erosion on some coarse-textured or sandy, cultivated variants. | Regional | The loamy and clayey soils of coastal flats with naturally high groundwater and the slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils have a low risk of soil erosion.<br><br>However, the slightly acid loamy and clayey soils with impeded drainage are prone to capping/ slaking, and are at risk of compaction if accessed when wet, thus increasing the risk of soil erosion by run-off.<br><br>The freely-draining lime-rich loamy soils are also potentially at risk of erosion when cultivated/ bare soil is exposed.<br><br>In the Lincolnshire Coast Rivers Priority Catchment, sedimentation and siltation of water courses is an identified problem and Catchment Sensitive Farming is promoted.<br><br>Inter-tidal habitats–the salt marsh and mudflats - play an important role in protecting inland soils from loss through coastal erosion and these need to be protected.<br><br>These soils need to be protected from sea flooding/saline intrusion. There is a need to pump, drain and protect the soils. Locally, some soils are saline and at risk of structural damage where drained, affecting productivity. | Encourage landowners and managers to use farming methods that protect the soil, such as maintaining vegetative cover.<br><br>Use of grass buffer strips can reduce soil erosion from susceptible arable fields in the autumn and winter.<br><br>Encourage the adoption by farmers and landowners of the Environment Agency's 'Think Soils' manual (2008).<br><br>Follow best practice of Catchment Sensitive Farming. Create grass buffers along ditches and watercourses to capture sediment run-off and plant where it is appropriate.<br><br>Ensure the protection/ retention of salt marsh to provide cost-effective defence against soil erosion.<br><br>Protect salt marsh and other habitats to create a buffer between the sea and agricultural land. Manage the abstraction of groundwater to prevent saline intrusion. | **Regulating soil erosion**<br><br>**Regulating water quality.**<br><br>**Regulating soil quality**<br><br>**Food provision**<br><br>**Climate regulation**<br><br>**Regulating water flow**<br><br>**Regulating water quality**<br><br>**Biodiversity** |

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| **Pollination** | Semi-natural habitats including salt marsh | 1 per cent of the area is coastal sand dunes.<br><br>Less than 1 per cent of the area is floodplain grazing marsh, as are reedbeds, lowland meadows and fens and calcareous grassland.<br><br>Within the farmed environment there are limited areas of semi-natural habitats. There are potential nectar sources from the marginal riparian habitats along canals/ watercourses. Also important are the small areas of woodland as these provide locations for food and hibernation.<br><br>The area is poorly served by pollinators as large sections of landscape become increasingly devoid of semi-natural habitats on which the pollinators depend for food and shelter. Such habitats are often isolated pockets with species-rich buffers, margins and verges providing valuable food and shelter for pollinators.<br><br>There has been a severe decline in wild and managed pollinator numbers over the last 30 years. Pollinating insects are generally supported by a range of semi-natural habitats, in particular, species-rich grasslands. | Local | Semi-natural vegetation is fragmented due to land drainage and the predominance of arable farming with its large field patterns bounded mainly by drainage ditches.<br><br>Hedgerows are generally found further inland on higher ground but the most extensive semi-natural habitat and nectar source is flood plain grazing marsh.<br><br>Some food crops, such as oilseed rape, benefit from insect pollination. These crops may become more widespread in the future if demand increases.<br><br>The most extensive semi-natural habitat should be restored and maintained. Sensitive management of hedges and verges in the agricultural landscape will allow plants to flower and improve availability to pollinators. A greater network of semi-natural habitats located next to food crops, will aid pollination and provide a wider choice of food crops in the future. | Seek opportunities to introduce flower-rich grasslands within arable areas, creating habitat networks where possible.<br><br>Protect areas of salt marsh and create, restore and maintain semi-natural habitats such as flood plain grazing marsh, coastal grassland and hedgerows.<br><br>Encourage sustainable farming practices such as uncropped field margins and planting of pollen and nectar mixes that increase habitat connectivity; manage boundary features/roadside verges to extend flowering time.<br><br>Encourage partnership working with a range of organisations such as The Wildlife Trust and Life on the Verge project, to manage road side verges so that they produce a range of flowering species/ nectar sources. | **Pollination**<br><br>**Food provision**<br><br>**Pest regulation**<br><br>**Biodiversity**<br><br>**Sense of place / inspiration** |

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| **Pest regulation** | Areas of semi-natural habitat<br><br>Flood plain grazing marsh<br><br>Hedgerows<br><br>Ancient woodland<br><br>Riparian grassland<br><br>Roadside verges | A variety of semi –natural habitats support populations of pest-regulating species. In the NCA these are fragmented due to land drainage and the predominance of large field patterns bounded largely by drainage ditches.<br><br>The extent of species- rich grassland is low but hedgerows are found on higher ground, Riparian grassland is found along the canals and other watercourses and flood plain grazing marsh. | Local | Certain habitats provide important overwintering areas for beneficial predatory invertebrates, for example beetles. | A stronger and wider network of semi-natural habitats could provide benefits for pest regulation, biodiversity and pollination.<br><br>Increase the diversity of the structure and composition of semi-natural habitats to support a variety of pest-regulating species. | **Pest regulation**<br><br>**Food provision**<br><br>**Pollination**<br><br>**Biodiversity** |

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| **Regulating coastal erosion and flooding**<br><br>*continued on next page* | Salt marsh<br><br>Natural sand dune defences<br><br>Sedimentation | The Lincolnshire coast is experiencing rising sea levels which, when combined with high river flows can result in significant flooding. The whole NCA falls within a flood risk area and, reflecting this risk, essentially the entire area is protected by artificial flood defences.<br><br>Major flooding occurred in 1953 and the main artificial flood defences were constructed after this event.<br><br>There are several active and relict sea banks parallel to the coast. Much of the coast is made up of salt marsh and dune systems which are well-preserved. Their preservation can be attributed to the Royal Air Force bombing ranges along the coast and more recently to the establishment of a number of nature reserves.<br><br>In order to reduce erosion since 1994, 'beach nourishment' in the form of replenishment of sand has been carried out at places of greatest erosion; Trusthorpe, Boygrift, Wolla Bank/ Chapel Six Marshes, Trunch Lane and Ingoldmells.<br><br>The salt marshes are currently increasing in area, affording further natural protection for the coastline. Where possible, natural processes should be allowed to continue and any modification to sea defences should seek to recognise the importance of | National | Sea level rise and climate trends show that the low-lying landscape of the NCA is at risk from flooding. Settlements along the coast are at risk of flooding.<br><br>Tidal flooding, exacerbated by rising sea levels and combined with high river flows and rainfall, represents a high risk, as much of the developed area is below high tide levels and its drainage infrastructure struggles to cope with extreme events.<br><br>Wetlands and coastal habitats offer essential buffers to safeguard human life and property during extreme flooding events. Natural sea defences to coastal flooding are a cost effective answer.<br><br>Essential coastal processes occurring on the North Sea coast carry sediment south to the Lincolnshire coast and the Wash, where it feeds beaches and through accretion helps inter-tidal habitats adjust to rising sea-levels. However, the hard defences on the coastline interrupt this natural sediment transfer.<br><br>The Flamborough Head to Gibraltar Point Shoreline Management Plan[11] (SMP) proposes future policy.<br><br>The policy approach is to hold the line and the existing sea bank alignments. The SMP policies should guide developments in flood prone, vulnerable areas.<br><br>The Flamborough Head to Gibraltar Point (SMP) policy along this coastline aims to ensure the continued protection from coastal flooding of the towns, while allowing the continuation of natural processes along the remainder of the coast.<br><br>On the south shore of the Humber, from Immingham to Grimsby, the approach is to hold the line of existing coastal defences throughout the long term (to 2105), protecting the significant industry, port and residential areas here. | Monitor processes and work with partners to find solutions that enable dynamic coastal processes to continue, taking into account the need to protect access to key facilities.<br><br>Seek opportunities to create fresh water habitats, wetland habitats, and brackish water bodies to compensate for those lost through rising sea levels.<br><br>The Lincolnshire Coastal Grazing Marshes support traditional livestock, producing high value products as well as supporting employment and rural income.<br><br>Seek opportunities to move flood defences inland, thus ensuring that intertidal habitats can expand and respond to rising sea levels.<br><br>Ensure that realignments are managed so that inter-tidal habitats can develop and expand effectively. Monitor processes and work with partners to find solutions that enable dynamic coastal processes to continue, taking into account the need to protect access to key facilities. | **Regulating coastal erosion and flooding**<br><br>**Sense of place/ inspiration**<br><br>**Biodiversity**<br><br>**Geodiversity** |

[11] Flamborough Head to Gibraltar Point Shoreline Management Plan, Humber Estuary Coastal Authorities Group

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Regulating coastal erosion and flooding**<br><br>*continued from previous page* | | natural processes. Over the medium and long term, it is probable that the balance of salt marsh and mudflats will change through erosion as a result of climate change. This will increase coastal squeeze where the salt marsh is constrained by coastal defences on its landward side. In the short term, the policy approach is to hold the existing sea bank alignments and in the medium and long term, landward realignment will need to be considered as an alternative to holding the line. | | The approach to the management of coastal defences on the south shore of the Humber is generally to 'hold the existing defence line'. The approach also ensures continued protection of the Theddlethorpe Gas Terminal from coastal erosion. No active intervention will occur in areas where the maintenance of defences becomes uneconomic. In some areas flood defences will be moved through managed realignment to create intertidal habitat and also provide flood storage to help manage water levels.<br><br>Current data suggests that a breach may occur within five to ten years (2012–2022)[12],[13].<br><br>Rising sea levels which when combined with high river flows and low atmospheric pressure can result in significant flooding. The whole NCA falls within a flood risk area and, reflecting this risk, essentially the entire estuarine shore is protected by flood defences. | Protect coastal sand dune system from damage resulting from recreational pressure and raise awareness of local issues and the seascape. | |

[12] The Humber Flood Risk Management Strategy, Environment Agency (March 2008)
[13] Flamborough Head to Gibraltar Point Shoreline Management Plan: Non-Technical Summary, Consultation Draft, Humber Estuary Coastal Authorities Group (2009)

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| **Sense of place / inspiration** | Biodiversity<br>Grazing marshes<br>Expansive views<br>Flat, low-lying landscape with big open skies and a lack of trees<br>Quiet rural area<br>Food provision<br>Remote locations<br>Contrasts with busy industrial areas | The area has a distinct sense of place because of its open, flat and low-lying nature and dispersed settlement pattern which give it an isolated and tranquil character.<br>The wild coast in particular provides a sense of place.<br>The mix of coastal influences, modern industrial complexes and agriculture give the area its particular character.<br>With the tourist centres of Skegness, Mablethorpe and Cleethorpes, this is one of the most visited areas of the East Coast.<br>The area is recognised for its open agricultural landscape, numerous 'mar' drains and dykes, streams and areas of the coast managed for wildlife.<br>An NCA within which falls a small part of the Lincolnshire Wolds Area of Outstanding Natural Beauty.<br>Distinctive areas designated for their biodiversity. International interest (Ramsar); European (SPA and SAC); national designations (SSSI).<br>Inspiring geology, habitats and landscapes with distinctive focal points including Donna Nook NNR and Gibraltar Point.<br>A landscape with a strong sense of belonging reflected in village communities and seaside accommodation.<br>A popular east coast tourist destination accessible by rail such as Skegness, with its good coastal access.<br>Historic towns such as Grimsby, with its strong heritage interest.<br>A concentration of RAF bases at Strubby, Manby, North Cotes and Donna Nook, which are of historical importance. Some RAF Second World War buildings are listed.<br>On the coast the wind is a key characteristic of the landscape experience. | Regional | The tidal nature of the coastline along with the weather provides a very changeable landscape on the coast. Inland the change is less obvious.<br>Although agricultural areas predominate, more remote and natural areas are also found in the coastal grazing marshes,<br>A sense of wildness offers inspiring experiences, for example Donna Nook NNR.<br>Maintain the expansive character of area including long views and tranquil areas and coastal links to the Lincolnshire Wolds.<br>Offshore wind farms are changing the character of this landscape. The size of the individual units, the area covered by wind farms and the cumulative effect of their locations are having a significant impact on the long views within/ out this NCA.<br>Currently tourism peaks sharply in the summer and changes the experience.<br>Coastal grazing marshes provide opportunities for food production at the same time benefiting biodiversity. | Explore opportunities to increase sustainable tourism throughout the season. Such initiatives need to improve visitors' enjoyment, understanding and environmental awareness. Support the local economy while protecting the special qualities of the area.<br>There are opportunities to improve green infrastructure links from the coastal towns through the development of green tourism. Plan new developments so that views are retained.<br>Improve access to flood banks so that more people can benefit from the distinctive shoreline.<br>Improve understanding of the many features and functions of the marine/coastal area including the changing geomorphological processes and wildlife resource.<br>There is an opportunity to raise awareness of birdlife and biodiversity of the wider area and to include farmland birds through partnerships such as the Wildlife Trust's 'Living Landscapes' [14] conservation plan. | **Biodiversity**<br>**Recreation**<br>**Sense of place/ inspiration**<br>**Food provision**<br>**Tranquillity** |

[14] Lincolnshire Wildlife Trust Living Landscapes (www.lincstrust.org.uk/conservation)-www.lincstrust.org.uk/conservation

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Sense of history** | Archaeological remains<br>Drainage history<br>Ridge and Furrow<br>Coastal management features<br>Sea fishing and coastal heritage<br>Scheduled monuments<br>Geological features<br>Characteristic buildings and architecture<br>Parklands<br>Military history and defences | A sense of history is evident in the reclaimed marshland landscape including occasional drainage dykes constructed in Roman and medieval periods along with the extensive channels, drains, flood protection and early pumping systems.<br>The wetlands preserve nationally-important palaeo-environmental and archaeological evidence.<br>The smaller settlements retain much of their historic character with little additional development. The isolated farmsteads scattered across the NCA have expanded significantly to include modern barns.<br>The cores of the settlements from Humberston to Healing are well-preserved and identifiable form medieval churches and 18th-and 19th-century red brick buildings.<br>A nucleated pattern of settlement is characteristic such as Alford while in the Outmarsh a dispersed settlement pattern is more characteristic.<br>Agricultural land retains old enclosures – old marshland drainage and reclamation – but there are also some planned enclosures dating from the 18th- and 19th-century.<br>Environmental records are preserved within the sediments and well-preserved remains of prehistoric landscapes that become exposed. Archaeology including from the Bronze Age and Roman.<br>There are several scheduled monuments and 957 Listed Buildings.<br>A landscape where its cultural heritage is less well-recognised –the ancient field systems and the history bound up with the management of the marsh are not widely appreciated.<br>There is a range of designated and undesignated heritage assets that reflects human use of the area. Historic parkland decreased significantly during the 20th century, with important areas remaining. Also, a concentration of war- time defences/RAF bases at Strubby, Manby, North Cotes and Donna Nook are historically important. | Regional | A landscape where its cultural heritage is less well- recognised - the ancient field systems and the history bound up with the management of the marsh.<br>There is a strong maritime influence on the landscape with much of the land reclaimed from the sea over several centuries.<br>There is also historic interest in villages, along with evidence of early industrial activity.<br>A sense of history is associated with the medieval dispersed settlement patterns, field systems and ancient churches.<br>The ancient field systems and the history of the management of the marsh have the potential to be more widely interpreted.<br>A number of parklands present today such as Gunby Hall, Well Vale Hall and Brocklesby, are under favourable management.<br>Restoration of historic features should use local materials and respect local styles.<br>Historic Second World War assets and RAF bases and their Listed Buildings are of historical importance.<br>The fishing industry provides a link with the sea –particularly around Grimsby, and this industry has changed dramatically in more recent years.<br>A landscape where the daily opportunity for people to have access to nature offers inspiration. The Coast and Marshes has the potential for more people to enjoy and understand its historic features and landscapes through improved interpretation, education and access. | Improve understanding and interpretation and enjoyment of past activities and cultural heritage.<br>Protect, conserve and enhance features of historic interest above/ below ground and their setting.<br>Conserve soil resources to protect buried features of archaeological or historic interest.<br>Through partnership working, raise awareness of the historic assets, such as parklands and ridge and furrow grassland in the area, to increase knowledge about the landscape and its diversity and heritage value.<br>Aspects of social history that are important include the large estates of Brocklesby and Gunby Hall.<br>Seek opportunities to promote awareness of more recent history-using Second World War structures like hangars –which are listed and an important tourism asset for the area.<br>Raise awareness of fishing and coastal heritage of the area including Grimsby Docks. | **Sense of history**<br>**Sense of place/ inspiration**<br>**Biodiversity**<br>**Geodiversity**<br>**Recreation** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Tranquillity** | A generally flat low-lying topography<br><br>Remote locations such as Gibraltar Point and Donna Nook<br><br>Sparse settlement patterns<br><br>Open views<br><br>Sea views towards and from the coast.<br><br>Undisturbed remote areas | There are a few industrialised areas and Grimsby Port that contrast sharply with the predominantly rural and tranquil areas.<br><br>According to the CPRE Intrusion Map (2007) 61 per cent of the area is still undisturbed with the landscape offering a strong sense of tranquillity away from the more settled areas. A sense of isolation exists in much of the area, with few major roads and a sparse population.<br><br>Areas of greatest tranquillity are those away from settlements and transport networks where 'dark skies' also feature in much of the NCA at night.<br><br>With more industrial activity, the conurbations of Grimsby and Cleethorpes have lower tranquillity scores. | Regional | Retain the contrasts between busy, active areas and more remote rural and wilder areas. This will require containment of development into busy areas and control of intrusive elements such as lighting.<br><br>This area is predominantly flat with generally wide open views across long distances, big open skies and a landscape offering a strong sense of tranquillity.<br><br>The exceptions are around the main coastal resorts and the access routes to them and other main roads. In addition there is weekly practice by the RAF at Donna Nook bombing range.<br><br>Industry is present and dominates the landscape in places around Grimsby, including large constructions and industrial turbines for renewable energy. | Encourage sensitively- sited development maintaining long and open views and strong sense of place<br><br>Minimise light spill, particularly in areas which are undisturbed, and allow dark skies to prevail at night allowing for the study of astronomy and giving more natural night-time environments.[15] | **Tranquillity**<br><br>**Sense of history**<br><br>**Recreation**<br><br>**Sense of place/ inspiration** |

[15] Dark Skies (www.darkskydiscovery.org.uk)

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Recreation** | Coast<br>Public rights of way<br>Network of parks and open spaces<br>Nature reserves/ National Nature Reserves | The east coast has been an important tourist destination since the late 19th century.<br>Today part of the area includes some communities with multiple deprivations such as Grimsby.<br>With the coastal tourist centres of Skegness, Mablethorpe and Cleethorpes,, and the concentration of historic Second World War RAF bases, the area is one of the most highly-visited areas of the east coast. This is very highly concentrated in and around the main holiday centres so that much of the coastal hinterland is relatively quiet and unvisited. A number of smaller coastal settlements also exist (such as Chapel St Leonards, Ingoldmells and Anderby Creek).<br>The rights of way network in the NCA is moderate (1.4 per cent of the NCA with a density of only 0.8 km per km$^2$) and no National Trails reflecting its historic inaccessibility. Rights of way afford the visitor opportunities to explore the landscape beyond the sea bank and provide opportunities to improve the recreational usage of links between the coastal towns.<br>Promoted routes exist at NNRs and in the Lincolnshire Coastal Country Park (LCCP). Numerous nature reserves and sea bank clay pits are regularly visited.<br>The NCA covers a large proportion of the Lincolnshire coastline of which approximately 65 per cent is already open and the subject of legal access rights. Much of this access is along hard structures such as promenades, along sea walls and defensive sea banks. Much of the remaining third of the coast is also accessible to pedestrian visitors, but the access is permissive in nature.<br>Some access to the coast exists but areas of highest use are where beaches have nearby parking/coastal settlements.<br>The NNRs covering 837 ha are excellent for bird watching and educational activities with seal-watching being particularly popular at Donna Nook NNR.<br>A North Sea observatory is also proposed at Chapel Point. Gibraltar Point offers an important location for visitors to experience coastal habitats.<br>There is coarse and trout fishing on many of the waters that flow through the NCA.<br>Adjacent to the NCA lies the Lincolnshire Wolds AONB which attracts visitors for its tranquillity and for walking. There are access routes linking these areas such as those along the Louth Canal. | Regional | The tourism industry forms an important part of the area's local economy and tourism on the coast peaks sharply in the summer with sea bathing, sun- bathing and water sports being popular. Some of the sandy beaches have Blue Flag status.<br>The undeveloped/ wild coast has potential for green tourism.<br>Away from the coast the landscape offers opportunities, albeit limited, for distinctive, low-key, informal recreation.<br>Maximise the recreational benefits provided by the coast while protecting the area and landscape.<br>Promoted routes exist at NNRs and in the LCCP, with opportunities to develop more in the future.<br>Access and public rights of way are limited for example, around Grimsby. Improve the health and wellbeing of the people living in areas (particularly within wards with multiple deprivation).<br>A significant resource for tranquillity is offered, especially in winter.<br>The marshes and open rural landscape offer opportunities for development of green tourism. | Work in partnership to promote green tourism opportunities throughout the year and reduce environmental damage due to tourism pressure.<br>Provide interpretation of the history, biodiversity, geodiversity and other aspects of the landscape in well- visited locations. Identify areas where access is currently poor and extend access while avoiding adverse impacts. Avoid developing access into areas where species need protection, such as overwintering birds.<br>Support well-planned green infrastructure to provide sustainable access routes that enhance community safety, foster community cohesion and contribute to people's physical health and well-being.<br>Improve people's understanding of the area.<br>Link public footpaths and settlements, especially on rising ground, so as to be resilient to potential rising water levels.<br>During the development of coastal access, ensure that the habitats are protected from damage resulting from excessive recreational pressure.<br>Development in relation to recreation will need to be appropriate and phased and sensitive to the needs of the natural environment including the marine environment. | **Recreation**<br>**Sense of history**<br>**Sense of place/ inspiration** |

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| **Biodiversity**<br><br>*continued on next page* | Internationally, nationally and locally-protected sites<br><br>European Marine Site–Gibraltar Point Special Protection Area (SPA)<br><br>Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Special Area of Conservation (SAC)<br><br>Coastal features including intertidal areas, coastal lagoons, sand dunes and mudflats<br><br>NNRs<br><br>SSSI<br><br>Semi natural habitats<br><br>Floodplain grazing marsh | A number of sites have been notified for their international importance for wildlife because the habitats they contain support assemblages of breeding birds and overwintering species.<br><br>Gibraltar Point is an internationally recognised Ramsar Site –as is the adjacent NCA area of The Wash.<br><br>The majority of the coastline is internationally designated for its biodiversity with sites of conservation importance (excluding the stretch of coast between Skegness to Mablethorpe).<br><br>The SPA and SAC exist covering marine and terrestrial environments.<br><br>Specific areas of coast are managed for wildlife, for example, Saltfleetby and Theddlethorpe Dunes NNR. An ancient calcareous dune system contains freshwater marsh and maritime fen is located south of Saltflleet Haven.<br><br>The coastal saline lagoons hold rare species.<br><br>Reedbeds cover over 349 ha of the NCA and are located in the wet areas on the Outmarsh. | International | The Lincolnshire Coast and Marshes are of international importance for their biodiversity.<br><br>The salt marshes, dunes and freshwater marsh and maritime fen provide habitats for species including little tern, redshank, lapwing ringed plover, whitethroat and lesser whitethroat.<br><br>The waterbird assemblage is significant and important. European non-breeding birds include grey plover, sanderling, bar-tailed godwit and red knot.<br><br>Conservation objectives are set for each habitat or species of the SPA/SAC.<br><br>Species include water shrew, natterjack toad, common lizard and a colony of grey seals.<br><br>Chalk streams remain under threat from excessive water extraction, physical modification, pollution, intensive fisheries management, urban development and invasive species.<br><br>The chemical status of the groundwater in the northern half of the NCA, the main chalk aquifer, is classified as poor. | Enhance the coastal habitats working with the relevant landowners and partners using the Flamborough Head to Gibraltar Point Shoreline Management Plan to guide proposals.<br><br>Manage intertidal habitats such as sand dunes and saline lagoons. Raise awareness of their importance linked with the marine environment and working in partnership with NNRs.<br><br>Working in partnership with, for example, the Lincolnshire Wildlife Trust/South Humber Bank Ecology Group, to secure areas of strategic habitat<br><br>Work with farmers and landowners by encouraging maintenance, restoration and creation of flood plain grazing marsh, woodlands, lowland grassland meadows and fen.<br><br>Work with farmers and landowners to adopt management interventions that will protect or improve habitats as well as water resources by creating buffer strips of meadow grassland to accommodate habitat change, creating more species-rich grassland.<br><br>Ensure that the network of ditches is well- managed so that they provide suitable habitats for rare species including protected species such as water vole and other wildlife.<br><br>Survey and monitor the ditch flora and fauna to understand the impact that changing nutrient levels are having on the biodiversity of this habitat.<br><br>Seek opportunities to buffer and expand existing semi-natural habitats, to link them with grassland strips and create connecting networks to enable species movement. | **Biodiversity**<br><br>**Geodiversity**<br><br>**Sense of place/ inspiration**<br><br>**Recreation**<br><br>**Water availability**<br><br>**Regulating coastal erosion and flooding**<br><br>**Tranquillity**<br><br>**Regulating water quality**<br><br>**Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Climate regulation** |

| Service | Assets/attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal services offered by opportunities |
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| **Biodiversity**<br><br>*continued from previous page* | Fen<br><br>Farmland bird assemblage species<br><br>Overwintering wildfowl<br><br>Riparian grassland<br><br>Broadleaved and mixed woodland<br><br>Chalk streams/ blow wells<br><br>Reedbeds | There are neutral and wet grasslands, including important areas at Lindsey Outmarsh.<br><br>Gibraltar Point SPA forms part of the The Wash and North Norfolk Coast European Marine Site. There are extensive mildly calcareous dunes and salt marshes in the SPA.<br><br>The mixture of habitats provides important feeding, roosting and resting areas for birds on passage and through the winter.<br><br>Arable birds– nationally important assemblages of arable birds are present on farmlands of the NCA.<br><br>The lowland calcareous grasslands and floodplain grazing marsh and the 39 ha of lowland hay meadows–traditional agricultural practices are important.<br><br>3 per cent of the area is SSSI. Of these sites 78 per cent are 'favourable management' and 22 per cent are in a status of 'recovering'.<br><br>A host of protected species are found in the NCA including grey seal, water vole and barn owl. A number of species have action plans for their recovery. | | Gibraltar Point is a key insect site and there are also mammals associated with the reserve including seal species. Gibraltar Point SPA has breeding birds such as little tern, redshank, lapwing ringed plover (in nationally important numbers), whitethroat and lesser whitethroat.<br><br>The water bird assemblage is significant and important European non-breeding birds include grey plover, sanderling, bar-tailed godwit and red knot. | Ensure that the land used by bird populations for foraging and roosting outside the designated areas is adequately protected and managed.<br><br>Provide habitats for farmland bird species such as grey partridge, skylark, barn owl, tree sparrow, yellowhammer and linnet.<br><br>Ensure farming practice within the wider landscape makes provision for ground nesting birds. Plant bird seed mixtures for spring and winter food and create a network of insect- rich habitats throughout arable areas and grasslands.<br><br>Seek opportunities for regeneration/creation of semi-natural vegetation landscape.<br><br>Protect and manage the chalk streams throughout the catchments with advice from partners including the Lincolnshire Chalk Streams Project and guidance from the Lincolnshire Wolds AONB Management Plan.<br><br>Increase the area of grazing marsh in good biological condition to benefit water quality and provide semi-natural habitat for a range of rare species.<br><br>Explore opportunities for partnership working with, for example, the Lincolnshire Wildlife Trust and, in the Lincolnshire Grazing Marshes Project, target areas to increase ecological resilience.<br><br>Secure the opportunities that exist for improving access and engagement. Seek opportunities to raise awareness of marine and seascape issues. | |

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| **Geodiversity** | Geomorphological processes<br><br>Marine alluvium of the Outmarsh<br><br>Coastal sand dunes and marine shingle<br><br>Soils<br><br>Chalk streams | 2 mixed interest SSSI, 1 geological SSSI and 8 Local Geological Sites.<br><br>There is a constantly changing and dynamic system of accretion and erosion and in contrast to many parts of eastern England, it is still accreting. Gibraltar Point consists of a pair of almost parallel dune systems separated by salt marsh of which the innermost dunes are believed to be at least 300yearsold.<br><br>Local building tradition demonstrated through use of local materials including greenstone used in churches and red brick and pantiles in farm buildings.<br><br>Blow wells occur in certain locations between Barton and Tetney, for example, Tetney Blow Well (SSSI). These are the result of artesian springs where water under pressure escapes from the Chalk through structural weaknesses (lenses of sand) in the overlying till to reach the surface.<br><br>Chalk streams on the western side of the NCA, for example, Laceby Beck, Waithe Beck, Great Eau and the River Lud.<br><br>Chalk bedrock underlies and extends beyond the NCA with mudstone, limestone and sandstone also present.<br><br>The area hosts one nationally designated geological site, Chapel Point to Wolla Bank SSSI, and two mixed interest SSSI of both geological and biological interest. Additionally, 8 Local Geological Sites cover 65 ha. Whilst 7 regionally important geomorphological sites cover in total 73 ha.<br><br>Gibraltar Point SSSI is an area of some 430 ha of sandy and muddy shores, calcareous coastal dunes, salt marshes and freshwater habitats, extending for a distance of about 5 km along the Lincolnshire coast from the southern side of Skegness to the entrance of the Wash. | Regional | Shoreline Management Plan provides a long term plan for the coast.<br><br>Geomorphology of the SSSI, for example, Gibraltar Point and North Somercotes, with dune sand and marine shingle which allows for interpretation, understanding and continued research into the geodiversity of the area. The sites also contribute to sense of place and history. At the SSSI at Gibraltar Point where a wide variety of coastal landforms and associated habitat types are present and its location here, on the north-western fringe of The Wash, is relatively sheltered.<br><br>Blow wells occur where sand and gravel lenses allow water from the Chalk to reach the surface. | Protect and maintain views and access to geological features to provide further interpretation, research and understanding of the area's geology. Gibraltar Point offers particularly interesting geodiversity and is an important opportunity for education in the NCA.<br><br>Conserve and enhance soil resources and geomorphology to safeguard the relationship between landscape, history of land use, wildlife, archaeological and cultural heritage.<br><br>Promote respect and understanding for the local building traditions and architectural styles and facilitate the use of appropriate local materials.<br><br>Where appropriate, improve and manage public access and interpretation and develop education/ recreation opportunities. | **Geodiversity**<br><br>**Regulating water quality**<br><br>**Regulating water flow**<br><br>**Water availability**<br><br>**Biodiversity**<br><br>**Recreation**<br><br>**Sense of place / inspiration**<br><br>**Sense of history**<br><br>**Regulating coastal erosion and flooding** |

**Photo credits**

Cover photo: Looking inland over the Outmarsh with the Middle Marsh in the distance across the open Lincolnshire Coast and Marshes NCA. © Peter Roworth/Natural England

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National Character Area profile:

# 43: Lincolnshire Wolds

Supporting documents



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# Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper[1], Biodiversity 2020[2] and the European Landscape Convention[3], we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

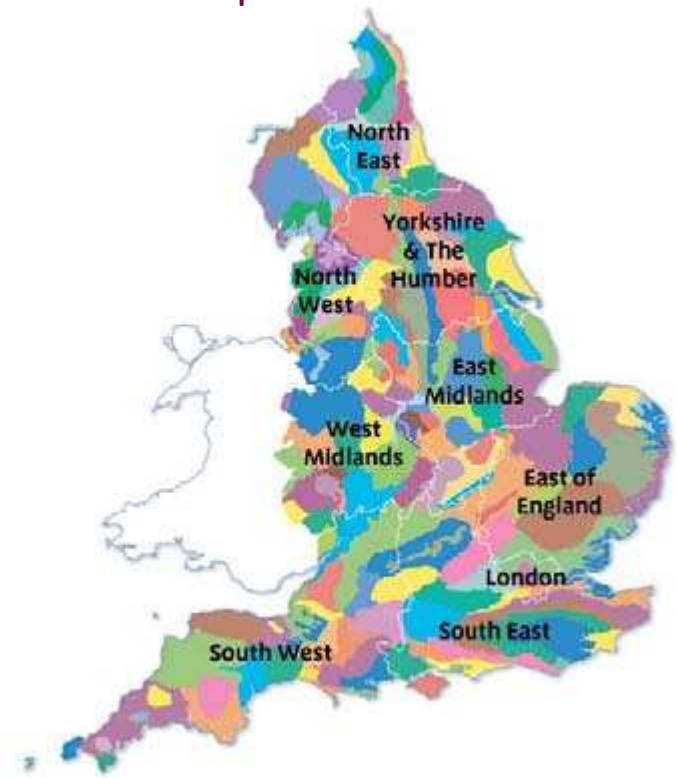
NCA profiles are guidance documents which can help communities to inform theirdecision-making about the places that they live in and care for. The informationthey contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing ncaprofiles@naturalengland.org.uk

## National Character Areas map



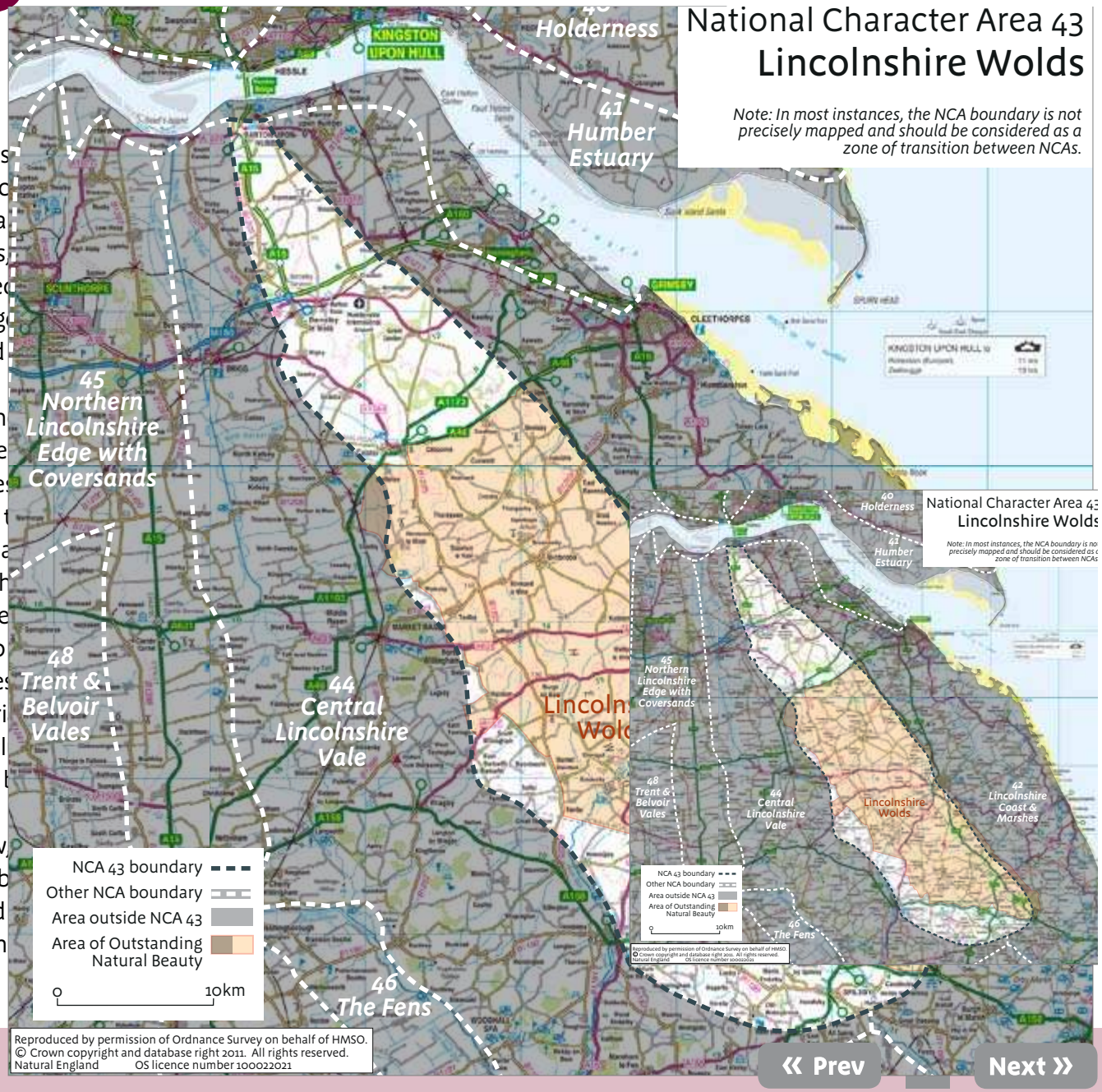

[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)
[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

## Summary

The Lincolnshire Wolds National Character Area (NCA) is
of rolling agricultural land dominated by a west-facing c
approximately 50 m high. The area is characterised by a
unified features including open, arable plateau hill tops,
deep dry valleys with sinuous beech woods and isolated
the skyline. The area is sparsely settled with many villag
folds of the landscape and modest country houses and

The landscape of the Wolds is strongly influenced by th
and the later glacial action that reshaped it. The solid ge
up of a sequence of sandstones, clays, sandy limestones
deposited between 155 and 95 million years ago during t
Cretaceous periods. The chalk is capped in places by gla
glacial meltwater channels have carved away parts of th
valleys. To the south-east, the overlying glacial till create
the Wolds, and towards the southern end the chalk cap
reveal the Lower Cretaceous sands, clays and ironstones
of low hills with gravel terraces. A variety of local materi
used as building material, are found across the area incl
sandstone, ironstone and chalk, with striking red chalk

The soils closely reflect the underlying geology. Shallow
predominate across the chalk plateau but many valley b
rich loamy soils. Sandy loams and heavier clay soils and
valleys reflect local sandstone geology and Jurassic Kim



The chalk aquifer is one of the main aquifers of the East Midlands, providing a major regional resource of freshwater. The resulting springs and chalk streams and interconnected blow wells found throughout the Lincolnshire Wolds provide a nationally important wildlife habitat.

The Lincolnshire Wolds are generally sparsely populated, with villages predominantly lying hidden at the foot of the slopes. Only a few small towns, such as Barnetby, Splisby and Caistor, are found within the Wolds with the larger market towns such as Louth and Horncastle located on the periphery of the NCA. These settlements have all retained much of their historic built character.

The Wolds is a treasure trove of heritage dating back many thousands of years. There are many ancient burial sites with monuments including Neolithic long barrows and bronze-age round barrows. There is also evidence of Roman occupation and a number of Roman roads are still in use. An interesting aspect of the historic environment is the high concentration of deserted medieval villages and the remains of these are often still visible in the landscape. There are over 100 abandoned settlements, representing one of the highest concentrations in the country. Remnants of ridge and furrow can also be seen, showing a legacy of medieval ploughing and cultivation in an open field system. Another aspect of the historic environment is numerous moats indicating a defensive purpose such as the medieval moated site at Brinkhill.

The area has inspired many artists, writers and poets including Tennyson, the 19th-century Poet Laureate, who came from Somersby. This part of Lincolnshire attracts increasing numbers of visitors and a variety of cultural and community activities continue today in celebration of the Wolds' rich local heritage. The Viking Way long-distance footpath passes through the Wolds as does the National Cycle Network.

**St.Mary's Church, Barnetby-le- Wold. An ancient church on the edge of the Wolds as they slope down to the Humber.**

## Statements of Environmental Opportunity

**SEO 1:** Protect, enhance and promote the rolling chalk landscape of the Lincolnshire Wolds with its open plateaux, outstanding long views, enclosed valleys, important habitats and high sense of tranquillity. Improve opportunities to enhance people's access and enjoyment of the Wolds' special qualities and the natural beauty.

**SEO 2:** Protect and manage the Lincolnshire Wolds' water resources and wetland habitats, including the Lincolnshire chalk aquifer, conserving the groundwater resource and biodiversity of the chalk streams by working in partnership to manage issues affecting water flow and quality at a catchment scale.

**SEO 3:** Maintain sustainable and productive agricultural practices for the continued provision of food and for the important contribution that farming makes to the sense of place. Enhance farmland habitats and expand and connect semi-natural habitats such as species-rich grassland, woodland and hedgerows to benefit biodiversity, soil and water quality.

**SEO 4:** Protect and appropriately manage the area's rich historic environment and geodiversity for its contribution to local character and sense of identity and as a framework for habitat restoration. Ensure that the wide range of historic features and geodiversity assets are recognised, promoted and valued.

Walkers in the Lincolnshire wolds.

# Description

## Physical and functional links to other National Character Areas

The Lincolnshire Wolds is a long, narrow; north–south aligned National Character Area (NCA) stretching between the Humber and the Wash. It is situated on the highest land in Lincolnshire, giving long views and strong visual links with adjacent NCAs. To the west there are views over the Central Lincolnshire Vale towards Lincoln Cathedral and the wider Trent Valley, and to the east of the Lincolnshire coast and marshes and the North Sea. To the north the Wolds subside to the Humber Estuary and to the south lie the extensive Fens.

Sixty-two per cent of the NCA is designated as an Area of Outstanding Natural Beauty (AONB), which also extends into the Central Lincolnshire Vale NCA and the Lincolnshire Coast and Marshes NCA.

The area is separated into the 'Chalk Wolds' to the north with geological chalk formations extending into the Yorkshire Wolds, and the 'Wolds Scarp, Ridges and Valleys' further to the south and west.

Springs and chalk streams are characteristic of the area and the headwaters of several rivers, including the Bain, Waring and Lymn, rise in the Wolds. The Great Eau and Waithe Beck drain to the North Sea via the Lincolnshire Coast and Marshes NCA. The River Bain drains south through the Central Lincolnshire Vale NCA where it meets the River Witham, while the River Lymn drains south through the southern edge of the Lincolnshire Coast and Marshes NCA to the Great Steeping River. There is a large chalk aquifer underlying the Lincolnshire Wolds which also extends beyond it. This is a regional resource which is a major supplier of water for industry, irrigation and domestic supplies.

No major settlements lie within the Lincolnshire Wolds although several A roads link the surrounding market towns and the popular coastal destinations to the east. The railway network also acts as a link, particularly in the northern part of the NCA. Here the distinctive Humber Bridge crosses the Humber Estuary where the Wolds meet the Humber Estuary NCA at Barton-upon-Humber.

A number of historic routes traverse the higher ground of the high Wolds. More modern trails such as the Viking Way long-distance footpath link to the Humber, extending through the area towards Rutland. The National Cycle Network's Hull to Harwich cycle route also crosses the Lincolnshire Wolds.

Although the NCA is generally unwooded in character, there are some significant areas of woodland, particularly on the lower-lying clay soils overlapping with the adjacent Lincolnshire Coast and Marshes NCA. A number of estates within the NCA are well wooded, including the one at Brocklesby.

## Key characteristics

- Rolling chalk hills and a predominantly agricultural landscape with a pronounced scarp edge to the north and west affording panoramic views across the surrounding land.
- A diverse geology of chalk, sandy limestone, ironstone and clay gives rise to a combination of elevated plateau and deep-sided dales. Soils are generally shallow and lime rich with rich loamy soils associated with valley bottoms. Typically sandy loams dominate the Lymn Valley with permeable loams in the Bain Valley which are interspersed with clay soils associated with Kimmeridge Clay beds.
- Predominantly arable, but some pasture fields with rectilinear patterns and clipped hawthorn hedgerows. Farmland habitats are found together with farmland birds including skylark, linnet, yellowhammer, reed bunting, corn bunting, yellow wagtail, curlew, tree sparrow, grey partridge, bullfinch and turtle dove.
- Woodland is limited particularly to the north but there are occasional shelterbelts, hedgerow trees and scattered beech clumps. Important alder carr woodland is associated with some of the valleys in the south-west.
- Isolated chalk and neutral grasslands typically on the steepest uncultivated slopes.
- Valuable semi-natural acidic mires are found in the valley marshes of the Lymn and Bain. The broader south-west valleys of the rivers Lymn and Bain have tree-lined watercourses. The mixed farmed landscape of irregular medium-sized fields in the south-west valleys provides contrasts with the arable-dominated plateau.
- Broad grass verges up to 20 m on some roads and historical tracks provide valuable species-rich linear habitats thought to be remnants of pre-enclosure pastures.
- Chalk springs and flushes and chalk stream habitats supporting submerged plants such as water crowfoot, a rich invertebrate fauna and flagship species such as otter, water vole, kingfisher and brown trout.
- A historically and archaeologically rich landscape of small parklands and modest country houses, ancient trackways, west–east salters' roads, deserted or shrunken villages and prehistoric round and long barrows.
- A sparse settlement pattern of small market towns and small nucleated villages (often in sheltered valleys) and scattered farmsteads. The settlements are predominantly linked by west–east A roads linking to coastal areas.
- A diverse geology gives rise to a variety of building materials including brick, sandy limestone, sandstone and ironstone with churches built of local stone.
- Development of wartime airfields including Kirmington (now operating as Humberside International Airport), Elsham Wolds, Binbrook, Ludford and Kelstern.

**Arable farmland, woodland, hedgerows and gently rolling hills near Horncastle.**

## The Lincolnshire Wolds today

The Lincolnshire Wolds NCA is predominantly a rolling landscape of open, rural character. The distinctive west-facing chalk escarpment is a dominant feature. Steep-sided dry valleys, open plateau hilltops, strong escarpments, long, open views and planted beech woods also contribute strongly to the distinctive sense of place. Much of the NCA is nationally designated as an AONB for its natural beauty and tranquillity.

Lying mid-way between Lincoln and the East Coast, the chalks Wolds rise to over 150 m along their western edge, the highest point being at Normanby le Wold. The underlying Lower Cretaceous strata are revealed in the bottoms of the valleys and at the foot of the scarp slope. These strata include ironstone, limestone and sandstone which creates a hummocky landscape punctuated by springs and isolated landslips, for example at Nettleton and Hainton. To the south-east, the overlying glacial till creates a rounded edge broken only by the deep valleys at Louth and Calceby. Towards the southern end of the Wolds, the chalk cap has been removed to reveal the Lower Cretaceous sands and clays.

The soil patterns are a close reflection of the solid and drift geology. To the north, plateau tops are dominated by light, chalky soil. On the west scarp edge there is a striking variation of colour and texture reflecting the underlying Red Chalk and Lower Cretaceous beds. To the south-east the clayey tills give rise to heavy, seasonally waterlogged soils whereas near the Lymn Valley, Spilsby Sandstone provides the parent material for well-drained, sandy loams. In the Bain Valley there are deep, coarse permeable loams except where the presence of Jurassic Kimmeridge Clays gives rise to localised wet areas.

**Farming is an important part of life in the Lincolnshire Wolds. The quality of the soil underpins the provision of food.**

Despite the overall cohesive character of the Wolds, variation in the underlying geology has led to some distinct subdivisions within the landscape. The pronounced and sinuous north-west-facing chalk scarp which runs from South Ferriby, on the Humber, down to North Willingham is steep and hummocky, and lined by compact springline villages at the foot of the slope. Rough pasture, scrub and woodland areas clothe the scarp, along which there are dramatic views. The high, open arable plateau of the Wolds themselves stretches from the Humber

down past Louth. Within this upland rolling plain are a series of inward-facing valleys, for example at Rothwell and Cuxwold on Laceby Beck. The planting of woodland on the steep slopes serves to emphasise the valley features. A series of villages are located in the dry valleys which face eastwards. Another distinct area of the NCA are the ridges and valleys of the south-west, marking the edge of the chalk outcrop. Between the villages of Donington on Bain and Tetford, an internal escarpment faces south-west overlooking ridges of glacial drift and valleys cut into sandstone. Three rivers, the Bain, Waring and Lymn, drain southwards through these valleys. River valley floors are marshy and alder carr woods are common. In the south-east claylands, the chalk ridge is masked by clay till which creates more rounded forms as the Wolds drop away to the Middle Marsh around Alford. Ancient oak and ash woodlands give this area a distinctive feel.

Some 18 main-stem rivers such the Great Eau, Waring, Bain and Lymn rise in the Wolds and are important for their biodiversity.

Springs, which originate from the chalk aquifer that underlies the higher parts of the Wolds, are common and the resulting chalk streams provide internationally rare priority habitat. Wild brown trout, European eel, grayling and brook lamprey are present in the streams, as well as otter, water vole, kingfisher, rare invertebrates including flatworm species, and the plants arrowhead and water crowfoot.

Woodland cover in these areas is sparse, particularly to the north, while to the south sinuous beech woods and younger mixed plantations follow the steeper slopes of the deep valleys. Isolated beech and ash trees form occasional markers. On the north-west scarp there is a mixed pattern of woodland, scrub and pasture created by the hummocky landform and poorer nature of the soils. The extensive mixed woodlands of the Brocklesby Estate to the north-east provide the other major area of woodland cover. Here some 1,200 ha of woodland were planted between 1750 and 1950. The alder carr woodlands on the heavy, seasonally waterlogged clay soils in the south are important nationally, as is the ancient woodland at Tetford. A number of moth species visit the woodland and the numbers of butterflies are showing signs of recovery.

This is an important food producing landscape and the rural economy is mainly based on arable farming with large cereal units together with some pasture land. Large rectilinear fields on the rolling plateau are enclosed by hawthorn hedges. To the south-west there is a more complex pattern of medium-sized irregular fields where grazing combines with crop cultivation. Pasture is less common now but livestock and sheep in particular have traditionally had great importance in the area. The large Lincoln Longwool sheep, which is now a rare breed, has a long association with the Lincolnshire Wolds. Grassland remains an important land use where mixed farming occurs and provides an important farmland habitat. Semi-natural habitats within this NCA are important because of the geology but the extensive arable areas mean that there are limited semi-natural habitats remaining. Isolated chalk grasslands located on the steepest uncultivated slopes and the broad, herb-rich road verges along ancient trackways and drover roads provide species-rich grassland habitats. Further important pockets of grassland occur in the churchyards and redundant quarries and pits found across the Wolds. Hedgerows provide linear habitats and these and other farmland habitats are important for farmland birds, with a nationally important 'Arable Assemblage East Midlands' including breeding lapwing, turtle dove and yellow wagtail.

The whole area is rich in archaeological remains, including ancient trackways, tumuli along the scarp and a high concentration of deserted medieval villages. Bronze-age round barrows and an important collection of Neolithic long barrows are located on thin chalk soils on the edges of escarpments and ridges.

Long barrows are particularly vulnerable to damage from cultivation and these earthworks are especially notable as they are ancient and very rare. Significant archaeological sites including the Neolithic long barrows continue to be at risk from arable cultivation, and remain on the Heritage at Risk register.

Georgian manors and parkland, avenue tree plantings and wide roadside verges are also distinctive features. There are no great parklands but a series of smaller estates, for example at Harrington and South Ormsby. These often include gracious but modest Tudor or Georgian country houses with Victorian farmsteads and farm workers' cottages. Bolingbroke Castle, the birthplace of Henry IV, is now in ruins but occupies a prominent setting at the foot of the southern sandstone scarp.

Sparsely settled, the NCA's distinctive topography and underlying geology act to hide the villages within the folds of this east Lincolnshire landscape and church spires characteristically rise out of the rolling landscape. The settlement density is marginally higher in the south-west river valleys while on parts of the high Wold there is no settlement. In the north the villages are simple and nucleated while in the south a rectangular plan is found with lanes enclosing a central area of cottages, farmhouses and paddocks in villages such as Old Bolingbroke. Settlements tend to follow physical features, such as the foot of the north-west scarp as at Tealby and Claxby, or the deep valleys within the chalk uplands as at Rothwell. There are no major urban areas within the Wolds but a series of small market towns lie at the foot of the hills including Horncastle, Spilsby, Louth and Caistor.

The area is not distinguished by a unified pattern of building material or style. Brick walls with pantile roofs are most common in domestic buildings. The varied geology is reflected in the variety of local material typically found as building material, particularly in many churches and older buildings; this includes Tealby Limestone, Spilsby Sandstone and local ironstones. Newer building has occurred near Binbrook where extensive housing was introduced to serve the airfield.

Large chalk quarries existed in the north of the Wolds at South Ferriby and Melton Ross and to the south at South Thoresby, and mineral extraction continues, albeit on a relatively small scale.

The road network generally follows ancient east–west routes across the Wolds and the A roads are particularly busy in the high season with tourists visiting the coastal resorts; the M180 in particular causes intrusion.

Visitors come to the area, especially in the summer months when they visit the nearby East Coast and the Lincolnshire Wolds. Located on the edge of the Wolds, market towns such as Louth (just beyond the NCA) with its steepled church attract tourists. The network of footpaths attracts walkers to the area and the annual Lincolnshire Wolds Walking Festival is a popular attraction for both residents and visitors. The Viking Way long-distance footpath which starts at the Humber passes through the area towards Rutland. Cycling is another popular pastime in the Wolds and the National Cycle Network passes through the NCA. Motorcyclists are also attracted to the relatively quiet roads of the Wolds and to the circuit at Cadwell Park.

## The Landscape through time

The Wolds are predominantly a dissected chalk table, falling gently eastwards from a western scarp face. The bedrock was laid down in marine conditions over a period of some 60 million years during the Upper Jurassic and Cretaceous periods. The lowest exposed rocks include the Jurassic Kimmeridge Clay which passes upwards into the younger Spilsby Formation; this predominantly consists of sandstones and spans the transition from the Jurassic to the Cretaceous period. Above this is the Lower Cretaceous Tealby Formation made up of clays and sandy limestone and ironstones. The Chalk, including the characteristic Red Chalk, is the youngest solid rock in the NCA (95 million years old) and is made up of millions of microscopic marine creatures. The solid geology of the area has since been extensively shaped to create the varied geology and landform that exist today. The bedrock was extensively moulded by glacial and periglacial action during the last ice age, when the drainage pattern was altered by the deposition of sands, gravels and clay till. The previous pattern of eastward drainage was locally blocked by ice tills which resulted in the cutting of several glacial meltwater channels, particularly in the south. Glaciers stripped away the chalk to expose Lower Cretaceous and even a few Upper Jurassic Kimmeridge sands, clays and ironstones, and shape the prominent west-facing chalk escarpment which dominates much of the area. The exposed Spilsby Sandstone to the south formed localised pockets of acidic soil with the clays producing seasonally waterlogged areas.

The area has a long history of farming as a result of its easily-worked chalk soils and loams. The present landscape of the Wolds is primarily the result of the enclosure of a largely typical open-field farming regime, and the subsequent changes to the associated nucleated settlement pattern. The earliest enclosures are to be found in close proximity to historic settlements. This is quite common

**Hoe Hill, at 127 metres, is one of the highest points in the area and an outlier of Roachstone.**

in Lincolnshire and represents an historic trend from arable farming to livestock rearing. Typically this was undertaken in order to raise sheep for wool production, which could then be sold. However, in the Wolds, these ancient enclosures are both more extensive than in the county as a whole, and more widespread, indicating that livestock made a proportionally larger contribution to the medieval economy.

Later enclosure typically follows the same planned form as elsewhere in the county. The pastoral history of the area has historically been closely allied to the fortunes of the neighbouring marshes and fens. In the later medieval period, and in the post-medieval period, wealthy Wold's farmers would rent grazing land on the marshes in order to fatten their stock on the rich grasslands close to the sea. The many east-west aligned roads and tracks, perhaps initially intended to provide access to the coastal salt industry, would have served as drove roads taking livestock between the two areas.

Visible archaeology today includes the many barrows which cap the hill tops, such as Six Barrows at Tathwell. It is the Neolithic long barrows found in this location that are particularly notable – they are very rare because of their great age. Located on thin chalk soils on the edges of escarpments and ridges, they are particularly vulnerable to damage from cultivation; they are often, however, found under arable cultivation and are therefore at high risk on the Heritage at Risk register.

The Lincolnshire Wolds have produced evidence of some of the oldest human remains in Britain in the 1,000-year-old burial site at the Saxon church at Barton-upon-Humber. The significance of these remains lies in their representation of the pathology of an isolated community from circa 950 ad onwards.

In the Neolithic period, early settlement concentrated on the highest, drier ground of the high Wolds. Later, in the Bronze and Iron Ages, settlement extended onto chalk in the southern Wolds, for example at Skendleby. From the Iron Age the chalk uplands had a well-established network of trackways; High Street and Bluestone Heath Road are examples of this. Many of the roads are still in use, for example Caistor High Street linking Horncastle and Caistor. These two important market towns which were fortified in Roman times.

Roman occupation was equally widespread, linked by major roads and by east–west tracks related to the coastal salt industry.

The area's village-based settlements have their origins in the late first millennium ad, many bearing Saxon or Danish place name elements. Village names with 'ham' or 'ton' are probably Saxon, while names ending in 'by' or 'thorpe' are of Danish origin. Depopulation of the Wolds villages began early, partly owing to epidemics and poor harvests in the 14th century, and partly through the actions of powerful landowners keen to turn arable land to pasture in order to capitalise on the value of sheep rearing in the 15th and 16th centuries. As a result of all these changes the mixed arable and grazing landscapes of the earlier medieval period gave way to extensive enclosed pasture.

There is evidence of a relatively high number of deserted (and shrunken) medieval villages across the Lincolnshire Wolds providing an insight into the area's interesting history. There are over 100 abandoned settlements, with this being one of the highest concentrations in the country. Remnants of ridge and furrow can also be seen, showing a legacy of medieval ploughing and cultivation in an open field system. Another aspect of the historic environment is numerous moats indicating a defensive purpose such as the medieval moated site at Brinkhill.

Monasteries were once situated on the edge of the Wolds (for example North Ormsby) and evidence of priories can also be found (such as Orford Priory) with many of the Wolds' churches demonstrating the prosperity of the area when they were built. One source of income for priories was farming, particularly sheep for wool. The Dissolution of the monasteries brought this era to an end around 1536.

A period of enclosure in the 17th century was concerned with improving arable production and between 1760 and 1850 the landscape was transformed by the Parliamentary enclosures, sweeping away the common pasture and huge open fields. Miles of hawthorn hedges were planted to enclose large rectilinear fields, and new Georgian manors, parks and farmsteads were created away from the villages. For example, the Brocklesby Estate's 400-ha park and woodland were laid out in 1770s by Capability Brown. Through a new interest in hunting and shooting, shelterbelts and avenues were planted in the open landscapes, while broad drove roads up to 20 m in width were created to provide grazing for sheep headed for the coastal grazing marshes. The lustre wool from Lincoln Longwool sheep was much prized and was also exported. The development of estates continued through the Victorian period and is evidenced by estate workers' cottages such as those at Wold Newton. These changes have made the Wolds into one of the most distinctive estate landscapes of the Agricultural Revolution in England, broadly comparable in terms of the date of the changes and their patterns (large fields and courtyard-plan farmsteads) with the Yorkshire Wolds to the north.

The area still retained a substantial number of villages until the final phase of enclosures in the later 18th and early 19th centuries, maintaining a sparse and dispersed settlement pattern, especially on the high Wolds. In the north the villages remained simple and nucleated while in the south a rectangular plan with lanes enclosing a central area of cottages, farmhouses and paddocks emerged, now seen in villages such as Old Bolingbroke. Owing to the varied geology, the Wolds did not develop a unified pattern of building materials or styles. The local chalk was generally a poor building material, being crumbly and weak, so brick or stone was preferred. In the north-west, the locally quarried Tealby Limestone and Claxby Ironstone were used and at Nettleton, where the buildings are a rich ochre colour, ironstone was utilised. To the

**Nettleton Valley was once the home of Roman occupiers and of early ironstone mining activity.**

south, the distinctive green or brown Spilsby Sandstone, although rather soft, was used in the more ornate 14th- and 15th-century churches built with the wealth of the wool industry. For domestic buildings, brick and render walls with pantile roofs were preferred. The Louth architect James Fowler is noted for his work in local churches, particularly at Binbrook and Ludford.

Pasture was important for cattle and sheep and ley pasture rotation was once common practice, although it is now rare. Changes in farming practice in the

20th century further altered the farmed landscape of the Wolds. This involved a shift to an even larger scale of arable production, often with significant loss of habitats such as unimproved grasslands, hedges, streams, ponds and woodland copses. While most permanent calcareous grassland disappeared during the period of the Enclosure Acts, the decline continued in the 20th century through a combination of ploughing, agricultural 'improvement' and neglect leading to scrub encroachment. As a result, some of the best surviving grassland habitats are restricted to the wide roadside verges.

Aside from agricultural intensification, 20th-century influence has been less marked than that of preceding years, but includes military land use – most notably airfields such as Binbrook (owing to its good drainage), many of which continued in use into the Cold War period, and the late 1930s radar station at Stenigot. Wartime airfields were often developed for industrial purposes. Humberside International Airport, previously RAF Kirmington, was extended in 1992 and has seen significant growth in cargo throughput and general aviation activity. There is a national motor racing circuit at Cadwell Park.

Following a number of years of consultation and landscape assessments, a large proportion of the Wolds was designated as an AONB in 1973. This ensured national recognition and protection on account of the area's natural beauty – comprising its wildlife, physiographic, cultural and heritage features, all of which combine to create the area's unique sense of place.

The main roads are generally A roads, including the A16 on the eastern edge; there is also the M180, which opened in 1979. To the north the rail networks cross the area with stations at Barton-upon- Humber and Barnetby le Wold. Other modern impacts include infill housing, quarrying and the construction of irrigation reservoirs to support cropping. Telecommunications masts and power cabling infrastructure have had significant impacts on the visual character of the area. Sourcing renewable energy has led to wind farms adjacent to the NCA and singular/paired wind turbines are a more recent issue.

The areas of land planted for biofuels and biomass have increased in recent times to supply anaerobic digesters and power plants located on the Humber.

In the agricultural landscape many areas have been brought under Environmental Stewardship, which has led to improved management of sites. Since 2000 data shows a dramatic increase in managed boundary features with 1,877 km under Environmental Stewardship options, mainly through the Entry Level Scheme (2011). The total length of hedgerow being managed has increased, resulting in tightly cropped hedges filling out and becoming taller and wider.

## Ecosystem Services

The Lincolnshire Wolds NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Lincolnshire Wolds NCA is contained in the 'Analysis' section of this document.

### Provisioning services (food, fibre and water supply)

- **Food provision:** The Lincolnshire Wolds are an important food production area with 50 per cent of soils in the NCA classified as Grade 2 and 43 per cent being Grade 3. Grade 1 agricultural land amounts to 2 per cent and 3 per cent is Grade 4 with non-agricultural land/urban as the remaining type. Approximately 50 per cent of the farmed area is devoted to cereals and 19 per cent is grassland with predominantly sheep and cattle. Pig farming is also important, but in recent years livestock numbers, including pigs and sheep, have been decreasing. Crops such as oilseed have increased rapidly.

- **Water availability:** The geology of the area has led to the formation of a major aquifer under the NCA. The Lincolnshire chalk aquifer is located in this NCA and is regionally important in terms of public water supply, industry and agriculture. The demand for potable water transfers have been growing in Lincolnshire[4] and little surplus groundwater is available. The aquifer currently has a Catchment Abstraction Management Strategy (CAMS) 'over abstracted' status[5] Abstracted water used for agricultural irrigation and drinking water affects water levels in drought conditions and licences are constrained in order to manage saline intrusion along the south bank of the Humber Estuary and to help to minimise environmental impacts at low flows.

**Farming plays a major part in the Lincolnshire Wolds where fields are predominantly arable.**

There are a number of rivers which rise in the NCA including the Great Eau, Lymn, Bain and Waithe Beck. The waterbodies in the northern part of the NCA – Laceby Beck and Waithe Beck – are 'over abstracted' according to the CAMS for the area. The Great Eau and Lymn are 'over licensed' while the Bain is assessed as having 'no water available'.

[4] *The Grimsby, Ancholme and Louth Catchment Abstraction Management Strategy*, Environment Agency (April 2006)

[5] *River Witham Catchment Flood Management Plan Summary Report*, Environment Agency (December 2009); *Humber River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009); *Anglian River Basin Management Plan*, Environment Agency (December 2009)

Robust abstraction control is required in order to protect Lincolnshire chalk streams and calcareous springs for their biodiversity. Abstraction strategies are proposed that make use of water available under higher river flows and take pressure away from low natural river flows. This should help to counter the rising pressure on water resources from irrigation reservoirs to support arable cropping.

- **Genetic diversity:** A number of specific breeds of farm animals have strong connections with Lincolnshire in terms of their provenance. These include Lincoln Red cattle, Lincoln Longwool sheep, Meatlinc sheep (a relatively new breed) and Lincolnshire Buff fowl.

  Lincoln Longwool sheep have been popular in the past for the production of both meat and lustre wool, and have a long association with the Lincolnshire Wolds. They now have rare breed status – deemed 'At Risk' by the Rare Breeds Survival Trust, with more stock crucially needed to improve their chances of survival. Lincoln Red cattle were similarly widely grazed across the mixed farms of the Wolds but the original stock of Lincoln Red now has 'Vulnerable' status, with an increase in numbers required to ensure their long-term survival.

### Regulating services (water purification, air quality maintenance and climate regulation)

- **Regulating soil erosion:** Soils within the NCA vary according to the local geology but they are generally thin and light. Soil erosion is likely to occur more on steeper slopes under arable production where cultivated or bare soil is exposed or where soils are becoming compacted. Soil erosion is impacting on water quality and causing sedimentation. Part of the North Lincolnshire Priority Catchment is located in the NCA where soil loss leading to sedimentation of watercourses is identified as a particular issue.

  Part of the Lincolnshire Coast and Rivers Priority Catchment is located in the south of the NCA including the River Lymn and the Great Eau. Here, sedimentation (caused partly by enhanced soil erosion) has a major effect on the ability of the Great Eau to support populations of salmon and trout, as sediment covers the gravel bed where spawning takes place. By reducing soil erosion the biodiversity (including fish populations) in the watercourses would improve. More sustainable management of the land within the catchments of these chalk streams, and increasing the amount of semi-natural habitat adjacent to watercourses, can lead to better regulation of soil erosion.

- **Regulating soil quality:** Most of the soils are Grade 2 and 3 and are in agricultural use. The thin chalky soils have a low carbon content of 0–5 per cent and there is a risk of compaction in certain soils.

  Carbon storage could be improved by increasing the organic matter content of cultivated soils and reducing the frequency and area of cultivation. Cultivation practices need to address organic content, such as extending grasslands where appropriate and ensuring that nutrient inputs are carefully managed, adhering to nitrate vulnerable zone guidelines. This type of practice could improve soil quality, benefiting farming as well as biodiversity.

  The role of soil quality in water filtration to the aquifer and water pollution is of significance to groundwater quality in the major chalk aquifer and to the biodiversity of chalk streams.

- **Regulating water quality:** Since the chalk aquifer is regionally important for water supplies and chalk stream biodiversity is influenced by water quality, regulating water quality is very important in the Lincolnshire Wolds.

Some 99 per cent of the NCA is a nitrate vulnerable zone and in the more urbanised area of the North Lincolnshire Priority Catchment high nitrate levels have been identified in groundwater resources and high phosphate levels and sedimentation in surface streams.

The priority areas in terms of protection of water include Ground Water Management Units identified within the Grimsby. Ancholme and Louth Catchment Abstraction Strategy. In particular the Grimsby, Ancholme and Louth Chalk Unit comprising a groundwater body covering the northern chalk outcrop in the north of the NCA and has been classed as being of poor status for the Water Framework Directive. Nitrate concentrations show a significant and sustained upward trend. Water abstraction and diffuse agricultural pollution are an issue as is point source pollution, mainly from small sewage treatment works attached to villages and clusters of septic tanks where houses are unsewered.

Within the NCA steep slopes increase rates of run-off, potentially adding to the amount of chemicals and sediment from cultivated soils in the watercourses. Rapid run-off needs to be carefully controlled to reduce the incidence of this.

River basin management plans show that at least 18 per cent of the waterbodies of the NCA have good ecological status /potential; with the Humber River Basin Management Plan indicating that the waterbodies' ecological status is generally moderate, while the ecological status of headwaters, such as the Waithe Beck, is good.

Within the Lincolnshire Coast and Rivers Priority Catchment high phosphate levels and eutrophication are issues in both the River Eau area and the River Lymn/Steeping. The surface water chemical status of the River Bain and the River Lymn is good but the ecological status of both these rivers is only moderate. The reduction of diffuse agricultural pollution through nitrates will improve the quality of the groundwater and chalk streams. Catchment sensitive farming measures are being promoted across some catchments with a particular focus in the Humber Basin's North Lincolnshire target area.

- **Pollination:** The semi-natural habitats are important for pollination as they are valuable for pollinating invertebrates and thus benefit agriculture, particularly when adjacent to certain food crops and oilseed rape. The NCA contains areas of semi-natural habitats, including roadside verges and hedgerows, linking other habitats that are likely to support sources of nectar. Creating a mosaic of habitats and arable margins will provide breeding sites and a food source for pollinators. Adding to the extent of semi-natural habitats increases the number and diversity of plants, which assists pollination.

  Pest regulation: Semi-natural habitats and hedges close to areas of commercial agriculture may support predators which help to regulate populations of pests that adversely affect food production.

### Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** The Lincolnshire Wolds NCA has a strong sense of place provided by the rolling hills, scattered settlements, unified rural landscape features and patterns, long, open views and a tranquil, undisturbed nature. This is complemented by enclosed, steep-sided valleys, occasional woodlands, and some drystone walls to the north, a variety of chalk streams and some small settlements nestling into the landscape.

  The area has inspired poets and artists including Poet Laureate Alfred, Lord Tennyson, who was born in Somersby in the Lymn Valley. This landscape

provided a source for many of his poems including In Memoriam AHH, The Lady of Shalott, Maud and The Brook. Tennyson wrote of the area: "Calm and deep peace on this high wold, and on these dews that drench the furze, and all the silvery gossamers, that twinkle into green and gold." In 1990, the Wolds again provided a setting for literature in A S Byatt's novel Possession, where she wrote: "The valleys are deep and narrow, some wooded, some grassy, some ploughed. The ridges run sharply across the sky, always have ... These slightly rolling hills appear to be folded out of the surface of the earth, but that is not the case, they are part of a dissected tableland. The villages are buried in the valleys, at the end of blind funnels."

The strong landscape character led to the national designation of AONB and the area is a rural tourist destination although, because of the limited number of 'honeypot' sites, the peaceful character is still retained.

- **Sense of history**: There is a strong sense of history across the Lincolnshire Wolds. With a rich archaeological heritage of ancient trackways, deserted and shrunken medieval villages and ancient barrows there is evidence of the Wolds' long history of settlement and communications.

Visible archaeology today includes the many barrows which cap the hill tops, such as Six Barrows at Tathwell. A network of ancient trackways once existed and many remain routes today, for example Caistor High Street and Bluestone Heath Road. The Romans built roads here primarily to access the coastal salt industry. A post-medieval ironwork industry has also been identified showing the area's industrial heritage such as Claxby ironworks.

The area was once well populated but as a result of disease and other factors depopulation occurred leading to the numerous deserted villages across

**Lincoln Longwool rare breed sheep.**

the Wolds, which give character to the area, for example Calcethorpe. The area contains evidence of some of the oldest human remains in Britain with important finds at the closed St Peter's Saxon church at Barton-upon-Humber. These date from circa 950 ad onwards and have been used extensively for the study of pathology.

Early Parliamentary enclosures (from 1760) transformed the area, sweeping away the common pasture and huge open fields. Hawthorn hedges were planted and new Georgian manors, parks and farmsteads were created. Shelterbelts and avenues were planted in the open landscape and broad drove roads which add historic character to the area were created for livestock grazing en route to the coast. The development of estates is evidenced by estate workers' cottages.

There are important buildings including country houses and estates which date from the late-medieval period. Aspects of history that are most evident to the general public include historic buildings such as those constructed from local materials, including Tealby church, which is built from local limestone.

The area also shows remnants of its recent history in relation to 20th-century military land use, from Stenigot Mast, a listed structure, through to the airfields such as at Binbrook, Cold War bunkers and a missile base at Ludford.

- **Tranquillity:** The Lincolnshire Wolds NCA is a predominantly sparsely populated landscape with dispersed settlement which is free in most part from major infrastructure, the exception being the short stretch of the M180 and Humberside Airport which cause disturbance locally. The area has generally escaped pressure from modern development and growth and affords a high level of tranquillity, especially on the high, open Wolds away from more built-up areas. It is also valued for its dark skies and astronomical observation.

- **Recreation:** The AONB is a leisure destination serving the nearby population as well as seasonal visitors. People are attracted to the general area by its tranquil and undisturbed character, the long views and the opportunities for outdoor recreation. The Viking Way passes through the NCA and 1.3 per cent of the land is publicly accessible via 578 km of public rights of way. The network of quiet roads and paths has led to a growth in recreational activities with walking, cycling and horse riding all being popular. The Lindsey Trail is a 110-km multi-user route, primarily for carriage drivers, but also cyclists, horse riders and walkers. The annual Lincolnshire Wolds Walking Festival is well attended and both Caistor and nearby Market Rasen (outside the area) have received 'Walkers are Welcome' status. Destination Lincolnshire Wolds is a partnership which promotes the area. There are a number of active volunteer groups and projects across the Lincolnshire Wolds.

- **Biodiversity:**There is a total of 1,662 ha of priority habitat covering approximately 6 per cent of the area. Although it represents only a small percentage of the NCA, this priority habitat includes broadleaved woodland, lowland meadow and fragments of lowland calcareous grassland, and chalk streams.

Although there are no internationally designated sites the area has 23 Sites of Special Scientific Interest (SSSI) making up nearly 1 per cent of the total area, and 26 local sites in the Wolds cover 4 per cent of the area. There are also a number of local wildlife sites, and a variety, of local nature reserves which are managed for their biodiversity. Some of the local nature reserves are located at the roadside providing opportunities for community conservation, surveys and engagement; for example, the Life on the Verge project.

The River Bain has particularly varied freshwater habitats. Chalk streams and their associated blow wells, calcareous springs and flushes are important BAP priority habitats and they are found in only a few places in the world. Their varied freshwater habitats include protected species such as otter and water vole, many invertebrates and rare aquatic plants. The Lincolnshire Chalk Streams Project has helped with enhancement and monitoring of the streams.

Tetford Wood is a rare example of semi-natural ancient woodland on chalk soil with hazel and ash. The woodland holds a diversity of plants indicative of its ancient origins and the associated ground flora plants are scarce. Another example of ancient semi-natural woodland is at Claxby.

Calcareous, acidic and neutral grasslands are valuable and the species-rich calcareous grasslands are particularly important. Roadside verges, many of which are protected, have some good grassland habitats along ancient

trackways with locally scarce southern and early marsh orchid. Other important species found within the area are nationally scarce plants such as the fine-leaved sandwort.

Farmland birds are an important asset to the area with arable habitats supporting nationally important assemblages of farmland birds including corn bunting, turtle dove, curlew, tree sparrow, lapwing and yellowhammer, and are a part of the 'Arable Assemblage East Midlands'.

- **Geodiversity:** The geology and geomorphological processes are factors influencing the topography and hydrology of the area and the geology is visible in terms of exposures and local vernacular. The solid geology of the area is complex and is formed by chalk, limestone and sandstone. Tealby Limestone, Spilsby Sandstone and colourful rusty-brown carstones can all be found in local building material. Superficial deposits are made up of sands, gravels and glacial till. Jurassic Kimmeridge Clays are found in the NCA and a number of disused chalk and clay pits remain, although quarrying is ongoing. Some of the remnant pits across the area form sites of geological interest and a number of them are used for research and geodiversity education as part of the Lincolnshire Geodiversity Action Plan.

There are nine geological and one mixed-interest SSSI. In addition, at least 38 Local Geological Sites can be found here including chalk pits, and although many are inaccessible they are an important resource for research. Red Hill Nature Reserve near Goulceby is an important educational resource, featuring rare exposures of Red Chalk (a formation extending only through Norfolk, Lincolnshire and Yorkshire).

**The chalk bedrock influences the Wolds landscape of today.**

# Statements of Environmental Opportunity

**SEO 1: Protect, enhance and promote the rolling chalk landscape of the Lincolnshire Wolds with its open plateaux, outstanding long views, enclosed valleys, important habitats and high sense of tranquillity. Improve opportunities to enhance people's access and enjoyment of the Wolds' special qualities and the natural beauty.**

**For example by:**

- Protecting the sense of place by conserving the outstanding views into the adjacent National Character Areas (NCAs), intimate, steep-sided valleys and geological features which provide a sense of inspiration and a tranquil recreational resource.
- Planning for the creation of a strong landscape framework to provide a setting for new and existing development and transport infrastructure, ensuring that the valuable and protected landscape of the Lincolnshire Wolds is not diluted and that its tranquillity is not negatively affected.
- Encouraging more people to visit the distinctive open countryside for quiet enjoyment, re-connecting them with the importance of the landscape, geodiversity and biodiversity.
- Providing the necessary recreational infrastructure to meet the significant demand without detriment to the landscape. Improving access across the area and supporting and promoting participation and community engagement.
- Avoiding development in remote and tranquil areas, in particular protecting the remote qualities of the Area of Outstanding Natural Beauty (AONB) and the wider landscape of the Lincolnshire Wolds. All new development should be well designed, sympathetically located and screened. The dark skies featuring in the more remote areas also need protection.
- Working in partnership to implement the Lincolnshire Wolds AONB Management Plan, and ensuring that local plans and policies recognise and support the plan.
- Managing the unique biodiverse assemblage of habitats including calcareous and other species-rich grasslands.
- Protecting the many verges and nature reserves with their species-rich grasslands by involving local communities and volunteers in their care and management.
- Expanding isolated and fragmented woodland where this is not in conflict with remnant grassland areas or important views. Woodland will enhance landscape character and habitat adaptation to climate change.
- Conserving and extending riparian habitats and nationally important wet alder carr woodland along the streams in the south-west valleys.

**SEO 2: Protect and manage the Lincolnshire Wolds' water resources and wetland habitats, including the Lincolnshire chalk aquifer, conserving the groundwater resource and biodiversity of the chalk streams by working in partnership to manage issues affecting water flow and quality at a catchment scale.**

**For example by:**

- Promoting the extensive sustainable management of agricultural land within key catchments to improve the water quality of streams and to increase biodiversity, and increasing and promoting catchment sensitive farming and the regulations relating to nitrate vulnerable zones.
- Maintaining and improving the chalk aquifer for public water supply, its long-term resilience and water storage by working with the local farming community to adopt sustainable farming practices and to improve filtration into the ground and reduce run-off through the creation or restoration of a network of grasslands.
- Managing and significantly enhancing the area's water resources and associated riparian habitats, including the valuable chalk streams, wet meadows and alder carrs which may come under increasing pressure from climate change, over-abstraction and low flows.
- Maintaining the chalk streams' biodiversity of related plant and invertebrate communities, including protected and rare species, for example aquatic bryozoans, invertebrate species, water vole, otter and lamprey.
- Improving chalk-based aquatic habitats by managing rivers, streams and flushes to maintain hydrological processes and enhance water quality and provision.
- Controlling the spread of non-native invasive species to water bodies.
- Creating and managing riparian corridors along watercourses and considering the reversion of arable to grassland on steeper slopes, where appropriate, to reduce soil erosion and to create links to existing semi-natural sites.
- Ensuring that local plans and policies recognise and support the Lincolnshire Wolds AONB Management Plan.
- Through landscape-scale partnership, undertaking joint initiatives in the adjoining NCAs to protect water quality and supply of groundwater of the chalk streams.
- Increasing semi-natural buffer areas around remaining calcareous springs flushes and blow wells.
- Restoring the physical diversity of chalk stream habitats where necessary, including patchy riparian tree planting and natural introduction of wood debris.

**Water resources and wetland habitats, such as chalk streams, are key to the area and need careful management.**

**SEO 3: Maintain sustainable and productive agricultural practices for the continued provision of food and for the important contribution that farming makes to the sense of place. Enhance farmland habitats and expand and connect semi-natural habitats such as species-rich grassland, woodland and hedgerows to benefit biodiversity, soil and water quality.**

**For example by:**

- Improving soil and crop management by encouraging the practice of green cover crops such as grasslands on cultivated or bare soil on steep slopes and field margins, and by encouraging extensive grazing regimes as appropriate.
- Developing an integrated package of catchment sensitive farming initiatives, and increasing and promoting catchment sensitive farming and sustainable farming practices.
- Seeking opportunities to re-create grassland and grassland buffers by increasing the quality, extent and interconnectivity of semi natural habitats; which will also improve water infiltration, reduced nitrate input resulting increased soil carbon content and improve overall soil quality.
- Promoting the management and restoration of traditional field boundaries, including species-rich enclosure hedgerows, to increase structural diversity and improve pollination, and encouraging good management of existing hedges and hedgerow trees, filling in gaps and allowing hedges to fill out.
- Increasing the uptake of agri-environment schemes and Environmental Stewardship arable options, extending grasslands along field margins and slopes to prevent sediment run-off and improving water quality, biodiversity and pollination.
- Encouraging management interventions on arable farmland and implementing plans to increase the numbers of important 'Arable Assemblage East Midlands' farmland birds which include English partridge, lapwing, curlew, turtle dove, reed bunting and tree sparrow.
- Managing woodland cover including through sustainable management of ancient woodlands, the oak and ash woodlands in the south-east and sinuous woods of the deep valleys, and isolated beech clumps on the Wolds.
- Restoring and enhancing existing woodland cover, parklands, shelterbelt plantations and wooded landscapes.
- Extending woodland and creating buffers around these habitats, linking with hedgerows and other boundary features to increase habitat networks.
- Conserving and extending riparian habitats and nationally important wet alder carr woodland along the streams and reservoirs in the south-west valleys.
- Planting new woodland in the north, and expanding isolated and fragmented woodland where this is not in conflict with remnant grassland areas or important views. Conserving archaeological features through land management practices.

**SEO 4: Protect and appropriately manage the area's rich historic environment and geodiversity for its contribution to local character and sense of identity and as a framework for habitat restoration. Ensure that the wide range of historic features and geodiversity assets are recognised, promoted and valued.**

**For example by:**

- Protecting and promoting the Lincolnshire Wolds for the contribution they make as a historical, cultural, scientific and educational resource.
- Protecting the distinctive Wolds towns and villages, with their local building materials and nucleated settlement pattern, recognising that large-scale development would be severely detrimental to their character.
- Encouraging the use of traditional building materials, for example brick and pantile roofs, to retain the connection with underlying geology, and restoring and maintaining existing traditional buildings and farmsteads.
- Maintaining the lightly settled character and traditional settlement pattern of medieval villages traditionally located on springlines and later estate villages and scattered farmsteads.
- Protecting the historic character of the settlement of larger villages of the Lincolnshire Wolds and ensuring that new development and expansion are sensitively designed and located.
- Improving the condition of significant archaeological sites and evidence for past use and settlement through appropriate measures and seeking to reduce conflicting or unsympathetic management regimes, while recognising the high potential in this landscape for undiscovered remains.
- Protecting, managing, enhancing and promoting important manmade and natural exposures of Cretaceous and Jurassic geology (chalk, sandstone, sandy limestones, ironstones and clays) and glacial features of geomorphological interest such as meltwater valleys.
- Maintaining the visible and hidden finite resource of past human landscape change, land use and settlement – the extensive prehistoric landscapes, iron-age and medieval settlements and later historic landscapes and parkland.
- Altering practices that could damage features at risk in the historic landscape and protecting remnant earthworks from agricultural practices and development pressure.
- Conserving archaeological features through land management practices, for example by reversion of arable to grassland, where land management threatens the integrity of earthworks and below-ground archaeology (Neolithic, bronze-age and iron-age monuments).
- Enhancing green infrastructure links throughout the NCA and promoting recreation and opportunities for interpretation for local people and visitors so that they can access, understand and connect with heritage features for enjoyment.
- Restoring disused chalk quarries and sand and gravel pits in line with their biodiversity and their designation as Local Geological Sites.
- Planning to limit the visual impact of any new development and, as appropriate, the encroachment of urbanising influences into areas with high tranquillity and low levels of light pollution.
- Ensuring the restoration of traditional farm buildings across the area.
- Protecting the geodiversity of the area and developing educational opportunities to learn about the Wolds' geology and geomorphology.

# Supporting document 1: Key facts and data

Total area: 84,486 ha

## 1. Landscape and nature conservation designations

There is one Area of Outstanding Natural Beauty (AONB) in this NCA, the Lincolnshire Wolds, which covers 52,092 ha or 62 per cent of the area.

More information about the protected landscape can be found at: http://www.lincswolds.org.uk/

**Source: Natural England (2011)**

### 1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

| Tier | Designation | Name | Area (ha) | % of NCA |
|---|---|---|---|---|
| International | n/a | n/a | 0 | 0 |
| European | Special Protection Area (SPA) | n/a | 0 | 0 |
| | Special Area of Conservation (SAC) | n/a | 0 | 0 |
| National | National Nature Reserve (NNR) | n/a | 0 | 0 |
| National | Site of Special Scientific Interest (SSSI) | A total of 23 sites wholly or partly within the NCA | 102 | <1 |

**Source: Natural England (2011)**

**Please note: (i) Designated areas may overlap (ii) all figures are cut to Mean High Water Line, designations that span coastal areas/views below this line will not be included.**

There are 342 local wildlife sites in the Lincolnshire Wolds covering more than 3,700 ha or 4 per cent of the NCA.

**Source: Natural England (2011); Greater Lincolnshire Nature Partnership (2012)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- Maps showing locations of Statutory sites can be found at: http://magic.defra.gov.uk/website/magic/ – select 'Rural Designations Statutory'.

#### 1.1.1 Condition of designated sites

A breakdown of SSSI condition as of March 2011 is as follows:

| SSSI condition category | Area (ha) | % of SSSI land in category condition |
|---|---|---|
| Unfavourable declining | 12 | 12 |
| Favourable | 62 | 60 |
| Unfavourable no change | 10 | 10 |
| Unfavourable recovering | 18 | 18 |

**Source: Natural England (March 2011)**

Details of SSSI condition can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

## 2. Landform, geology and soils

### 2.1 Elevation

Elevation ranges from a minimum of 3 m above sea level to a maximum of 167 m. The mean average elevation is 77 m.

**Source: Natural England (2010)**

### 2.2 Landform and process

The Lincolnshire Wolds is dominated by a west-facing Chalk escarpment some 50 m high. The Wolds comprise a high open, arable plateau stretching from the Humber past Louth to a 'bluff' above the Lincolnshire fens at East Keal. Within this upland rolling plain are a series of inward facing valleys. Between the villages of Donington-on-Bain and Tetford, an internal escarpment faces south-west overlooking ridges of glacial drift and valleys cut into sandstone. To the south-east the Chalk ridge is masked by clay till which creates more rounded forms as the Wolds fall down to the Middle Marsh of the adjacent Lincolnshire Coast and Marshes NCA around Alford.

**Source: Lincolnshire Wolds Countryside Character Area Description**

### 2.3 Bedrock geology

Underlying Lower Cretaceous strata are revealed in the bottom of the valleys and at the foot of the scarp slope in the Wolds. The Lincolnshire Wolds is dominated by a west-facing Chalk escarpment some 50 m high. These strata include ironstone, limestone and sandstone. Within the valleys of the rivers Bain and Lymn, Jurassic Kimmeridge Clay creates marshy poorly drained vales. The bedrock was extensively moulded by glacial and periglacial action during the last ice age, when the drainage pattern was altered by the deposition of sands, gravels and clay till.

**Source: Lincolnshire Wolds Countryside Character Area Description**

### 2.4 Superficial deposits

In the south-east the overlying glacial till creates a rounded edge broken by deep valleys at Louth and Calceby.

**Source: Lincolnshire Wolds Countryside Character Area Description**

### 2.5 Designated geological sites

| Designation | Number of Sites |
|---|---|
| Geological Site of Special Scientific Interest (SSSI) | 9 |
| Mixed interest SSSI | 1 |

There are 42 Local Geological Sites within the NCA

**Source: Natural England (2011); Greater Lincolnshire Nature Partnership (2012)**

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm

### 2.6 Soils and Agricultural Land Classification

In the northern Wolds along the plateau tops are light chalky soils. On the valley sides, rivers have cut through to the underlying Red Chalk and Lower Cretaceous series. In the south-east from Louth to Candlesby, chalky boulder clays produce a heavy seasonally waterlogged soil giving rise to a gentle rounded landform. The Lymn valley has cut through to the Lower Cretaceous Spilsby Sandstone that provides parent material for well-drained, acidic loams. Along the river valleys of the Bain, Waring and Lymn glacial sands and gravels have produced deep, course and generally permeable loams. The presence of Upper Jurassic Kimmeridge Clay gives rise to localised areas of impermeable soil which is seasonally waterlogged.

**Source: Lincolnshire Wolds Countryside Character Area Description**

The main grades of agricultural land in the NCA are broken down as follows (as a proportion of total land area):

| Agricultural Land Classification | Area (ha) | % of NCA |
|---|---|---|
| Grade 1 | 1,353 | 2 |
| Grade 2 | 42,410 | 50 |
| Grade 3 | 36,702 | 43 |
| Grade 4 | 2,290 | 3 |
| Grade 5 | 0 | 0 |
| Non-agricultural | 1,496 | 2 |
| Urban | 236 | <1 |

**Source: Natural England (2010)**

Maps showing locations of Statutory sites can be found at: http://magic.defra.gov.uk/website/magic/ – select 'Landscape' (shows ALC classification and 27 types of soils)

## 3. Key water bodies and catchments

### 3.1 Major rivers/canals

The following major rivers/canals (by length) have been identified in this NCA.

| River name | Length (km) |
|---|---|
| River Bain | 22 |
| Steeping River | 17 |
| Great Eau | 5 |

**Source: Natural England (2010)**

**Please note: other significant rivers (by volume) may also occur. These are not listed where the length within the NCA is short.**

The Bain, Waring and Lymn drain southwards through the valleys to the south-east of the Wolds.

**Source: Natural England (2010)**

### 3.2 Water quality

The total area of Nitrate Vulnerable Zone is 84,479 ha, which is 99 per cent of the NCA.

**Source: Natural England (2010)**

### 3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

## 4. Trees and woodlands

### 4.1 Total Woodland Cover

The NCA contains 4,561 ha of woodland, 5 per cent of the total area, of which 448 ha is ancient woodland.

**Source: Natural England (2010), Forestry Commission (2011)**

### 4.2 Distribution and size of woodland and trees in the landscape

It is estimated that only 5 per cent woodland cover remains in this NCA compared with the national average of 8 per cent. A variety of woodland is present, although there is only one ancient semi-natural woodland on the chalk, which can be seen at Tetford Hill. This occurs on the scarp slope and consists of hazel, ash and wych elm with sycamore. Wet woodlands can be found on heavy soils in the valleys; particularly in the north around Stainton le

Vale and in the south along the Bain and Lymn. In the north, oak-ash stands are most common, while in the south, alder carr frequently lines the streams. The most extensive woodlands occur on the calcareous clay soils in the south-east and largely consist of oak-ash-hazel woodlands.

**Source: Lincolnshire Wolds Natural Area Profile, Lincolnshire Wolds Countryside Character Area Description**

### 4.3 Woodland types

A statistical breakdown of the area and type of woodland found across the NCA is detailed below.

Area and proportion of different woodland types in the NCA (over 2 ha)

| Woodland type | Area (ha) | % of NCA |
|---|---|---|
| Broadleaved | 3,595 | 4 |
| Coniferous | 569 | 1 |
| Mixed | 145 | <1 |
| Other | 252 | <1 |

**Source: Forestry Commission (2011)**

Area and proportion of Ancient Woodland and Planted Ancient Woodland within the NCA.

| Woodland type | Area (ha) | % of NCA |
|---|---|---|
| Ancient semi-natural woodland | 116 | <1 |
| Ancient re-planted woodland (PAWS) | 332 | <1 |

**Source: Natural England (2004)**

## 5. Boundary features and patterns

### 5.1 Boundary features

Large rectilinear fields with clipped and degraded hedgerows date from late enclosure. Occasional shelter belts, concentrated on steeper sided valley and scarp slopes, emphasise the landform. The broad verges to some roads and tracks provide valuable herb-rich habitats.

**Source: Lincolnshire Wolds Countryside Character Area description; Countryside Quality Counts (2003)**

### 5.2 Field patterns

Land cover is predominantly arable with large rectilinear fields on the rolling plateau that are enclosed by clipped and 'gappy' hawthorn hedgerows. To the south-west there is a more complex pattern of medium-sized irregular fields where grazing combines with crop cultivation.

**Source: Lincolnshire Wolds Countryside Character Area description; Countryside Quality Counts (2003)**

**Old Bolingbroke showing settlement patterns within the Lincolnshire Wolds area.**

## 6. Agriculture

The following data has been taken from the Agricultural Census linked to this NCA.

### 6.1 Farm type

Cereal holdings represent the largest type of farm, with 156 holdings or 38 per cent of the total. The second largest type is general cropping with 104 holdings or 25 per cent of the total. The total number of holdings fell from 458 in 2000 to 409 in 2009, a fall of 11 per cent.

**Source: Agricultural Census, Defra (2010)**

### 6.2 Farm size

Farms over 100 ha in size are the most numerous with 205 holdings, covering 92 per cent, or 65,568 ha, of the farmed area within the NCA. The number of holdings in each size category has fallen slightly since 2000.

**Source: Agricultural Census, Defra (2010)**

### 6.3 Farm ownership

Sixty-six per cent of the land farmed (47,029 ha) is owner managed, a similar figure to 2000.

2009: Total farm area = 71,159 ha; owned land = 47,029 ha
2000: Total farm area = 77,762 ha; owned land = 49,303 ha

**Source: Agricultural Census, Defra (2010)**

### 6.4 Land use

Cereals are grown most widely in this NCA with nearly 50 per cent (35,252 ha) of the farmed land devoted to growing cereals. This is followed by grassland with 19 per cent of the farmed land (13,343 ha). The area used to grow oilseed crops has increased since 2000 by nearly 116 per cent, from 4,540 ha in 2000 to 9,790 ha in 2009.

**Source: Agricultural Census, Defra (2010)**

### 6.5 Livestock numbers

Pigs are the most numerous livestock with 31,500 animals, followed by sheep (28,200) and cattle (12,200). The numbers of pigs and sheep have fallen significantly since 2000, with 28,600 fewer pigs, a fall of 48 per cent, and 21,100 fewer sheep, a fall of 43 per cent).

**Source: Agricultural Census, Defra (2010)**

### 6.6 Farm labour

There are 509 principal farmers in the NCA, suggesting that the majority of holdings are run by dedicated farmer / managers. This number is 17 per cent lower than the number in 2000 (673 principal farmers). The number of fulltime farm workers has also fallen by over 100 since 2000, to 336 workers.

**Source: Agricultural Census, Defra (2010)**

**Please Note: (i) Some of the Census data is estimated by Defra so will not be accurate for every holding (ii) Data refers to Commercial Holdings only (iii) Data includes land outside of the NCA belonging to holdings whose centre point is within the NCA listed.**

## 7. Key habitats and species

### 7.1 Habitat distribution/coverage

Calcareous, acidic and neutral grasslands are all present in this NCA. Calcareous grasslands are particularly important as they are species rich; only 44 ha of this grassland type remains, the rest has been 'improved' or ploughed.

Nationally scarce plants include the fine-leaved sandwort. Road verges have some of the best surviving grassland habitats, particularly along ancient trackways and drove roads.

River headwaters and chalk streams constitute the main aquatic and riparian habitats.

The River Bain contains particularly varied freshwater and riparian habitats. Notable species include otter, kingfisher, many invertebrates and locally scarce plants such as the southern and early marsh orchards. Another rare aquatic plant in the Wolds is the arrowhead.

Little woodland remains in the Wolds. Most large woods are found on the clay soils of the south-east scarp of the Wolds where they overlap with the Lincolnshire Coast and Marshes NCA.

Tetford Wood is a rare example of an ancient semi-natural wood on chalk soil. A number of important alder carr woods occur on spring lines and valley bottoms.

The white satin moth, along with the common fan-foot and the hook-tip are important moths that visit the woodlands. The 1960s saw the loss of all the woodland fritillary butterflies, but the numbers of white admiral and speckled wood butterflies are showing signs of recovery.

In addition the NCA contains important arable habitats. These support nationally important assemblages of farmland and arable birds.

**Source: Lincolnshire Wolds Natural Area Profile, Natural England (2011)**

### 7.2 UK Biodiversity Action Plan (BAP) priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at; www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx.

The NCA contains the following areas of mapped priority habitats (as mapped by National Inventories). Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

| UK BAP priority habitat | Area (ha) | % of NCA |
|---|---|---|
| Broadleaved mixed and yew woodland (broad habitat) | 1,103 | 1 |
| Lowland meadows | 286 | <1 |
| Lowland calcareous grassland | 157 | <1 |
| Purple moor grass and rush pasture | 69 | <1 |
| Fens | 35 | <1 |
| Lowland dry acid grassland | 12 | <1 |

**Source: Natural England (2011)**

Recent habitat creation has resulted in the creation of approximately 65 ha of flood plain grazing marsh (based on NE and EA information)

### 7.3 Key species and assemblages of species

- Maps showing locations of UK BAP Priority Habitats are available at: http://magic.defra.gov.uk/website/magic/ – select 'Habitat Inventories'
- Maps showing locations of S41 species are available at: http://data.nbn.org.uk/

## 8. Settlement and development patterns

### 8.1 Settlement pattern

The Wolds has maintained a very sparse and dispersed settlement pattern over the last few centuries. Population density is marginally higher in the south-west river valleys while on parts of the high Wold there is no settlement at all. In the north villages are simple and nucleated while in the south a rectangular plan is often found with lanes enclosing a central area of cottages, farmhouses and paddocks, such as the village of Old Bolingbroke. Settlements tend to follow the physical features found within the NCA, such as the foot of the north-west scarp as at Tealby and Claxby, or the deep valleys within the chalk uplands as at Rothwell. To the south-west, villages such as Hemingby and Tetford are located in the river valleys. There are no major urban areas within the Wolds, but a series of small market towns, such as Louth in the east and Spilsby in the south lie at the foot of the hills.

**Source: Lincolnshire Wolds Countryside Character Area description; Countryside Quality Counts (2003)**

### 8.2 Main settlements

The main settlements are; Spilsby, Caistor, Binbrook and Barnetby le Wold and the fringes of Louth, Horncastle and Barton-upon-Humber. The total estimated population for this NCA (derived from ONS 2001 census data) is: 29,368.

**Source: Lincolnshire Wolds Countryside Character Area description; Countryside Quality Counts (2003), Natural England (2012)**

### 8.3 Local vernacular and building materials

The Wolds is not distinguished by a unified pattern of building materials or styles. The local chalk is generally a poor building material being crumbly and weak, and so brick or stone has been preferred. In the north-west the locally quarried Tealby Limestone and Claxby Ironstone can be seen. To the south the distinctive green or brown Spilsby Sandstone is used in the more ornate 14th and 15th century churches. Domestic buildings on the other hand are commonly built with brick and render walls, with pantile roofs.

**Source: Lincolnshire Wolds Countryside Character Area description; Countryside Quality Counts (2003)**

## 9. Key historic sites and features

### 9.1 Origin of historic features

The Lincolnshire Wolds has produced evidence of some of the oldest human remains in Britain. Visible archaeology is strong with many barrows capping the hill tops, such as Six Barrows at Tathwell. From the Iron Age the chalk uplands had a well established network of trackways, an example of which is High Street and Bluestone Heath Road. The Romans built east-west roads to access the coastal salt industry. Village names with -ham or -ton are evidence of the permanent and extensive settlement undertaken in the Saxon period. Those with names ending in -by or -thorpe are likely to be of Danish origin. Deserted village locations have been identified, such as Calcethorpe, thought to be related to the Black Death and the growth of the wool industry. Post-medieval ironwork sites are also found as at Claxby.

**Source: Draft Historic Profile, Countryside Quality Counts, Countryside Character Area description**

### 9.2 Designated historic assets

This NCA has the following historic designations:

- 4 Registered Parks and Gardens covering 1,475 ha
- 1 Registered Battlefield covering 176 ha
- 120 Scheduled Monuments
- 740 Listed Buildings

**Source: Natural England (2010)**

More information is available at the following address:
http://www.english-heritage.org.uk/caring/heritage-at-risk/

http://www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

## 10. Recreation and access

### 10.1 Public access

- 1.3 per cent of the NCA or 1,094 ha is classified as being publically accessible.
- There are 578 km of public rights of way at a density of 0.7 km per km2.
- There are no national trails within the NCA

**Sources: Natural England (2010)**

The table below shows the breakdown of land which is publically accessible in perpetuity:

| Access designation | Area (ha) | % of NCA |
|---|---|---|
| National Trust (Accessible all year) | 0 | 0 |
| Common Land | 0 | 0 |
| Country Parks | 40 | <1 |
| CROW Access Land (Section 4 and 16) | 8 | <1 |
| CROW Section 15 | 6 | <1 |
| Village Greens | 2 | <1 |
| Doorstep Greens | 0 | 0 |
| Forestry Commission Walkers Welcome Grants | 1 | <1 |
| Local Nature Reserves (LNR) | 82 | <1 |
| Millennium Greens | <1 | <1 |
| Accessible National Nature Reserves (NNR) | 0 | 0 |
| Agri-environment Scheme Access | 152 | <1 |
| Woods for People | 896 | <1 |

**Sources: Natural England (2011)**

**Please note: Common Land refers to land included in the 1965 commons register; CROW = Countryside and Rights of Way Act 2000; OC and RCL = Open Country and Registered Common Land.**

## 11. Experiential qualities

### 11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the least tranquil areas in the NCA are around the main settlements such as Louth. The most tranquil areas can be found on the high, open Wolds.

A breakdown of tranquillity values for this NCA are detailed in the table below:

| Tranquillity | Tranquillity Score |
|---|---|
| Highest value within NCA | 36 |
| Lowest value within NCA | -59 |
| Mean value within NCA | 4 |

**Sources: CPRE (2006)**

More information is available at the following address:
http://www.cpre.org.uk/what-we-do/countryside/tranquil-places/in-depth/item/1688-how-we-mapped-tranquillity

### 11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows a similar picture to the tranquillity data with a fairly low rate of disturbance in the more rural isolated areas with greater disturbance around settlements and the road network. A breakdown of intrusion values for this NCA is detailed in the table overleaf.

| Intrusion category | 1960s (%) | 1990s (%) | 2007 (%) | Percentage change (1960s-2007) |
|---|---|---|---|---|
| Disturbed | 2 | 12 | 19 | 17 |
| Undisturbed | 97 | 88 | 80 | 17 |
| Urban | 0 | 0 | <1 | <1 |

**Sources: CPRE (2007)**

**The notable trend from the 1960s to 2007 is a very small increase in the percentage of undisturbed land in this NCA.**

More information is available at the following address:
http://www.cpre.org.uk/resources/countryside/tranquil-places

## 12 Data sources

- British Geological Survey (2006)
- Natural Area Profiles, Natural England (published by English Nature 1993-1998 )
- Countryside Character Descriptions, Natural England (regional volumes published by Countryside Commission/Countryside Agency 1998/1999)
- Joint Character Area GIS boundaries, Natural England (data created 2001)
- National Parks and AONBs GIS boundaries, Natural England (2006)
- Heritage Coast Boundaries, Natural England (2006)
- Agricultural Census June Survey, Defra (2000,2009)
- National Inventory of Woodland & Trees, Forestry Commission (2003)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- BAP Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)Detailed River Network, Environment Agency (2008)

**Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100%. The convention <1 has been used to denote values less than a whole unit.**

# Supporting document 2: Landscape change

### Trees and woodlands

- The Brocklesby Estate to the north east has some of the largest woodland blocks and oldest plantations. Woodland character in the estate is being enhanced through new woodland panting and woodland management.
- Woodland character in the area has improved through new woodland planting and reversal of previous periods of neglect and planting of conifers on steeper slopes.
- The planted beech woodlands are generally found on the thinner chalk soils and are susceptible to wind blow.

### Boundary features

- The uptake of management agreements for boundary and woodland elements has maintained and in some cases strengthened the character of boundary features. Specific recent changes and trends include:
  - Data from 2011 shows a dramatic increase of managed boundary features with 1,877 km under Environmental Stewardship options, mainly through the Entry Level Scheme.
  - The total length of hedgerow being managed in 2011 is 1,600 km resulting in tightly cropped hedges filling out and becoming taller and wider.
  - This includes 17 km hedgerow restoration-laying coppicing and gapping up and 1.6 km of hedge planting.

### Agriculture

- Between 2000 and 2009, there was a decline in the farmed area of both cereals and grassland. More land was ploughed and there was an increase in oilseeds and other arable crops.
- The number of principal farmers has fallen by 17 per cent since 2000 and the employment of full time farm workers was reduced by 23 per cent.
- Livestock farming has changed within the NCA as numbers of livestock have reduced-particularly the number of pigs and sheep (down by 48 per and 43 per cent respectively) between 2000 and 2009.
- Pressure on water resources has increased, leading to the construction of irrigation reservoirs to support cropping; this has impacted on local character.
- The neglect and loss of traditional agricultural buildings-of predominantly brick and pantile is generally having an impact on the landscape.
- More land is taken up land use for biomass and biofuels.

### Settlement and development

- Development pressure within the NCA is generally low, although localised impacts include commercial and residential expansion around Barnetby le Wold, Barton-upon-Humber and around both Spilsby and Horncastle.

- Telecommunication masts are visually impacting on the Wolds notably on the chalk wolds.

- Beyond the area itself wind farms that have been constructed in the last 10–15 years and which are currently operational can be seen from this NCA and visually impact on the landscape character. The visual impact of expanding renewable energy developments is one of the biggest pressures on this NCA because of the impacts on the long, rural, undisturbed views which are characteristic to the area.

- Light, noise and air pollution comes from roads including M180/A180, settlements, quarries and other localised activities including Humberside International Airport.

### Semi-natural habitat

- 61 per cent of the area's SSSI are in favourable condition, while 18 per cent are in unfavourable condition but recovering.

- More Local Wildlife Sites are in positive conservation management.

### Historic features

- A large number of archaeological and historic features exist and have been designated as 'at risk'.

- Threats to the archaeological resource/ scheduled monuments from agriculture and woodland planting/lack of management have been reduced.

- There remains some threat to archaeological sites from ploughing with a number of scheduled monuments on the national 'Heritage at Risk' owing to plough damage, however this is improving.

- Planting of miscanthus as biomass; there could be adverse impacts in archaeologically sensitive areas, as well as on historic landscape character, associated with this crop.

### Coast and rivers

- The catchments face a range of challenges including diffuse pollution from agriculture and water abstraction has increased together with raising the demand for the potable water.

**The historic environment is visible in Spilsby market town which shows the red brick, characteristic in many traditional buildings and in the settlements of the area.**

- The chemical and quantitative trends for groundwater suggest that the Lincolnshire chalk aquifer suffers from over abstraction.
- Water Storage for flood alleviation schemes has increased- and more reservoirs exist.
- Some stream/river barriers have reduced opportunities for the migration of fish.
- High phosphate levels and eutrophication are increasingly important issues particularly in the Rivers Eau and Lymn – which is part of a Priority Catchment.

### Minerals

- Chalk quarries and sand/gravel pits are found. Historic extraction has left a legacy of old quarries on the landscape, some of which are designated Local Geological Sites.

## Drivers of change

### Climate change

- Climate trends suggest increased rainfall, periods of drought, and more frequent storm events. Increased summer droughts could result in demands on groundwater resources associated with the underlying chalk aquifer. Low groundwater levels inside the NCA are likely to result in lower river levels.
- Unpredictable and frequent periods of drought and flood will give rise to erratic flows and difficulties in managing flows. Water dependent chalk streams and springs and wetland habitats are vulnerable to low groundwater levels and resilience may be reduced by historical low flows along many streams.
- Warmer, drier summers may lead to drought causing potentially increased demands on agricultural land for food production in relation to food security. The need for food security will result in continued agricultural production along with changing farming practices. Agri-environment schemes provide an opportunity to work with land managers to incorporate farmland habitats, develop networks of linked habitats and enhance the rural character of the landscape.
- Increasing temperatures, drier summers may lead to new varieties of crops of and cropping patterns and new livestock systems may emerge. The longer cropping seasons could potentially lead to double cropping.
- Warmer, drier summers may lead to drought causing impacts on semi-natural habitats, in particular on chalk grasslands, and on species through drought conditions and including dominance of drought-resistant species. Thermal stress will also impact on a range of species especially those near their southern limit of their range. Loss of small or isolated habitats, notably unimproved grasslands surviving on steeper slopes and road verges.
- Warmer, drier summers may lead to drought causing reduced rainfall in summer months leading to deterioration in water quality due to reduced flows in wetland habitats on major valley floodplains.
- Warmer, drier summers may lead to drought causing increased demand for water abstraction during the summer months, while the pattern of rainfall may also reduce the opportunities for aquifer recharge with winter events increasingly concentrated in major downpours, much of which is lost to surface run-off.
- With changing climate and unpredictable conditions opportunities for invasive species exotic pests and disease pose a potential threat.

- Drier summers and increased frequency of storms could lead to loss of beech through drought and wind throw. Any loss of mature landmark trees will be significant in terms of impact on the overall landscape.

- Effective adaptation and mitigation and long-term climate change strategy will help safeguard the Lincolnshire Wolds AONB.

- Rise in water temperatures may have an impact on biodiversity of the chalk streams.

### Other key drivers

- The protected Lincolnshire Wolds Area of Outstanding Natural Beauty covers 62 per cent of the NCA. The AONB Management Plan will be used to drive change in the area within the protected landscape, demonstrating how partnerships can continue to protect environments.

- There is provision for the protection of the Lincolnshire Wolds and enhancement in the local planning policy framework. Further development would need to be of the highest standard in order to make a positive contribution to the distinctive character of the area.

- Recreation, access and tourism bring opportunities for improved facilities for the enjoyment of nature. This may bring with it a pressure on the landscape and biodiversity especially at the most popular destinations.

- Decline in livestock farming and implications on the Wolds landscape and biodiversity.

- Private ownership will sometimes restrict opportunities for public access, though there is further potential for promoted cycle routes, plus improved circular routes under the Rights of Way Improvement Plan.

- Threats to the tranquillity from visual impact of road improvements and increased pollution from heavy seasonal traffic, plus noise and light pollution from settlements and developments.

- Demand for wind turbines and renewable energy, oil exploration and telecommunication infrastructure can create disturbance.

- Promotion of careful development will be required concerning mineral/aggregates abstraction. Sustainable after-use and assimilation into the rural landscape of and chalk quarries and sand/gravel pits.

- Demand for re-use of redundant airfields and the threats to impact on the rural landscape and tranquillity.

- Opportunities for the re-creation of flood plain grasslands and the enhancement of ditches for wildlife, plus management of valley marshes, mires and carrs to retain wetland character of river valleys.

- Threats to woodland including continued decline in management and isolation of woodland, change in woodland composition, notably loss of beech, ash dieback, inappropriate location/species mix. Opportunities to promote appropriate management practice and the provision of wood fuel.

# Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

Cawkwell Bank on the edge of the chalk escarpment.

| Statement of Environmental Opportunity | Ecosystem service: Food provision | Timber provision | Water availability | Genetic diversity | Biomass provision | Climate regulation | Regulating water quality | Regulating water flow | Regulating soil quality | Regulating soil erosion | Pollination | Pest regulation | Sense of place / Inspiration | Sense of history | Tranquillity | Recreation | Biodiversity | Geodiversity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SEO 1:** Protect, enhance and promote the rolling chalk landscape of the Lincolnshire Wolds with its open plateaux, outstanding long views, enclosed valleys, important habitats and high sense of tranquillity. Improve opportunities to enhance people's access and enjoyment of the Wolds' special qualities and the natural beauty. | ↔ * | ↑ ** | ↔ ** | ↗ ** | ↔ ** | ↗ * | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↗ ** | ↔ *** | ↑ *** | ↑ *** | ↔ ** | ↑ ** | ↔ ** | ↗ *** |
| **SEO 2:** Protect and manage the Lincolnshire Wolds' water resources and wetland habitats, including the Lincolnshire chalk aquifer, conserving the groundwater resource and biodiversity of the chalk streams by working in partnership to manage issues affecting water flow and quality at a catchment scale. | ↔ * | ↗ ** | ↗ * | ↗ ** | ↔ *** | ↗ ** | ↑ ** | ↗ ** | ↗ ** | ↗ ** | ↗ ** | ↗ ** | ↗ *** | ↔ ** | ↗ ** | ↔ ** | ↗ *** | ↗ * |
| **SEO 3:** Maintain sustainable and productive agricultural practices for the continued provision of food and for the important contribution that farming makes to the sense of place. Enhance farmland habitats and expand and connect semi-natural habitats such as species-rich grassland, woodland and hedgerows to benefit biodiversity, soil and water quality. | ↗ *** | ↔ *** | ↗ ** | ↔ ** | ↔ ** | ↗ * | ↗ ** | ↗ ** | ↑ *** | ↑ *** | ↗ *** | ↗ ** | ↔ ** | ↔ ** | ↔ *** | ↔ *** | ↑ *** | ↔ *** |
| **SEO 4:** Protect and appropriately manage the area's rich historic environment and geodiversity for its contribution to local character and sense of identity and as a framework for habitat restoration. Ensure that the wide range of historic features and geodiversity assets are recognised, promoted and valued. | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↔ *** | ↑ *** | ↑ *** | ↔ *** | ↗ ** | ↗ *** | ↗ *** |

Note: Arrows shown in the table above indicate anticipated impact on service delivery ↑=Increase ↗ =Slight Increase ↔=No change ↘ =Slight Decrease ↓=Decrease.
Asterisks denote confidence in projection (*low **medium***high) °=symbol denotes where insufficient information on the likely impact is available .

Dark plum =National Importance; Mid plum =Regional Importance; Light plum =Local Importance

## Landscape attributes

| Landscape attribute | Justification for selection |
|---|---|
| The rolling landform that has been extensively shaped by glacial activity, resulting in prominent escarpments and deep valleys and chalk exposures. | ■ The rolling, open plateau is a key characteristic of the Lincolnshire Wolds, while the scarps and valleys provide striking distinguishing features.<br>■ Long views are afforded from the ridge tops both over surrounding NCA and within the area.<br>■ A varied geology due to the effects of glacial activity, resulting in distinct areas of land cover/use.<br>■ Important geological exposures of chalk occurring largely in quarries and deposits of Lower Cretaceous sandstones, ironstones and clays, plus meltwater valleys of geomorphological interest. |
| The prominent north west scarp. | ■ The scarp is clothed in rough pasture, scrub and woodland, providing contrast with the open arable plateau.<br>■ There are panoramic views to the Central Lincolnshire Vale. |
| The area's localised woodland cover, including extensive oak-ash-hazel woodlands in the south-east, sinuous beech woodlands in the deep southern valleys, isolated beech clumps on the Wolds, wet woodland to the south, and the extensive mixed woodlands of the Brocklesby Estate to the north-east. | ■ Little woodland remains in the Lincolnshire Wolds, with the most extensive areas occurring on the calcareous clay soils in the south-east.<br>■ Tetford Wood is a rare example of an ancient semi-natural wood occurring on chalk soil, while the alder carr woods in the Bain and Lymn valleys are also of high nature conservation interest.<br>■ Game coverts and isolated beech and ash trees form prominent features on the open arable plateau.<br>■ Lack of traditional management such as coppicing, with sycamore invading many woodlands. |
| Hedgerow field boundaries in large, geometric patterns, with local variations including the dry-stone walls to the north and irregular patterns in the south-west valleys. | ■ Hedgerows are predominantly hawthorn and gappy –with significant opportunities to enhance wildlife value and landscape. |

| Landscape attribute | Justification for selection |
|---|---|
| The area's rivers and wetland habitats, including chalk streams in the north and the more acidic waters of the southern rivers. | ■ The chalk streams are a habitat of special interest and are internationally rare habitat confined mainly to England and North West Europe. They occur in an otherwise dry landscape supporting a high diversity of species of national conservation importance including mammals, freshwater fish, invertebrates and aquatic plants.<br>■ Chalk streams mainly occur where groundwater reaches the surface in chalk valleys.<br>■ Wetland habitats such as wet meadows and floodplain grazing marsh have been lost to development and agricultural improvement.<br>■ Numerous springs and flushes arise at the foot of the scarp.<br>■ Calcareous marshes and spring-line flushes and blow wells form further important wetland components of the wider river catchments.<br>■ The award winning Lincolnshire Chalk Streams project is dedicated to the conservation and enhancements of the streams. |
| The broad, marshy south west valleys of the Bain and Lymn. | ■ The mixed farmed landscape of irregular medium-sized fields in the south west valleys provides contrasts with the arable dominated plateau.<br>■ Alder carr is a distinctive feature of the Bain and Lymn valleys in particular, and has become nationally rare, increasing its importance for conservation. |
| Fragments of calcareous grassland surviving on steep slopes, roadside verges and old quarries, plus neutral/acidic grassland in river valleys and other patches. | ■ The resource is less extensive and more fragmented than other areas known for chalk grassland. This is a consequence of the unique combination of a complicated topography, distribution of other habitats and pattern of land use over the centuries.<br>■ Calcareous species rich grassland is an internationally important habitat, with most remaining fragments in the NCA now SSSI designated; or part of highway verges. |

| Landscape attribute | Justification for selection |
|---|---|
| An agricultural landscape of predominantly arable habitats including arable field margins and conservation headlands. Livestock farming remains important where mixed farming occurs. | ■ The farmed landscape dominates land use and Grade 3 land accounts for a mix of arable and livestock farming.<br>■ Opportunities exist to greatly improve the wildlife value of the intensively farmed, arable-dominated landscape.<br>■ The hedgerows shelter belts, farm ponds, arable field margins provide wildlife habitats.<br>■ Livestock numbers have been in decline but some remain and these help conserve remaining areas of grasslands and meadows. Rare/traditional breeds are associated with the Wolds include Lincoln Red cattle and Lincolnshire Longwool sheep.<br>■ Nationally important populations Farmland birds are found in the arable areas such as lapwing, grey partridge, turtle dove, yellow wagtail, tree sparrow and corn bunting. |
| A highly dispersed settlement pattern, with typically nucleated villages located along the foot of the north west scarp and nestled within the southern valleys, often associated with small estates. | ■ The Wolds plateau is sparsely settled, and the settlement pattern contributes to the open, tranquil character and sense of history.<br>■ The open landscape is vulnerable to the visual impacts of more recent development. |
| A varied local vernacular, including brick and render walls with pantile roofs for many domestic buildings, with stone in larger buildings varying according to the distribution of limestone, ironstone and sandstone. | ■ Local vernacular contributes to the landscape character with the area's stone buildings reflect the distribution of underlying geology, contributing to a localised sense of place.<br>■ Unsympathetic development/restoration has led to a loss of local distinctiveness in some Wolds villages. |
| A rich historic environment, including extensive prehistoric barrows and trackways that line the Wolds plateau and a particularly high concentration of deserted medieval village sites. | ■ The Lincolnshire Wolds have the densest distribution of long barrows in the country and an important grouping of round barrows, as well as one of the highest concentrations of deserted medieval villages in England.<br>■ Archaeological remains are under threat from deep ploughing, as well as potentially through neglected woodland management and inappropriate planting. |
| Tranquillity – 80 per cent of the NCA is still classified as 'undisturbed'. | ■ Tranquillity is a significant feature of the Wolds plateau.<br>■ A lack of light pollution is a key feature of much of the area. |

## Landscape opportunities

- Protect the designated landscape of the Area of Outstanding Natural Beauty.
- Protect the distinctive character of the landscape and nucleated settlement pattern.
- Protect expansive views as this is generally a landscape of large scales where wide expanses of the large fields and rolling hills meet vast skies affording extensive views and tranquillity.
- Ensure adequate clean groundwater supply to the chalk wolds aquifer and hydrology of the NCA.
- Protect existing boundary features and restore hedgerows-creating connectivity with existing habitats. Priority should be given to schemes following historic boundaries. Manage and enhance the hedgerows to create a robust network throughout the arable areas.
- Encourage land management interventions to provide food and shelter for farmland birds of East Midlands Arable assemblage (-including skylark, linnet, yellow hammer, reed bunting, corn bunting, yellow wagtail, curlew, tree sparrow, grey partridge, bull finch and turtle dove).
- Restore and create areas of calcareous grassland (in combination with other unimproved grasslands.) Grassland creation should favour high and steep ground, and where there is strong heritage interest. In addition to encouragement of low input grassland adjacent to streams.
- Manage rivers, streams and wetland habitats, including the restoration and interlinking of wet meadows and calcareous flushes to maintain hydrological processes and enhance the biodiversity of important plant and invertebrate communities and in particular those of the chalk streams.
- Manage existing trees and woodland encouraging new planting to ensure a diverse age and ecological structure. Although woodland cover is limited featuring more in the southern section of the NCA-there are opportunities for in new small scale woodlands in appropriate areas, and around key settlements, ensuring that the open character of the landscape is maintained. The creation of broadleaved woodlands outside the AONB can provide screening in the north, helping to enhance landscape character and maintain tranquillity. All schemes require sensitive planning to minimise undesirable impacts particularly on prominent viewpoints and heritage assets. Proposals should be undertaken in collaboration with partners with appropriate expertise and guidance.
- Protect manage enhance and restore species rich grasslands.
- Protect and manage historical features including drove ways and enclosure roads with wide verges, ensuring their continued contribution to biodiversity and landscape character.
- Protect the cultural heritage of the Wolds including archaeological evidence and features such as barrows, settlement sites and earthworks through conservation and appropriate management.

- Manage and enhance the conservation of the archaeological and historical resource-supporting land managers and local communities. Identify in combination with the historical resources opportunities for geodiversity education, access and research.

- Plan new building to be sympathetic to local styles and materials reflecting the diverse vernacular/geology.

- Consider the impact of any new tourist facilities and any diversification of farms.

- Support developments that are sensitive to protecting the expansive views of the Wolds. Protect the character of the NCA by siting structures away from prominent locations and ensuring that installations are of appropriate size and scale. Built development is affecting the pattern and character of rural settlement in the Wolds and both noise and light pollution should be avoided especially in hilltop and brownfield sites. The area has visually prominent and sensitive locations and the impact of development on long distance views should be considered.

- Manage disused quarries including chalk quarries for their biodiversity with restoration through minerals planning with landscape, geodiversity biodiversity educational and recreational benefits.

- Create better access and recreation opportunities working with the Local Access Forum. Manage and maintain existing rights of way network and plan access opportunities building on best practice and experience in for example, Caistor and Market Rasen.

- In the southern area where Fen and Marsh margin farmlands exist in adjoining areas consideration should be given to local variations and the landscape should maintain a sense of openness.

**Alder carr woods in the Lincolnshire Wolds at Keal Carr, also a Site of Special Scientific Interest.**

## Ecosystem service analysis

The following section shows the analysis used to determine key Ecosystem Service opportunities within the area. These opportunities have been combined with the analysis of landscape opportunities to create Statements of Environmental Opportunity.

Please note that the following analysis is based upon available data and current understanding of ecosystem services. It does not represent a comprehensive local assessment. Quality and quantity of data for each service is variable locally and many of the services listed are not yet fully researched or understood. Therefore analysis and opportunities may change upon publication of further evidence and better understanding of the inter-relationship between services at a local level.

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Food provision** | Livestock systems<br><br>Cereal and oilseed production<br><br>Soils | A high percentage of grade 2 and 3 agricultural land exists and is dominated by arable production with mixed farming and livestock production.<br><br>Between 2000 and 2009 there was a reduction in livestock grazing units. The number of sheep and pigs reduced together with an increase in cereal and oilseed production. | National | Food provision is a significant service in the area. This industry is predominantly arable and farming contributing to sustaining national food production levels and the preservation of the historic landscape character of this area.<br><br>However production can also lead to decreased water availability due to irrigation demand, and loss of soil and water quality due to high nitrate input.<br><br>Extensive arable and limited semi-natural habitats in the NCA mean that there are limited resources for pollinating insects which are important in sustaining food production within this NCA.<br><br>Hedgerows and managed boundary features offer a more structurally diverse habitat and may protect against soil erosion. | Work with land managers and farmers to support food production in ways that it can deliver multiple benefits for biodiversity soil quality, carbon storage, water quality, water availability and landscape.<br><br>Enhance historic landscapes by working with land managers to alter cultivation practices to avoid damaging historic landscape patterns and buried archaeology, while maintaining levels of food production.<br><br>Promote the management of traditional field boundaries for multiple benefits. | **Food provision**<br><br>**Biodiversity**<br><br>**Sense of history**<br><br>**Sense of place / inspiration**<br><br>**Climate regulation**<br><br>**Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Regulating water quality**<br><br>**Water availability** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Timber provision** | Woodland<br><br>Soils<br><br>Conifer plantations | Existing woodland cover represents 5 per cent of the NCA (4,561 ha). The majority of this is broadleaved woodland.<br><br>There is currently little commercial timber in production other than that produced from small estate woodlands and shelterbelts. | Local | Existing woodland cover is low (5 per cent); comprising predominantly linear cover with a small amount of ancient semi-natural woodland.<br><br>Much of the broadleaved woodland that exists is of high nature conservation value and should be protected and maintained.<br><br>Limited opportunities exist for further woodland creation because of the potential impact on productive agricultural land and landscape character. This restricts opportunities for planting to small woodland blocks on higher land, steep slopes, and around development.<br><br>Greater opportunities exist for Woodland creation outside the AONB (38 per cent of NCA is outside the AONB). | Promote the management of multi-purpose woodland for multiple benefits.<br><br>Plant to extend existing cover and to create buffers and semi natural grassland around wooded habitats. | **Timber provision**<br><br>**Regulating water flow**<br><br>**Regulating water quality**<br><br>**Biomass energy**<br><br>**Regulating soil quality**<br><br>**Recreation**<br><br>**Climate regulation**<br><br>**Regulating soil erosion** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Water availability** | Aquifers<br><br>Semi natural chalk grasslands | The main rivers in the NCA are the River Bain, the River Lymn (also Steeping River) and the Great Eau and Waithe Beck and River Lud.<br><br>The chalk substrate forms a major aquifer supplying domestic water as well as irrigation for agriculture.<br><br>There are some issues with sedimentation. | Regional | There is little surplus water available, with the aquifer considered to be over-abstracted, potentially creating a risk to the base flows in some rivers and streams.[6]<br><br>Abstracted water used for agricultural irrigation and drinking water supplied to the region is likely to affect water availability in drought conditions. The demand for water is increasing.<br><br>In the Great Eau there is evidence that abstraction has impacted on the sensitive chalk habitats within the river.[7]<br><br>Excessive water abstraction and drainage is one of the main issues affecting freshwater habitats. | Maintain and improve adequate clean groundwater supply of the chalk aquifer and improve the overall hydrology of the NCA.<br><br>Work with the farming community to adopt sustainable farming practices such as the creation or restoration of a network of grasslands to improve filtration into the ground and prevent nutrient run-off.<br><br>Promote winter storage reservoirs instead of direct abstraction from rivers.<br><br>Protect the chalk streams for their biodiversity.<br><br>Protect the flows of the Rivers and protect and enhance the catchments for multiple benefits. | **Water availability**<br><br>**Climate regulation**<br><br>**Regulating water quality**<br><br>**Food provision**<br><br>**Biodiversity**<br><br>**Regulating soil quality** |

[6] Lincolnshire Wolds Natural Area Profile

[7] DEFRA ECFSDI priority catchments Information

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Genetic diversity** | Rare sheep and cattle breeds<br><br>Areas of species-rich semi-natural grassland habitat<br><br>Permanent pasture | Rare breeds with a heritage from the area include;<br><br>*Lincoln Longwool Sheep have an 'At risk' status on the Rare Breeds Survival Trust schedule.<br><br>*Lincoln Red Cattle original stock- has status 'Vulnerable' on the Rare Breeds Survival Trust schedule. | Local | Maintaining rare breeds is important for food security. Numbers of livestock have been reducing and strategies exist to improve numbers and genetic diversity.<br><br>Hardy adaptable rare breeds can also aid future land management through conservation grazing. This will help to maintain a sense of place and increase biodiversity. | Encourage the promotion and development of supply chains and markets for high quality local produce.<br><br>Increasing areas of permanent pasture.<br><br>Putting in place appropriate grazing for specific habitats to deliver multiple benefits.<br><br>Support native livestock breeds and genetic diversity and highlight the heritage of livestock and practice. | **Genetic diversity**<br><br>**Biodiversity**<br><br>**Food provision**<br><br>**Sense of place / inspiration**<br><br>**Sense of history** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Biomass energy** | Existing woodland<br><br>Short rotation coppice<br><br>Miscanthus | There is limited availability of existing woody biomass. The existing woodland cover (5 per cent) consists of small isolated plantations and copses that offer limited potential for the provision of biomass. | Local | Improved woodland management on existing sites could provide a local source of fire wood and chip.<br><br>The area offers limited locations for new biomass plantings because of the special landscape qualities of the area, and the detrimental impacts that new plantings would have.<br><br>The NCA generally has a medium potential yield for short rotation coppice (SRC), while the potential miscanthus yield is generally medium.<br><br>The sensitive historic environment and special /protected sensitive landscape needs to be considered in relation to any new planting.<br><br>Semi-natural woodlands may require non-intervention for the protection of biodiversity within them. For example deadwood may be significant for Invertebrate species. | Opportunities for SRC exist and the potential miscanthus yield is generally medium in the south and central areas and high around Wooton and Barnetby le Wold.<br><br>Where appropriate -existing woodlands are managed to produce surplus timber that could be used to provide sources of biomass. With a range of management techniques to be used in semi-natural woodlands.<br><br>Options of non intervention should be considered.<br><br>. | **Biomass energy**<br><br>**Regulating soil erosion**<br><br>**Climate regulation**<br><br>**Regulating soil quality**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Climate regulation** | Soils<br><br>Woodland<br><br>Semi-natural habitats<br><br>Permanent pasture | The soils over most of the NCA have a low carbon content of 0-5 per cent reflecting a dominance of mineral soils.<br><br>The relatively thin chalk soils have low levels of organic matter, especially where they are under continuous arable cultivation.<br><br>Woodlands, semi-natural habitats and permanent pasture such as in the south west and on the steeper slopes are valuable for storing carbon. | Local | There are a few scattered pockets of land within the NCA with a higher carbon content of 5-10 per cent likely to be associated with areas of woodland and permanent grassland. However the low woodland cover (5 per cent) contributes little to carbon storage.<br><br>The mineral soils may have potential for carbon sequestration by increasing organic matter inputs.<br><br>Soil cultivation and fertiliser used for arable farming are likely to be a significant source of the greenhouse gas, nitrous oxide.<br><br>The low woodland cover that is present (5 per cent) contributes little to carbon storage in its current state. | Promote cultivation practices that retain and increase the organic content of soils and increase the area of over wintering stubble and include fallow rotation to management practices.<br><br>Adopt cultivation practices that reduce reliance on high levels of fertiliser input and that follow NVZ regulations.<br><br>Encourage management of hedges and hedgerow trees, gapping up and allowing them to fill out.<br><br>Encourage woodland creation and extend existing woodland within valleys or as shelter belts- where appropriate. Sensitivity to the special landscape qualities will need to be considered and guidance sought. | **Climate regulation**<br><br>**Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Biodiversity**<br><br>**Timber provision**<br><br>**Regulating water quality** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating water quality** | Chalk aquifer<br><br>Semi-natural habitats<br><br>Watercourses - rivers and chalk streams | 99 per cent of the area falls into a Nitrate Vulnerable Zone (NVZ) and part of the area falls into a catchment sensitive farming priority catchment (The Lincolnshire Coast and Rivers catchment.)<br><br>In the north and east of the NCA the groundwater chemical status is generally poor.<br><br>High nitrate levels have been identified in groundwater resources and high phosphate levels and sedimentation in surface streams.<br><br>High nutrient levels (including high phosphate levels and eutrophication) are issues in both the River Eau area and the River Lymn/Steeping.<br><br>The surface water chemical status of the River Bain and the River Lymn is good but the ecological status of both these rivers is moderate. | Local | Diffuse agricultural pollution through nitrates is likely to affect water quality of the groundwater, the waterways in adjoining NCAs and the fragile chalk streams.<br><br>Point source pollution is an issue in the catchment area.<br><br>Much of the groundwater is abstracted for use in the region. The abstraction and water quality have impacts on the NCA and on adjacent NCAs, for example, the Humber Estuary NCA. (Issues of saline intrusion downstream are affected by water abstraction within the Lincolnshire Wolds NCA.)<br><br>In agricultural areas measures can be taken to reduce nutrient and sediment run –off by establishing permanent grassland as a buffer along water courses.<br><br>The chalk streams are also benefiting from the application of conservation activities delivered through partners involved in the Lincolnshire Chalk Streams Project.<br><br>The North Lincolnshire Target Area Catchment Sensitive Farming (CSF) falls within the Lincolnshire Coast and Rivers catchment. | Reduce diffuse pollution by encouraging sustainable farming practices: adhering to NVZ guidelines.<br><br>Reduce demand for water for irrigation by selecting drought resistant crops and / or increasing water storage capacity on farms.<br><br>Establish buffers of permanent grassland along watercourses.<br><br>Chalk Stream Enhancements opportunities exist on the Waithe Beck, Great Eau, and Laceby Beck.<br><br>Follow best practice from the Catchment Sensitive Farming - North Lincolnshire Target Area. | **Regulating water quality**<br><br>**Regulating soil erosion**<br><br>**Biodiversity**<br><br>**Water availability** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating water flow** | Chalk aquifer<br><br>Water courses<br><br>Semi-natural habitats<br><br>Permanent pasture<br><br>Wooded valley sides | Some water courses are prone to drying / reduced flows in their upper reaches and the permeability of the Chalk means that infiltration can occur.<br><br>Chalk streams with historically low flows have been a significant issue.<br><br>The permeable nature of the underlying chalk ensures that there are no large areas at risk from river flooding but some localised flooding does occur.<br><br>The 3 main catchments in the NCA are:<br>-Grimsby and Ancholme<br>-Louth Coastal and<br>-River Witham.<br><br>In the River Witham catchment, the River Bain (which rises at Ludford) is susceptible to flooding.<br><br>Barton upon Humber is identified as being susceptible to flood risk from a combination of surface water and groundwater flooding.<br><br>The River Lymn and the Great Eau have low to moderate flood risk associated with the two rivers in the Louth Coastal Catchment. | Local | Groundwater provides a consistent flow volume to chalk streams. However, abstraction can give rise to artificial and low flow which impact on ecology of rivers and habitats including fens, wet woodlands and meadows.<br><br>Abstraction pressures contributing to low flows are currently a concern. The River Bain has been widened, straightened and embanked in places to reduce flood risk.[8]<br><br>Flood issues exist downstream at Barton upon Humber (and downstream in the Humber Estuary NCA).<br><br>Flood defence schemes are in development for the River Lud (Louth), and in the longer term the River Bain (Horncastle)<br>Flood risk management within the areas should be maintained whilst ensuring that environmental opportunities are incorporated into flood risk management. | Manage flood risk by maximising the potential of natural assets in the catchment.<br><br>Work with farmers and land managers to improve soil management and to maximise and create land cover which slows and filters run- off for example through arable reversion, hedgerow restoration and planting, permanent arable field margins, wooded slopes and reedbeds.<br><br>Encourage the development of sustainable drainage systems and green space to store floodwaters and filter pollutants.<br><br>Encourage the extension of flood storage areas.<br><br>Restore historic and natural features in to floodplains to increase capacity for water storage.<br><br>On the River Bain near Horncastle (within the NCA area) there is a relatively low risk of flooding but the floodplain in this area can provide important areas to store water during flood events.<br><br>Flood alleviation schemes should be developed to incorporate opportunities to deliver multiple benefits. | **Water availability**<br><br>**Regulating water quality**<br><br>**Regulating soil erosion**<br><br>**Biodiversity**<br><br>**Climate regulation** |

[8] *River Witham Catchment Flood Management Plan Summary Report*, Environment Agency (December 2009); *Humber River Basin Management Plan, Annex A: Current state of waters*, Environment Agency (December 2009); *Anglian River Basin Management Plan*, Environment Agency (December 2009)

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating soil quality** | Soils<br><br>Sustainable farming practices<br><br>Semi-natural chalk grasslands<br><br>Geological processes | The majority of the NCA has light chalky soils and permeable loams, with impermeable soils associated with the Jurassic Kimmeridge clays.<br><br>The calcareous soil types are typically shallow and free draining. Although they are vulnerable to drought they also have a degree of natural resilience due to their calcareous nature. The soils are valuable for aquifer recharge.<br><br>The NCA has chalky boulder clays, well drained acidic loams as well as areas of impermeable soils. | Local | Maintain soil structural condition and water infiltration for example by avoidance of compaction and increase in soil organic matter.<br><br>Organic matter may be lost through frequent tillage associated with intensive arable farming; however, cultivation of some crops can help retain organic matter.<br><br>Impermeable soils are seasonally waterlogged. Compaction may occur if heavy machinery is used. | Seek ways of reducing demand for water by selecting crops and /or increasing storage of water on farms.<br><br>Encourage sustainable farming practices; adopt cultivation practices that increase organic content of cultivated soils, such as introducing fallow into rotations, over wintering stubbles, direct drill and green cover crops. | **Regulating soil quality**<br><br>**Regulating soil erosion**<br><br>**Biodiversity**<br><br>**Regulating water quality**<br><br>**Water availability** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Regulating soil erosion** | Soils<br><br>Sustainable farming practices<br><br>Semi-natural habitats<br><br>Woodland | The predominantly thin, chalky tills of the Lincolnshire Wolds are subject to soil erosion under certain land uses.<br><br>Some soils are intrinsically vulnerable to erosion and steep slopes accentuate the issue.<br><br>Wind erosion and water erosion occur but those soils under permanent vegetation are less prone to erosion.<br><br>Soil loss leading to sedimentation of watercourses is identified as an issue in the Lincolnshire Coast and Rivers Priority Catchment in the NCA including the River Lymn and the Great Eau.<br><br>In the Great Eau area there is evidence that sedimentation -a product of soil erosion- has a major effect on the ability of the river to support populations of salmon and trout. | Local | With the NCA falling into a Nitrate Vulnerable Zone overlying a regionally important aquifer, soil erosion is a concern in relation to water quality because water can transfer sediments and contaminants into groundwater and surface water.<br><br>Soil erosion is likely to occur more frequently on steeper slopes under arable production where shallower lime-rich soils are at risk of erosion on cultivated ground, or where bare soil is exposed. Freely draining lightly loamy soils are also vulnerable where there is the potential for wind erosion.<br><br>The loamy and clayey soils with impeded drainage, are easily compacted by machinery or livestock if accessed when wet, increasing the risks of soil erosion by surface water run-off.<br><br>Soil management is critical as many of the soil types are vulnerable to damage and hence erosion. Erosion of thin chalk soils can lead to total loss of soil to expose bare rock.<br><br>Soils under woodland will be conserved but are notaccessible for food production. | Encouraging sustainable farming practices.<br><br>Encouraging the use of steep slopes for pasture and recognising that where thin chalk soils are present, there will be significant opportunities to deliver biodiversity benefits.<br><br>Incorporation of organic matter into cultivated soils and reduced tillage will result in the avoidance of Compaction, minimising runoff and reduce soil erosion.<br><br>The incorporation of features such as hedgerows and grassland buffers to intercept runoff will reduce widespread erosion, filter contaminants whilst enhancing the landscape and benefiting biodiversity.<br><br>Encourage longer growing periods between grazing rotations to increase sward diversity, increase root penetration and increased soil stability. | **Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Regulating water quality**<br><br>**Water availability**<br><br>**Climate regulation**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Pollination** | Pollinating insects<br><br>Semi natural chalk grasslands<br><br>Semi-natural woodlands | The dominance of arable cultivation currently limits habitat available for pollinating insects to thrive.<br><br>Current semi-natural, non-wooded habitats cover only a small percentage of the NCA.<br><br>Lowland meadows provide some nectar sources for pollinating insects but overall this habitat is small limiting natural sources of nectar-bearing plants. | Local | The pollination of crops is essential for sustainable agricultural production. A lack of semi-natural habitats provides less variety of plant species for pollinating insects.<br><br>Semi-natural woodlands can be a source of nectar, particularly early in the season. | Encourage sustainable farming practices; increase species-rich grasslands and plant nectar-rich seed mixes.<br><br>Create an ecological network of habitats including roadside verges to support pollinating species.<br><br>Extend the network of woodland cover where appropriate. | **Pollination**<br><br>**Food production**<br><br>**Biodiversity** |
| **Pest regulation** | Habitat mosaic | The area is arable production dominated by a few types of cereal crops and lacks semi natural pasture/grassland.<br><br>A lack of heterogeneity in the landscape provides less resilience against widespread pest and disease damage. | Local | There is recognised pest damage affecting timber production/trees, mammals including grey squirrels, muntjac, fallow deer and insects, including oak processionary moth. Sudden oak death and ash dieback are also potentially affecting trees.<br><br>Non-native invasive species are a potential threat to native aquatic biodiversity.<br><br>The mosaic of woodlands, hedgerows and watercourses may facilitate disease and pest dispersal, however, the mosaic of habitats will also have potential to support natural predators. | Build resilience against pests and diseases, by supporting diversity within species populations and support habitats, through selection of crop types. Focus upon managing impacts upon food and timber provision and biodiversity.<br><br>Establish pest and disease management strategies for the Wolds woodlands and watercourses, in particular. | **Pest regulation**<br><br>**Timber production**<br><br>**Biodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Sense of place/ Inspiration** | Long open views of rolling hills and big skies<br><br>Contrasting enclosed steep sided valleys<br><br>Tree cover framing views<br><br>Sparse settlement patterns<br><br>Historic environment<br><br>Poets, writers and artists- including Alfred, Lord Tennyson | An area characterised by rolling landform of and deep steep-sided valleys. A place providing inspiration –reflected through the work of poets and artists.<br><br>Fine panoramic views and open skies. The pattern of enclosure and land cover gives the area a simple but strikingly bold character.<br><br>A distinct rural character, emphasised by the sparse settlement pattern. A wide range of historic features and local materials. | National | Opportunities exist to celebrate the landscape's cultural ties including the area's long association with the poet laureate Alfred, Lord Tennyson.<br><br>The Wolds provided inspiration to painter, Peter de Wint and the novelist A S Byatt. Inspiration and escapism are likely to be particularly associated with the far-reaching views and of the rural landscape throughout the area.<br><br>The area is a protected landscape designated an Area of Outstanding Natural Beauty. Natural and cultural heritage is increasingly accessible and celebrated. | Ensure that development respects local settlement patterns, building material, views, wildlife, geology and historic evidence.<br><br>Encourage visitors to the NCA. Offer good quality experiences and interpretation, and encourage opportunities for education and visitor/ community engagement in relation to landscape, biodiversity, geology and heritage.<br><br>Further develop strong locally produced products and materials where this supports management of the landscape, for example woodland and sheep farming products and local building materials.<br><br>Encourage community engagement and activity and 'join up' making links to the AONB Management Plan. | **Sense of place**<br><br>**Sense of history**<br><br>**Biodiversity**<br><br>**Tranquillity**<br><br>**Recreation**<br><br>**Geodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Sense of history** | Pre-historic monuments and Earthworks<br><br>Deserted villages<br><br>Field patterns<br><br>Historical routes, high roads and tracks<br><br>Estates and parkland<br><br>Churches and historic buildings<br><br>Quarrying<br><br>Human remains | The history of the landscape is evident in an exceptional array of archaeological evidence. Prehistoric occupation and land use from the Neolithic period. Notable long barrows along the Wolds plateau and bronze-age barrows capping the hill tops.<br><br>Roman roads linking to the coastal salt industry, villages of Saxon origin, numerous deserted medieval villages.<br><br>Rectilinear field patterns reflecting late-medieval and Parliamentary enclosure.<br><br>Country houses and estates that date from the late-medieval period and historic buildings built from the local stone. | National | TThe Lincolnshire Wolds has been settled since Neolithic times. Pre-historic barrows are numerous in the NCA and need protection and scheduling. Many historic features are at risk.<br><br>Ancient track ways, Roman roads burial mounds and drovers routes are evidenced.<br><br>The visible archaeology is an important feature of the area, and there are a number of scheduled monuments.<br><br>A high proportion of deserted medieval villages exist and medieval settlements also remain such as Brinkhill.<br><br>The small market towns have been very important historically and the Lincolnshire Wolds towns maintain their historic character with a number of listed buildings.<br><br>Several parklands and historic buildings can be found in the NCA.<br><br>There is also a military history with second world war air bases. | Protect historic features and encourage best practices in agriculture relating to earthworks and below ground archaeology.<br><br>Maintain estates and parkland and protect ancient monuments at risk identifying opportunities through agri-environment schemes.<br><br>Ensure developments respect the local vernacular.<br><br>Develop opportunities for visitors to access and learn about the local historic environment.<br><br>Encourage community involvement in learning about local history and archaeology. | **Sense of history**<br><br>**Sense of place / inspiration**<br><br>**Geodiversity**<br><br>**Recreation** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Tranquillity** | Expansive open views<br><br>Sparse settlement patterns<br><br>Few infrastructure routes | The area has a strong sense of Tranquillity and is known for its big open skies. Much of the area is sparsely populated and a high proportion of the area lies within the protected Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB).<br><br>In 2007, 80 per cent of the NCA was classified as undisturbed. (CPRE Intrusion Map).<br><br>The area is also recognised for its dark skies at night. | Regional | The Lincolnshire Wolds is predominantly an area of higher ground. The majority of the area is located within the Lincolnshire Wolds Area of Outstanding Natural Beauty- nationally protected for its natural beauty and tranquillity.<br><br>A very large proportion of the NCA contributes to the sense of tranquillity due to elevated views, sparse settlement patterns. The area predominantly has village settlements and it lacks any major towns/cities. It has a low proportion of manmade structures. | Encourage sensitive development respecting the open and expansive views and a strong rural character and natural beauty.<br><br>The Lincolnshire Wolds AONB Management Plan provides a number of objectives and actions-under Theme1 'Protecting the Wolds' and Theme 4 'Developing the Wolds'. | **Tranquillity**<br><br>**Sense of history**<br><br>**Sense of place / inspiration**<br><br>**Recreation** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Recreation** | AONB<br><br>Network of footpaths (0.53 per km$^2$)<br><br>Viking Way – long distance footpath<br><br>Estates and<br><br>Parklands<br><br>Historic sites<br><br>National cycle routes<br><br>Geological sites<br><br>Woodlands | The Area of Outstanding Natural Beauty covers 62 per cent of the NCA and offers opportunities to protect and enhance the landscape.<br><br>Only 1.3 per cent of the NCA is 'publically accessible' and with only 579 km of public rights of way at a density of 0.53 per km$^2$.<br><br>There are few publicly owned and managed sites with country parks being the main type and Woods for People and Local Nature Reserves important in terms of access provision. Main routes include the Viking Way regional footpath links a number of historic sites and places of interest.<br><br>The National Cycle Network crosses the NCA. | Regional | The NCA has a low density of public rights of way. It offers varied recreation and access opportunities and access to sites of cultural historic and geological interest.<br><br>Market Rasen and Caistor share 'Walkers are Welcome' a nationwide initiative launched in 2007 to encourage towns and villages to be 'welcoming to walkers'.<br><br>There is scope to improve access opportunities including promotion of the number of walks leaflets in the area. The Lincolnshire Wolds Walking Festival is now one of the largest in the country.<br><br>There is potential for more cycling and promoted cycle routes.<br><br>Potential to improve the access routes and to engage people in their development. There will also be opportunities to encourage sustainable transport links with adjacent / surrounding settlements.<br><br>Access provides an opportunity to celebrate the history of the area, the geodiversity and biodiversity.<br><br>A long association with Alfred, Lord Tennyson. | Improve and extend green tourism opportunities-providing sustainable solutions, where the natural environment is protected.<br><br>Improve access to recreation for a wide range of users.<br><br>Improve access by ensuring that paths are well maintained and signposted and that some surfaced paths are provided to ensure easy access walks<br><br>There are opportunities to link the area to the coast and historical sites. There is scope for joining up of the main routes improving links into the AONB, developing walking and cycling routes from public transport interchanges.<br><br>Supporting and promoting new linear and circular routes such as the Lindsey Trail suitable for horses, carriages, cyclists and walkers.<br><br>Improved access provides an opportunity to celebrate the history of the area, the geodiversity and the biodiversity. Several cultural ties exist which offer opportunities to celebrate, for example, the association with Tennyson.<br><br>The Lincolnshire Wolds AONB Management Plan provides a number of objectives and actions under Theme 3, 'Discovering the Wolds' which provide opportunities for recreation. | **Recreation**<br><br>**Sense of history**<br><br>**Tranquillity**<br><br>**Sense of place / inspiration**<br><br>**Biodiversity**<br><br>**Geodiversity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Biodiversity** | National designations<br><br>Semi-natural/<br>Priority habitats :<br>Rivers and streams<br><br>Broadleaved mixed woodland<br><br>Lowland meadows<br><br>Lowland calcareous grassland<br><br>Small areas of Purple moor grass and rush pasture; Fens; and Lowland dry acid grassland | There are over 1,007 ha of Priority habitat representing 1 per cent of the area within the NCA.<br><br>There are 23 nationally designated SSSI covering 102 ha. These are mostly in favourable condition. (March 2011).<br><br>There are 342 local 'wildlife sites' within the NCA.[9]<br><br>In comparison to many other NCAs this is a very limited area of semi-natural habitat. The NCA contains no Special Area of Conservation, Special Protection Area or Ramsar sites.<br><br>[9] Lincolnshire Wolds Draft AONB Management Plan (2013–2018) | Regional | Improving the biological condition of the designated resource is likely to require sustainable land management practices to Increase in the coverage of semi-natural habitats:<br><br>Creating buffer strips, extending grassland along field margins, slopes and arable margins. Maintenance and improvement of hydrological systems, employing sensitive grazing regimes and extending woodland in appropriate places. These will help to increase /improve regulating services such as water quality, and soil erosion while contributing to sense of place. | Protect SSSI and BAP habitats; species-rich grasslands and broadleaved woodlands:<br><br>Establish a resilient ecological network, identify core areas and address gaps-particularly in relation to calcareous grassland and riparian habitats-including chalk streams.<br><br>Conserve important species populations in semi-natural and farmland settings; chalk grasslands on steep slopes, wet meadows and alongside chalk streams.<br><br>Create new grasslands for biodiversity linking with existing semi natural habitats to deliver multiple benefits.<br><br>Manage the ancient woodlands and parkland trees for their biodiversity.<br><br>Manage arable farmland habitats and farm woodlands to support increased numbers of farmland birds.<br><br>Incorporate access improvements and make provision for public engagement with nature. | **Biodiversity**<br><br>**Recreation**<br><br>**Regulating soil erosion**<br><br>**Regulating soil quality**<br><br>**Regulating water quality**<br><br>**Water availability**<br><br>**Sense of place / inspiration**<br><br>**Tranquillity** |

| Service | Assets/ attributes: main contributors to service | State | Main beneficiary | Analysis | Opportunities | Principal service offered by opportunities |
|---|---|---|---|---|---|---|
| **Geodiversity** | Designated geological sites<br><br>Exposures in old quarries<br><br>Local Geological sites<br><br>Local building stone<br><br>Rocks and fossils | There are currently 9 Nationally designated geological SSSI, 1 mixed interest SSSI and 38 Local Geological Sites. The Carstone, Red Chalk and white chalk are notable and provide a striking variation of colour and texture.<br><br>Most of the older buildings in the NCA are built of local stone including Tealby Limestone, Claxby Ironstone and Spilsby Sandstone. | Regional | SSSI, Local Geological Sites and geological exposures and geomorphological features provide important opportunities for research education and interpretation enabling a greater understanding of the nature and evolution of the landscape through time.<br><br>Exposing and managing the features for scientific, educational and recreational use makes a positive contribution to 'sense of place' and 'history'.<br><br>Local building stone is still available and is used for building which enhances local distinctiveness. | Conserve, manage and promote geodiversity sites and features as an integral part of the NCA to a wide audience; developing and improving visitor access where appropriate. | **Geodiversity**<br><br>**Sense of history**<br><br>**Sense of place / inspiration**<br><br>**Recreation**<br><br>**Biodiversity**<br><br>**Water availability** |

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The countryside charity

# Building on our food security

July 2022

# Contents

# Executive summary

Maintaining agricultural capacity to deliver significant levels of domestic food production is critical. This must be achieved in the context of addressing and adapting to climate change, reversing the loss of nature and meeting increasing demands on land for other social goods — not least affordable housing and renewable energy.

With enough previously developed 'brownfield' land to provide 1.2 million homes, and south-facing rooftops that could meet much of our energy needs, we have a chance to tackle the climate, housing and cost-of-living crises without sacrificing our farmland. Adjusting our farming sector to a post-Brexit model of subsidies should support the necessary move away from damaging intensive farming practices and towards a more multifunctional approach to using land — reconciling food production with better management for natural and cultural heritage, and for public access. Policies that are put in place now will be crucial in ensuring the most efficient use of our land in the face of these challenges.

This report by CPRE, the countryside charity, looks to quantify rates of built development on farmland identified as Best and Most Versatile (Grades 1, 2 and 3a) in the Agricultural Land Classification (ALC) used by government. The review covers development between 2010 (the date of the last published government-commissioned review) and 2022. Our report is also the first to look at national rates of development specifically on Grade 1 and 2 land. We propose alternative policy measures which would result in better outcomes for this valued land and more sustainable options for building the new homes we need. Our recommendations aim to influence the full review of the National Planning Policy Framework (NPPF) expected in 2023.

There are clearly many competing priorities for our land, but it is essential to preserve our most productive agricultural land from long-term loss; the NPPF[1] aims to protect best and most versatile land from development, but evidence shows that this is not being achieved in practice. In recent years, substantial losses have been reported for housing development that could have been built on suitable brownfield land instead. And as we know, once this precious asset is built on, it is lost for good.

## Our key findings include:

- In the past 12 years we have lost over 14,000 hectares of prime agricultural land to development, including 287,864 houses — equivalent to the productive loss of around 250,000 tonnes of vegetables and enough to provide nearly two million people with their 5-a-day for an entire year.
- 2022 saw the greatest number of hectares of BMV land planned for development — equating to a 100-fold increase on the number of hectares of BMV land built on in 2010.
- Flooding as a result of climate change poses a further risk, with almost 60% of our most productive Grade 1 land already sitting in the Environment Agency's Flood Zone 3.
- Since 2010, planning appeals which involved BMV land have had a 46% allowance rate in comparison to a total appeals allowance rate of 25%.
- The East of England has lost 3,232 ha of BMV land since 2010 — the greatest absolute loss within a single region.
- The BMV land surrounding our towns and cities (almost a quarter of the total, and a valuable resource for feeding these populations) is being developed at a rate nearly twice that of the national average.

## CPRE therefore recommends that the government should:

- Consult on and publish a national land use strategy that provides an integrated framework for local policy and decision-making on both planning and farming.
- Incorporate the following guidelines in the new NPPF to ensure the loss of valuable farmland is minimised:
  - a brownfield first policy
  - a greater steer towards medium- and high-density new housing
  - a firm presumption against development on BMV land — the higher the ALC grade, the greater the weight which should be attached to its protection.
- Require site-specific surveys to be mandatory on any development proposals involving more than 1 ha of land, unless it is clear that the site will not contain BMV land.
- Require local authorities to identify and track development on BMV land in their district.

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# Introduction

Maintaining agricultural capacity to deliver significant levels of domestic food production is critical. This must be achieved in the context of addressing and adapting to climate change, reversing the loss of nature and meeting increasing demands on land for other purposes — not least affordable housing and production of renewable energy. There is a particular need to move away from intensive farming practices and towards a more multifunctional approach to using land, reconciling food production with better management for natural and cultural heritage.

Appropriate identification, protection and use of our most productive land for food production will be a vital part of our national food security. The Government Food Strategy published in June 2022 stated that:

> "We have some of the best performing farms in the world, with 57% of agricultural output coming from just 33% of the farmed land area"[2].

It is therefore essential that we preserve the most productive agricultural land from long-term loss, but the evidence shows that, in practice, our national policies do not achieve this; recent years have seen substantial losses to housing development that could have been accommodated on suitable brownfield land instead.

Harnessing upcoming changes to land use policy can result in alternative policy measures which would result in better outcomes for our most productive land, as well as more sustainable options for building the new homes and energy facilities we need.

## Our Best and Most Versatile agricultural land

While all our land is of great value and potential for myriad reasons, the planning system's 'Best and Most Versatile' (BMV) classification is given to the agricultural land that is regarded as the most valuable in terms of its food producing potential. BMV land was first identified and classified in response to the demand for self-sufficiency following the Second World War. Land is identified as BMV (either Grade 1, 2 or 3a; there are six grades altogether) using the Agricultural Land Classification (ALC). The mapping of agricultural land is maintained by Natural England. Land which is classified as one of these three grades is deemed the most flexible in terms of the range of crops which can be grown, while also requiring lower inputs to produce high crop yields.

### Agricultural land classifications:

**Grade 1:**
Excellent quality agricultural land — land with no (or very minor) limitations and high and less variable yields. A very wide range of agricultural crops can be grown, such as apples and pears, salad crops, soft fruit, and winter harvested vegetables.

**Grade 2:**
Very good quality agricultural land — land with minor limitations that affect crop yields, cultivations or harvesting. Generally high yielding land but may be lower or more variable than Grade 1.

**Grade 3a:**
Good quality agricultural land — land which can consistently produce moderate to high yields of a reduced variety of arable crops, such as cereals, sugar beet and potatoes.

**Grade 3b:**
Moderate quality agricultural land — capable of producing moderate yields.

**Grade 4:**
Poor quality agricultural land — land with severe limitations.

**Grade 5:**
Very poor quality agricultural land — land with very severe limitations.

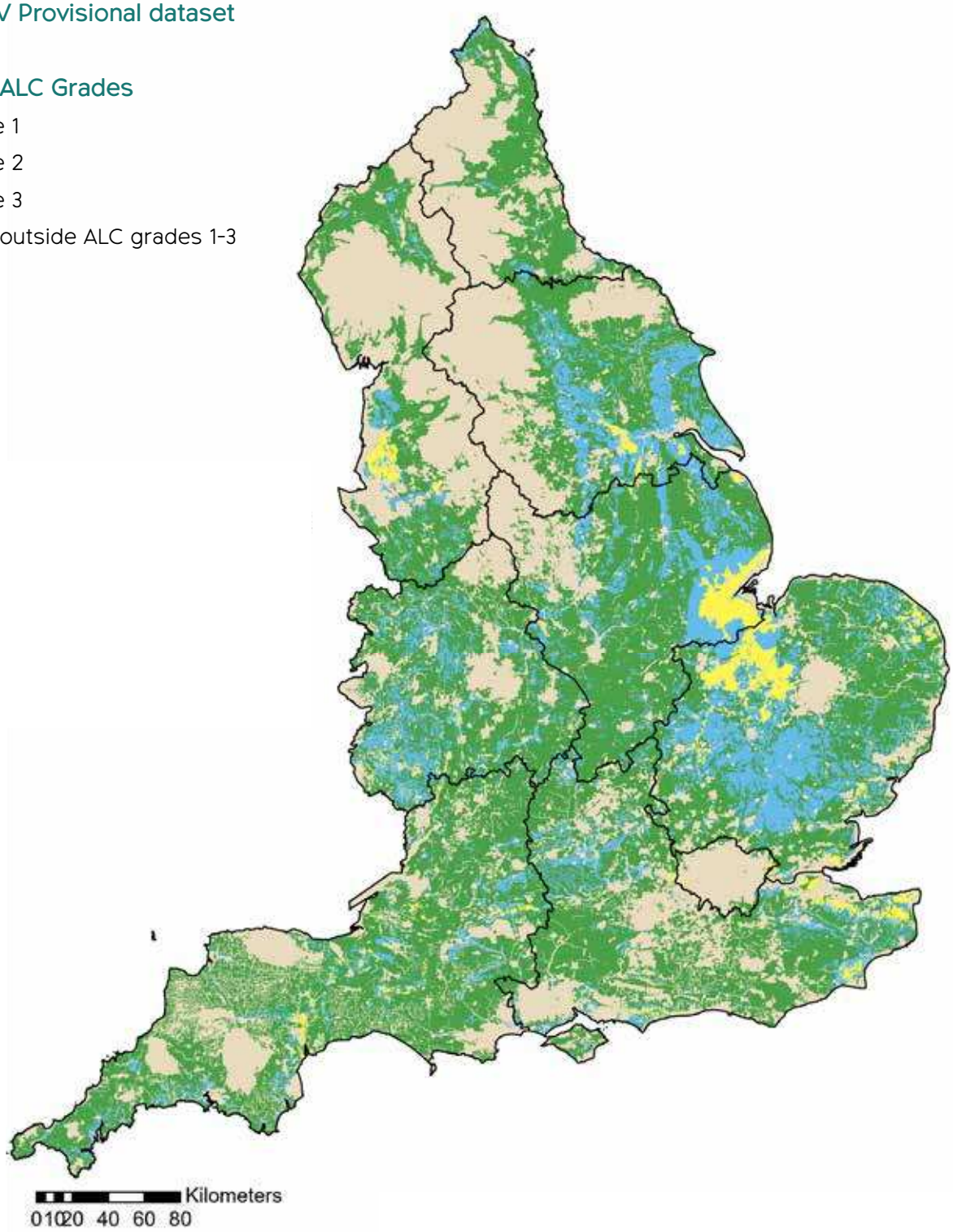
The process of grading agricultural land requires assessing factors which affect the site and its interactions, including: climate, aspect, gradient and soil. Crucially, the classification of BMV land does not consider the current agricultural use of the land, instead basing its grade on its inherent potential.

Figure 1

## Map of BMV Provisional dataset

### Provisional ALC Grades

- Grade 1
- Grade 2
- Grade 3
- Land outside ALC grades 1-3



## BMV: Protected through policy but not monitored

Identifying where the Best and Most Versatile agricultural land is located is a vital process for enabling the planning system to deliver on its sustainable development objectives. Identifying the locations of BMV land informs decisions on how farms and soils might be affected by a development, with the overall purpose of protecting the land from inappropriate or unsustainable proposals.

The National Planning Policy Framework (NPPF) states that:

> 'Planning policies and decisions should contribute to and enhance the natural and local environment...' by 'recognising the intrinsic character and beauty of the countryside and the wider benefits from the natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land...'

(Chapter 15, para. 174b). The NPPF also encourages local planning authorities to try to prioritise areas of poorer quality land for development over BMV.

In addition to national planning policy, legislation requires local planning authorities to consult Natural England (the government's adviser for the natural environment) on all non-agricultural applications which result in the loss of more than 20 hectares of BMV land but are not included in their local development plan[3]. National Planning Practice Guidance for the natural environment provides planning authorities with information on the value of protecting BMV and planning for its future use[4]. Furthermore, undertakings to protect BMV land were made in the Government's 25 Year Environment Plan of 2018[5], which states that the sustainable and efficient use of natural resources is vital to improving the environment.

No monitoring of the use of BMV land, or loss of it to development, has been reported by government since 2010[6]. In fact, to CPRE's knowledge, no national monitoring of development on land in the highest two grades (1 and 2) has ever been reported. This is in clear contrast to protected landscape designations of National Parks and Areas of Outstanding Natural Beauty, where land use patterns are monitored by the Department for Environment, Food & Rural Affairs (DEFRA), and Green Belts, where development rates are monitored by the Department for Levelling Up, Housing and Communities (DLUHC).

### Green Fingers in The Blue Finger

The 'Blue Finger' is a strip of Grade 1 agricultural land in north east Bristol that runs north into South Gloucestershire and is home to a number of community growing initiatives. Grow Wilder is a nature-friendly farming and gardening initiative run by Avon Wildlife Trust, while the Edible Futures market garden produces high quality salads and vegetables for the local community using environment friendly practices. Both these projects show the immense value that can be gained by communities and nature through the use of BMV land at the edge of towns and cities. Despite this, the Blue Finger has also suffered inappropriate development, with a new bus junction being developed through it in 2015. Changing national planning policies to require local plans to consider local food growing could play an important role in better protecting these often overlooked soils.

## Our best agricultural resource under threat

Despite national planning policy stating that the presence of BMV land should be considered when making planning decisions, this is not being achieved in practice. Shifts in policy which once focused on prioritising securing food production have now moved towards achieving 'sustainable development', which has resulted in increased losses of greenfield land in order to fulfil government housing delivery targets.

How we use our land resource is only going to become more important as the impacts of the climate emergency become evident, with significant areas of BMV land at risk of permanent flooding. Climatic change, especially rainfall patterns and accumulated temperatures, may also lead to changes in agricultural land quality that will reduce the extent of BMV land.

The purpose of this report is to build upon the previous research undertaken by DEFRA to review the effectiveness of BMV policy, in 2010 and 2004, which found considerable losses of high-grade agricultural land to development. We will explore the current extent of BMV land in England, analyse the current pressures placed on this land, and discuss policy measures which will result in better outcomes for people and the environment.

## A note on the different BMV datasets used

A number of datasets have been used in this report. Information on the extent of BMV land grades and development data in England was obtained and analysed from the following datasets:

- Provisional ALC 1:250,000 dataset (available at www.magic.gov.uk) — this dataset categorises BMV land into Grade 1, 2 and 3 and was used to identify developments which have taken place on BMV land.
- Post 1988 ALC Site Data (DEFRA, available from Natural England) — a dataset of detailed individual site survey data which classifies 2.8% (or 325,200 ha) of England's rural land into Grade 1, 2, 3a and 3b. This is out of a total area of 972,052 ha of detailed survey data available (8% of England's rural area).
- 'Likelihood of Best and Most Versatile' (BMV) land/ ALC Strategic Map (DEFRA, available from Natural England, received April 2022) — a predictive dataset at a scale of 1:250,000 which uses a combination of detailed ALC post-1988 surveys, provisional ALC data, climatic data and National Soil Resources Institute information to assess soil association areas by their likely proportion of BMV land. The likelihood maps do not distinguish individual grades, instead the categories are: High likelihood (areas where more than 60% of the land is likely to be BMV), Moderate likelihood (20-60% of the land is likely to be BMV) and Low likelihood (less than 20% of the land is likely to be BMV)
- Glenigan Report commissioned by CPRE on development proposals and decisions on BMV agricultural land (Glenigan.com)

## How much BMV land is there and where is it?

In 2012 Natural England[7] estimated that Grades 1 and 2 together formed about 21% of all farmland in England, with Grade 3a covering a further 21%. At that time DEFRA[8] estimated that the total area of farmed land in England was 8.9m hectares, suggesting that just under 3,750,000 ha of farmland (42%) was BMV in 2012.

Across rural England, there has been limited detailed surveying of BMV land. Datasets that exist which try to quantify how much land is classified as Grade 1, 2 or 3a are largely based on strategic analyses of land quality. Due to the predictive nature of assessing BMV land quantities, there are several datasets using different methodologies to provide estimates. We explore the 'Provisional ALC', 'Post 1988 detailed survey', and 'Likelihood of BMV' mapping datasets in the following tables.

Table 1 shows the hectares of Grade 1, 2 and 3 according to the 'Provisional' mapping produced via reconnaissance mapping in 1966. It also describes the hectares of Grade 3a land which have been identified through the Post 1988 detailed mapping. This dataset only assesses 8% of rural England, and in the light of the 2012 Natural England estimate mentioned above, the true quantity of this land type will be much (possibly as much as 1.5 million ha) higher. Table 1 shows that, which the data we have available, there is an estimated 2,272,782 ha of BMV (Grade 1, 2 and 3a) land across England. This is largely concentrated across the East Midlands, East of England, South West and Yorkshire and the Humber regions.

### Table 1

The hectares of Grade 1 and 2 land according to the 'Provisional' dataset and the hectares of Grade 3a according to the 'Post 1988' dataset in England. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data.

| Region | Grade 1 | Grade 2 | Grade 3a (Identified) | BMV Total (Grades 1, 2 and identified 3a) |
|---|---|---|---|---|
| East Midlands | 105,864 | 398,622 | 5,654 | 510,140 |
| East of England | 104,133 | 506,487 | 8,169 | 618,789 |
| London | 4,128 | 7,895 | 77 | 12,100 |
| North East | | 16,497 | 2,760 | 19,257 |
| North West | 29,134 | 79,143 | 4,812 | 113,089 |
| South East | 47,361 | 173,095 | 13,395 | 233,851 |
| South West | 37,318 | 220,045 | 17,033 | 274,396 |
| West Midlands | 13,584 | 186,845 | 7,847 | 208,276 |
| Yorkshire and the Humber | 13,064 | 260,449 | 9,371 | 282,884 |
| Total | 354,586 | 1,849,078 | 69,118 | 2,272,782 |

# Analyses

## Development on BMV land

The dataset obtained from development consultancy Glenigan was used to determine the hectares of BMV land which had been built on since 2010. This provided us with information on the developments which have taken place on BMV land according to the Provisional ALC dataset. As the Provisional ALC dataset does not provide subdivision of Grade 3, we used the Post 1988 detailed survey ALC dataset to identify which Grade 3 land was its respective Grade 3a category, where this detailed survey information was available (see above for further detail on this dataset).

From our available data we found that, between 2010 and 2022, there were 14,415 hectares of Grade 1, 2 and identified Grade 3a agricultural land covered by development (Figure 2). Of this, 8,035 ha were used for private housing developments totalling 287,864 houses. Another 1,400 ha were used for renewable energy developments including solar, illustrating that housing developments have had 55% of the impact on BMV land take.

In total, this 14,415 ha represents a 0.6% loss of our total identified BMV agricultural land of 2,272,782 ha (Table 1). Figure 2 also highlights that since 2010, there has been an overall increase in the amount of BMV agricultural land used for new developments, with a particular spike for projects with a start date of 2022. A total of 61 ha of identified BMV land was converted to development in 2010; this increases 100-fold in 2022, which sees project starts covering 6,500 ha of prime agricultural land and the highest rate of development identified to date.

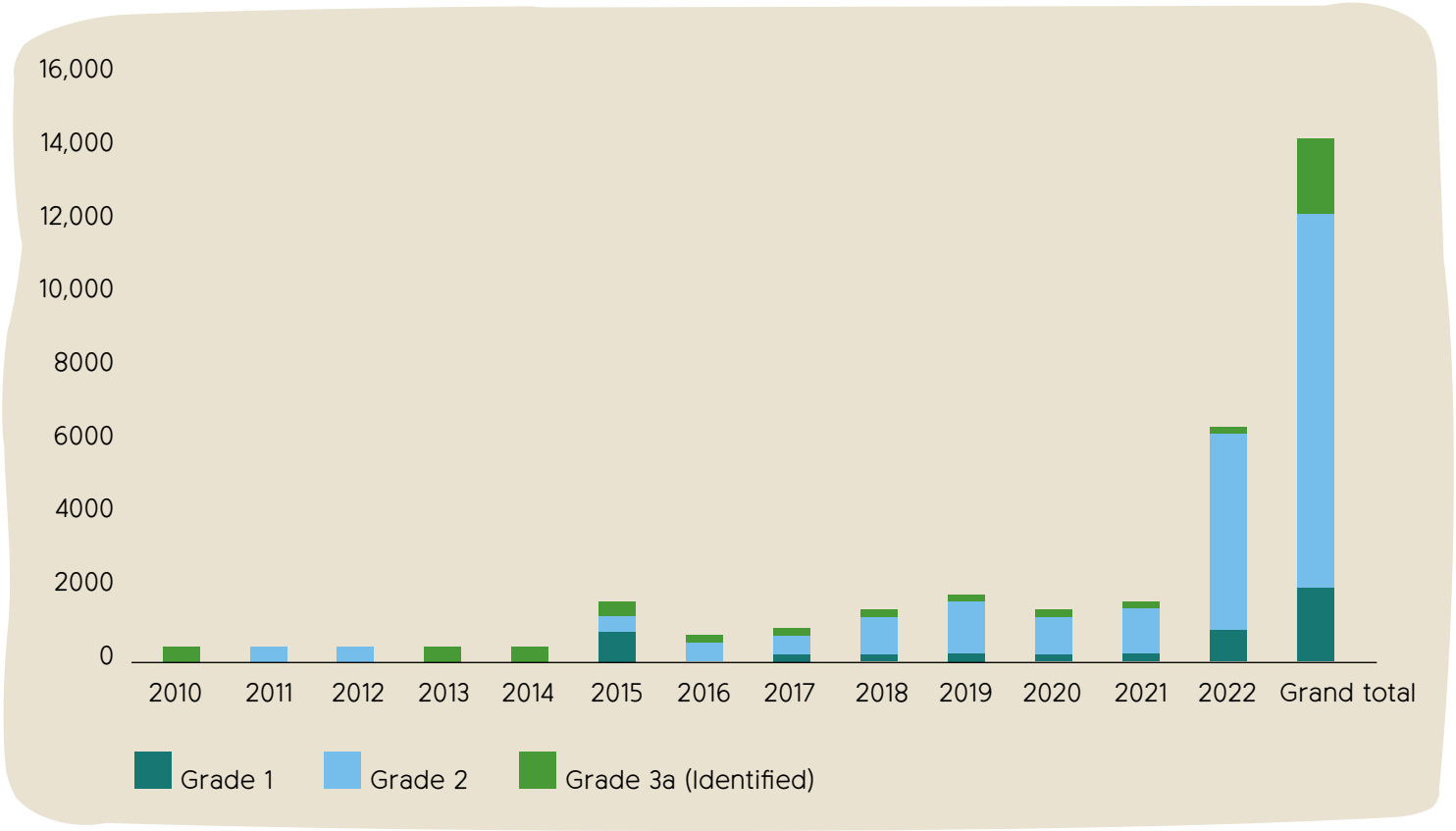
On first impression a 0.6% loss in our total BMV agricultural land sounds insignificant. However, the Food Foundation's Veg Facts series[9] found that, in 2018, only 1% of the UK's agricultural land was used to produce 52.7% of our vegetables — equivalent to 2.4 million tonnes[10] from 137,360 ha, or on average, 17.5 tonnes per hectare. If we extrapolate this production rate to the 14,415 ha BMV land developed in England, this is equivalent to losing the production of around 250,000 tonnes of vegetables — enough to provide nearly two million people with their 5-a-day for an entire year[11]. However, this calculation does not account for the higher crop yields from BMV agricultural land, meaning the production loss is likely to be higher than this.

For CPRE, the key point is that the loss of this land is unnecessary and avoidable. We have highlighted, through our State of Brownfield reports, that there is a plentiful and constantly replenishing supply of suitable previously developed (brownfield) sites available for housing development in each English region — more than enough to accommodate the housing that has been built on BMV land. In addition, there is plenty of potentially suitable alternative space for renewable technologies — particularly for solar panels on existing rooftops.

The general increase in the rate of development shown here is likely to be due to a gradual weakening of national planning policies on BMV, as well as on brownfield land and housing density. As previously discussed, the NPPF asks local planning authorities to consider the economic benefits of high-grade agricultural land when making planning decisions. But this is a demotion of BMV relevance within policy when we consider that the 1997 edition of the government's Planning Policy Guidance note 7 had a firm presumption against building on BMV; this was supported by the 'brownfield first' and minimum residential density policies contained in PPG3 after 2000 — both of which served to minimise the need to build on productive farmland.

## Figure 2

Shows the number of hectares of BMV land lost to development since 2010. Hectares lost of Grade 1 and 2 land are based on the 'Provisional' dataset and hectares lost in Grade 3a are based on available detailed survey information in the 'Post 1988' dataset. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data; Glenigan. See Table A1 for figures.



## The regional profile of BMV development

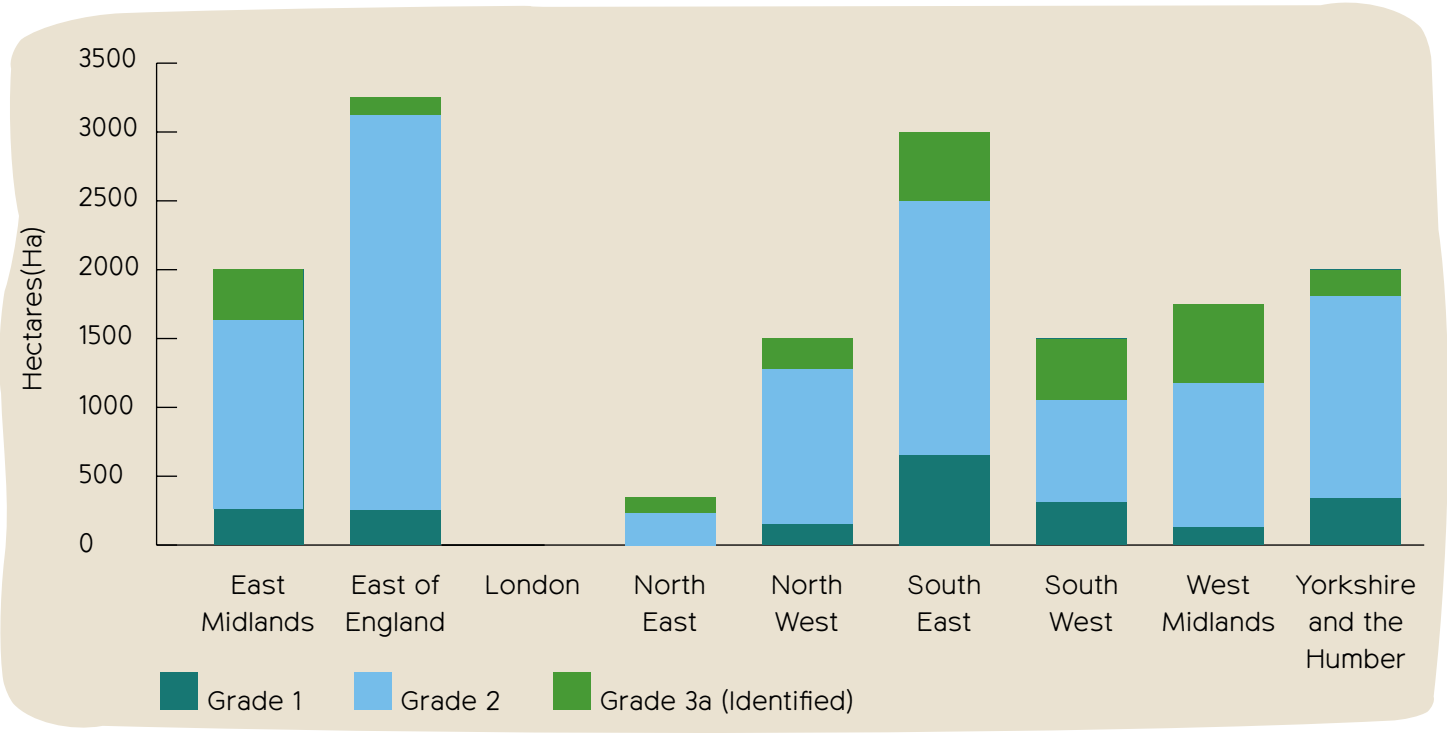
The same datasets were used to evaluate the regional differences in the overall loss of BMV agricultural land between 2010 and 2022, the result of which can be seen in Figure 3 and Tables 2 and 3.

There have been three regions (East Midlands, East of England and the South East) which have experienced the highest absolute losses of BMV agricultural land from development projects between 2010 and 2022 (Figure 3 and Table 2). In particular, the East of England has seen high levels of development on BMV land, having lost over 3,200 hectares over the past 12 years. This is followed closely by the South East region losing 2,920 hectares of BMV land overall, including the greatest regional loss of Grade 1 (excellent quality agricultural land) BMV land at 577 hectares.

Our BMV agricultural land is not spread evenly throughout the country; as previously highlighted, the top regions for the proportion of BMV are the East of England, East Midlands and Yorkshire and the Humber, so it would stand to reason that these areas would have some of the highest losses. However, Table 2 also shows that with over 1% loss each, the North East, North West and South East have seen the highest proportions of BMV land lost to development. Going further into the data, Yorkshire and the Humber has seen had the highest proportional loss of Grade 1 land, at over 3.5%, while the East Midlands, West Midlands and South East have lost 7%, 6% and 4%, respectively, of their Grade 3a land (Table 3).

### Figure 3

The hectares of Grade 1, 2 land according to the 'Provisional' dataset and the hectares of Grade 3a according to the 'Post 1988' dataset in England, which have been developed since 2010, by region. Data: Provisional ALC 1:250,000 dataset/ Post 1988 ALC Site Data/ Glenigan. See Table A2 for breakdown of figures.



## Table 2

Shows the total hectares of BMV in each region, the number of those hectares which have been developed and the percentage developed as a proportion of the total area of BMV land in that region*. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data.

| Region | BMV Total | BMV Developed | Proportion developed (%) |
|---|---|---|---|
| East Midlands | 510,140 | 1,970 | 0.39 |
| East of England | 618,789 | 3,232 | 0.52 |
| London | 12,100 | 2 | 0.02 |
| North East | 19,257 | 314 | 1.63 |
| North West | 113,089 | 1,255 | 1.11 |
| South East | 233,851 | 2,920 | 1.25 |
| South West | 274,396 | 1,316 | 0.48 |
| West Midlands | 208,276 | 1,629 | 0.78 |
| Yorkshire and the Humber | 282,884 | 1,777 | 0.63 |
| Total | 2,272,782 | 14,415 | 0.63 |

* BMV figures derived from total sum of 'Grade 1', 'Grade 2' in Provisional dataset and 'Grade 3a (Identified)' in the Post 1988 dataset.

## Table 3

The percentage of Grade 1, 2 and Grade 3a (identified) which has been developed in that region since 2010 as a proportion of the total area of each category in that region*. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data; Glenigan.

| Region | Grade 1 | Grade 2 | Grade 3a (Identified) |
|---|---|---|---|
| East Midlands | 0.22 | 0.33 | 7.37 |
| East of England | 0.23 | 0.57 | 1.26 |
| London | 0.05 | - | - |
| North East | - | 1.52 | 2.29 |
| North West | 0.38 | 1.23 | 3.60 |
| South East | 1.22 | 1.04 | 4.04 |
| South West | 0.84 | 0.31 | 1.93 |
| West Midlands | 0.66 | 0.56 | 6.23 |
| Yorkshire and the Humber | 3.53 | 0.45 | 1.47 |

* BMV figures derived from total sum of 'Grade 1', 'Grade 2' in Provisional dataset and 'Grade 3a (Identified)' in the Post 1988 dataset.

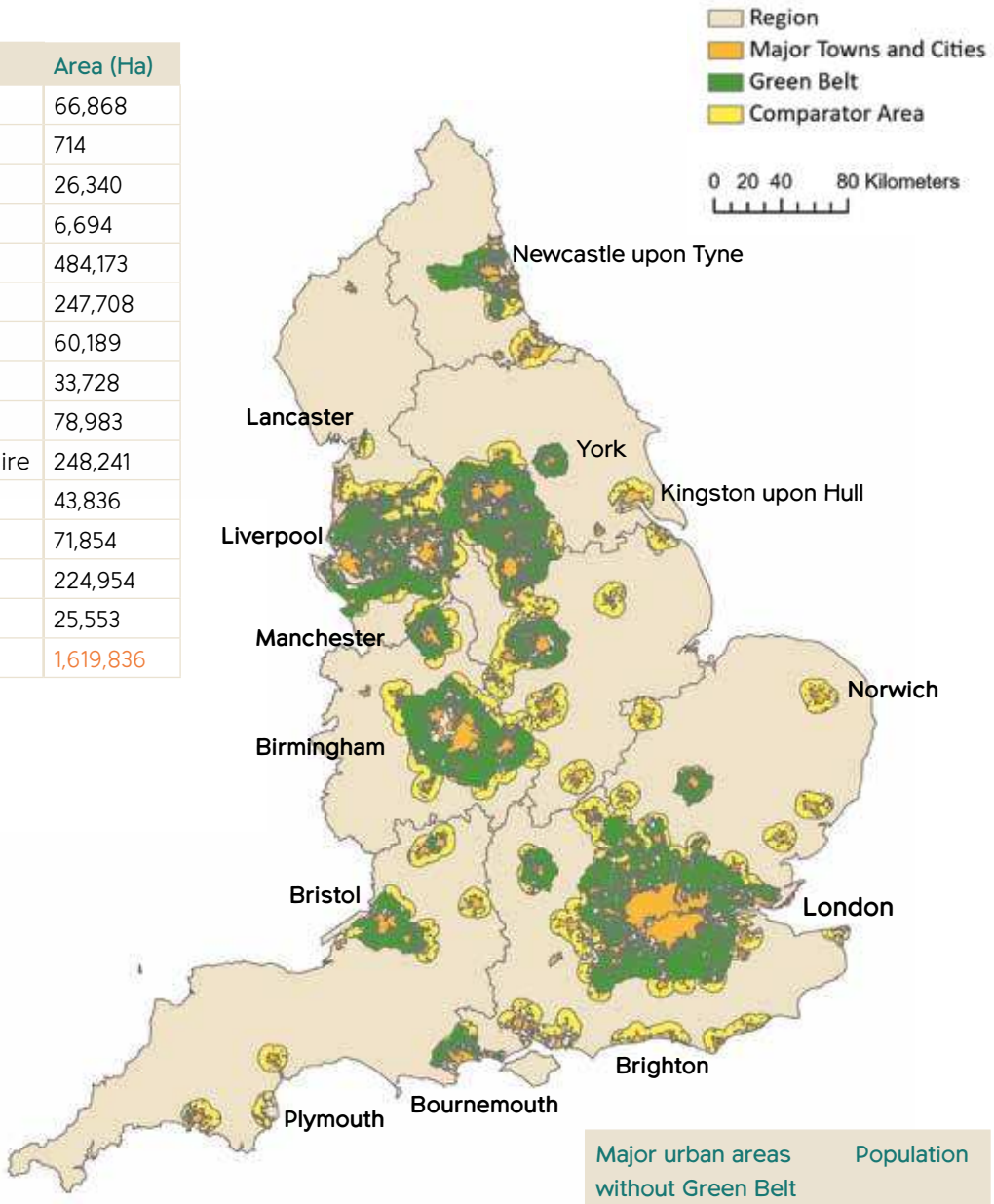
## BMV around towns and cities

This part of the research looks at BMV development in areas designated as Green Belt, as well as areas of undesignated and largely undeveloped land around large towns and cities. Together, these areas of land make up around 22% of England's land area (Figure 4)

### Figure 4

**Countryside around towns including:**
**Green Belt (green); other large towns & cities without Green Belts (yellow)**

| Green Belt | Area (Ha) |
|---|---|
| Avon | 66,868 |
| Burton and Swadlincote | 714 |
| Cambridge | 26,340 |
| Gloucester and Cheltenham | 6,694 |
| London | 484,173 |
| North West | 247,708 |
| Nottingham and Derby | 60,189 |
| Oxford | 33,728 |
| SW Hampshire and SE Dorset | 78,983 |
| South Yorkshire and West Yorkshire | 248,241 |
| Stoke on Trent | 43,836 |
| Tyne and Wear | 71,854 |
| West Midlands | 224,954 |
| York | 25,553 |
| Total | 1,619,836 |




| Major urban areas with Green Belt | Population |
|---|---|
| London | 7,215,900 |
| Birmingham | 970,900 |
| Liverpool | 469,000 |
| Leeds | 443,250 |
| Sheffield | 439,870 |
| Bristol | 420,560 |
| Manchester | 394,270 |
| Coventry | 303,480 |
| Bradford | 293,720 |
| Stoke on Trent | 259,250 |
| Wolverhampton | 251,430 |
| Nottingham | 249,650 |
| Derby | 229,400 |

| Major urban areas without Green Belt | Population |
|---|---|
| Leicester | 303,580 |
| Kingston upon Hull | 301,420 |
| Plymouth | 243,800 |
| Southampton | 234,250 |
| Reading | 232,660 |

Safeguarding the land around our urban centres for nature-friendly farming allows for the connection between urban and rural economies to be rebuilt. This offers multiple benefits, such as securing access to locally produced foods for our urban centres; creating jobs through increased generation of goods and services; and providing green spaces and educational opportunities for city dwellers. The promotion of ecological farming practices in our urban fringe also has many benefits which will support existing government goals for the sequestration of carbon and promotion of biodiversity. The use of our urban fringe BMV land for ecological farming offers us the optimal return in regard to all of these benefits. However, due to its location, BMV land in the urban fringe is unique in that it will face a higher development threat than other areas of BMV land.

Our analysis found that there are 537,262 hectares of BMV classified land in the countryside around towns and cities; 23.6% of all England's BMV is in these areas, making the urban fringe representative of the wider countryside in this sense.

Table 4 shows the amount of development which has occurred on BMV land in countryside around towns and cities. In total, 5,565 hectares have been lost — over a third of England's total BMV loss and 1% of the total BMV land available in these areas. The regions which have been hardest hit by BMV development in countryside around their towns and cities are the East Midlands, North East, South East and South West. Grade 3a is experiencing the highest losses, with the East Midlands losing nearly 8% of its total identified 3a land while the North West and South East have lost 4% and 5% respectively.

### Table 4

The hectares of Grade 1, 2 and 3 land according to the 'Provisional' dataset and the hectares of Grade 3a and 3b according to the 'Post 1988' dataset around towns and cities, which have been developed since 2010. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data; Glenigan.

| Region | Grade 1 | Grade 2 | Grade 3a (Identified) | BMV Total |
|---|---|---|---|---|
| East Midlands | - | 547 (0.94) | 266 (8.53) | 813 (1.31) |
| East of England | 18 (0.15) | 1,012 (0.86) | 21 (0.59) | 1,051 (0.79) |
| London | 2 (0.06) | - | - | 2 (0.02) |
| North East | - | 102 (2.01) | 35 (2.37) | 136 (2.09) |
| North West | 60 (0.21) | 392 (0.94) | 128 (4.25) | 580 (0.79) |
| South East | 363 (2.18) | 548 (0.85) | 268 (5.34) | 1,178 (1.37) |
| South West | 168 (1.96) | 332 (1.30) | 60 (1.39) | 559 (1.46) |
| West Midlands | 14 (0.53) | 599 (0.77) | 230 (3.93) | 843 (0.98) |
| Yorkshire and the Humber | - | 347 (0.97) | 55 (0.94) | 402 (0.96) |
| Total | 625 | 3,878 | 1,062 | 5,565 (1.03) |

## Development through Appeals

Local planning authorities make the decisions on whether a planning application should be given permission after weighing up many different variables as required by national planning policies. If an authority decides that a planning application should not be given permission, the applicant has a six-month window to decide if they would like to appeal that decision to the Secretary of State.

The Planning Inspectorate is a government agency which has the power, acting on behalf of the Secretary of State, to overturn a refusal of planning consent by a local planning authority (LPA) if it believes the LPA decision was unsound. In major cases the final decision may be taken by the Secretary of State who can overrule the planning inspector's recommendation. For this part of the research, CPRE analysed appeal decisions from 2010 onwards which include reference to BMV land, to gain understanding of how much weight the presence of BMV land has in planning decisions by the inspectorate.

Table 5 shows that since 2010, there have been 147 appeals that mention BMV land within the appeal report. Of these, 67 were allowed and 80 dismissed, an overall allowance rate of 46%. Appeals which were allowed used 788 ha of BMV land, with over half of this land take occurring in 2015 and 2016. This is much higher than the average rate at which all appeals are allowed (about 25%) but also consistent with the rate at which appeals involving a public inquiry are allowed. Most, if not all, appeals involving BMV land would need an inquiry due to the heightened controversy.

Further analysis into appeal reports showed us that the most common reason quoted for an application appeal to be allowed was due to the local planning authority not having a five-year housing land supply, quoted in 22 of the appeal reports. Of the 87 appeals which were dismissed, 12 gave 'significant' weight to the presence of BMV land while 10 gave 'moderate weight'. The presence of BMV land in 33 dismissed appeals played either a 'limited', 'modest' (or 'some') or no role in the appeal ultimately being rejected. This raises the question of how much value is being placed on the presence of BMV land by DLUHC and the Planning Inspectorate within the wider context of meeting housing targets in a district.

A recent comment made by Lord Benyon in a Lords debate on food security[12] remarked that

> 'very strict rules relate to both planning and the use of the best agricultural land',

in relation to a major solar development which has been given permission on BMV land in Suffolk. However, with almost half of appeals involving BMV land being allowed by the Planning Inspectorate, it could be reasonably argued that these policies are not strong enough.

## Housing development versus BMV protection

September 2021 saw an appeal for 118 houses on a BMV site in West Sussex allowed by the Planning Inspectorate. The development of the site resulted in a loss of 4.5 ha of Grade 2 and 3a agricultural land, as well as 2 ha of a nitrate mitigation site, and was described as 'not ideal' in the inspector's report. Driven by Chichester's out-of-date Local Plan, the development of this BMV land was described as 'inevitable' due to constraints on land from the protected South Downs National Park and Chichester Harbour AONB, limiting other development site opportunities to meet the councils housing needs. Current national planning policy results in these trade-offs between different land uses, whereas policy should allow for a more integrated decisions and better outcomes.

The introduction of a national land use strategy, together with more local influence over the implementation of land management policy, would allow for more integrated policies and decision-making, and better outcomes, addressing the wasteful pattern of development often driven by the requirement for a district to meet its housing targets. The outcome should be living more within environmental limits and being able to expand environmental capacity rather than continue to shrink it. In England, there is also an important equity dimension to land use: there is an increasingly urgent need to spread or 'level up' development and quality of life more fairly between the pressurised south of the country and the relatively neglected midlands and northern regions.

### Table 5

Shows the number of allowed and dismissed appeal decisions which have mentioned BMV land within the Planning Inspector's report. Data: Compass; CPRE analysis

| Year | Allowed | Dismissed | Allowed Area (Ha) | Allowed Rate (%) |
|---|---|---|---|---|
| 2010 | - | - | - | - |
| 2011 | - | 3 | - | 0 |
| 2012 | 1 | 3 | 4 | 25 |
| 2013 | 3 | 1 | 11 | 75 |
| 2014 | 3 | 4 | 77 | 43 |
| 2015 | 7 | 17 | 366 | 29 |
| 2016 | 17 | 28 | 117 | 38 |
| 2017 | 12 | 6 | 38 | 67 |
| 2018 | 4 | 5 | 11 | 44 |
| 2019 | 3 | 2 | 7 | 60 |
| 2020 | 4 | 5 | 45 | 44 |
| 2021 | 11 | 8 | 71 | 58 |
| 2022 | 2 | 1 | 40 | 67 |
| Total | 67 | 80 | 788 | 46 |

# Future threats: Flooding

The land losses resulting from permanent development on land classified as BMV is further compounded if we consider other current and future pressures on this land. Farmland is severely damaged when hit by flooding, causing delays to the harvest and a reduction in yields. For this analysis, we look into the current flooding threat BMV land faces.

The Environment Agency produces maps of flood risk to support food risk assessments in planning. Using the 'Flood Map for Planning (Rivers and Sea) - Flood Zone 3' dataset (data.gov.uk)[13] we determined how much of the Provisional ALC mapping fell into these areas. Flood zone 3 represents areas of the highest risk of flooding.

Table 6 shows that an estimated 212,319 ha of all England's Grade 1 BMV land is within flood zone 3 areas — this means 59.8% of all England's Grade 1 BMV land is at the highest risk of flooding. The regional profile of flood risk shows that 75% and 95%, respectively, of the East Midlands and East of England Grade 1 land is at the highest risk of flooding, shown on (Figure 6 a and b).

The figures presented here are representative of the current threat posed by flooding, but the consequences of climate change are likely to increase the threat posed by flooding even further. The Met Office predicts that the intensity of rain will increase and that, by 2070, rainfall in the summer will have increased by 20%, with a 25% increase in winter[14]. The implications of climate change will have severe consequences for the loss of BMV land and our resulting food security. Protecting BMV land from permanent development now is vital if we are to maintain a supply of BMV land as climate change progresses. Our analysis found that around 450 hectares of BMV land have already been used to build flood defence developments, suggesting that we are already seeing the impacts on climate change on this land.

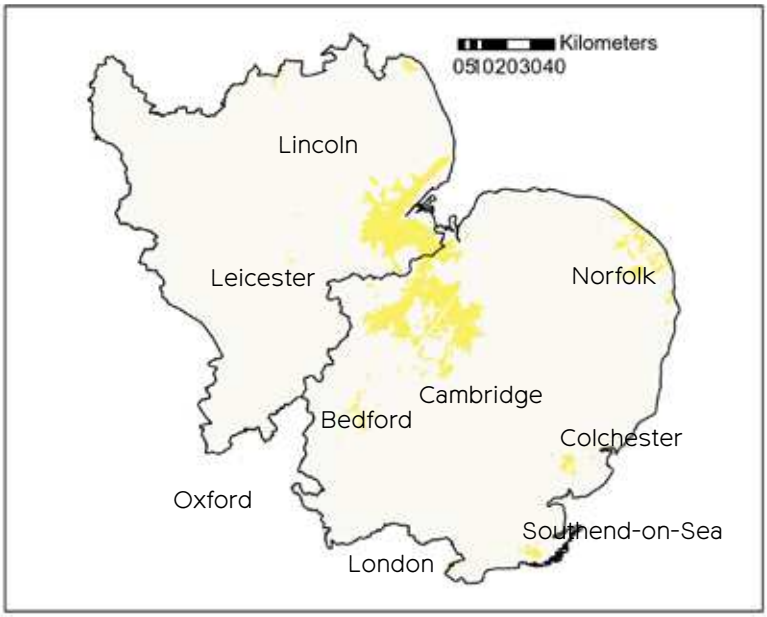
### Table 6

The hectares of Grade 1, 2 and 3 land according to the Provisional dataset which fall into Flood Zone 3 by region. Data: Provision ALC 1:250,000 dataset / Environment Agency[15]

| Region | Grade 1 | Grade 2 | Grade 3 | Total |
|---|---|---|---|---|
| East Midlands | 79,903 | 121,191 | 105,897 | 306,991 |
| East of England | 98,784 | 89,969 | 87,797 | 276,550 |
| London | 130 | 15 | 1,077 | 1,222 |
| North East | - | 5,153 | 16,732 | 21,885 |
| North West | 6,625 | 10,965 | 41,290 | 58,880 |
| South East | 6,994 | 24,256 | 51,944 | 83,194 |
| South West | 1,606 | 14,956 | 82,424 | 98,986 |
| West Midlands | 1,426 | 9,349 | 44,525 | 55,300 |
| Yorkshire and the Humber | 16,851 | 58,736 | 97,000 | 172,587 |
| Total | 212,319 | 334,590 | 528,686 | 1,075,595 |

Figure 6a shows the Grade 1 classified land within the East Midlands and East of England regions. Figure 6b shows the Grade 1 land (as in Figure 6a) and those areas which are considered to be in 'Flood Zone 3'

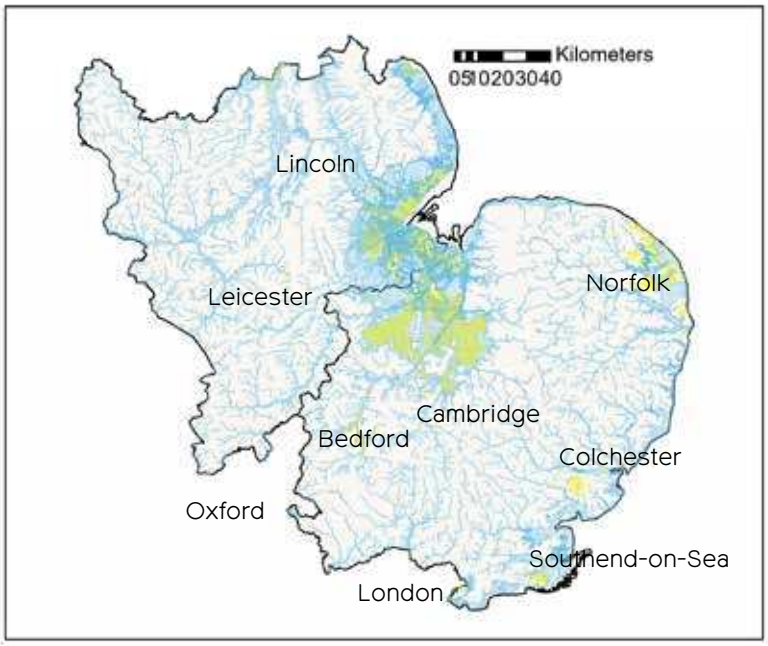
## Figure 6a




### Legend

- Grade 1
- Flood zone 3
- East Midlands and East Region

## Figure 6b






# Conclusion and recommendations

This report has found that current planning policy is not sufficient in protecting our BMV agricultural land and that we continue to needlessly place development on this valuable resource. We have seen a trend of increasing amounts of BMV land being used for development since 2010, likely resulting from continued pressure on Local Planning Authorities to find land within their districts to meet their nationally imposed housing targets. The effects of housing pressure are surfacing in the usual hot spots for development such as the East of England and South East, in addition to high BMV land take in the West and East Midlands, likely resulting from a lack of land use strategies across the country. However, drawing solid conclusions on the status of development on BMV land will continue to be difficult until more accurate and up-to-date information is available on exactly where BMV land is. As a result, the figures we have stated in this report are indicative but are likely to be conservative estimates.

It is vital that we maintain as much of our domestic food production as possible. As recent events have shown, the food security of the country increasingly hangs in the balance. Meanwhile, the pressures on our most productive land will only continue to increase as we experience more damaging effects from the changing climate. Protecting our BMV agricultural land should be of top priority.

CPRE therefore reccommends that the government should:

- Consult on and publish a national land use strategy that provides an integrated framework for local policy and decision-making on both planning and farming.
- Incorporate the following guidelines in the new NPPF to ensure the loss of valuable farmland is minimised:
  - a brownfield first policy
  - a greater steer towards medium- and high-density new housing
  - a firm presumption against development on BMV land — the higher the ALC grade, the greater the weight which should be attached to its protection.
- Require site-specific surveys to be mandatory on any development proposals involving more than one hectare of land, unless it is clear that the site will not contain BMV land.
- Require local authorities to identify and track development on BMV land in their district.

# Annex

## Methods

Development on BMV land analysis: To understand the quantities of BMV land which have been built on since 2010, we used several spatial datasets from Natural England and a development dataset obtained from development consultancy, Glenigan. The majority of information on the ALC Grade of soils throughout the country is based on the old system which does not include Grades 3a and 3b, instead placing both of these Grades into an aggregated Grade 3. Using GIS tools and the Post 1988 dataset, we were able to determine which developments in our dataset fell into Grade 3a land, and as a result could be considered BMV for our findings. It should be noted that the post 1988 dataset covers only 8% of rural England, and as a result, we were only able to identify 3% of the Grade 3 land which fell into Grade 3a or 3b.

### Appeals analysis:

During April 2022, CPRE collated inspector reports from planning appeals platform, Compass. A key word search was conducted using the phrases 'BMV' and 'Best and Most Versatile' to identify the relevant appeals.

### Flooding risk analysis:

To assess the risk to faced by BMV to Flooding, CPRE used the existing 'Provisional' mapping dataset and the Environment Agency's flood risk for planning, flood zone 3 datasets, to understand where areas of BMV land were falling in relation to high flood risk areas. Using GIS tools these two spatial datasets were overlaid, and the intersect between flood zone 3 and Grade 1 areas was measured.

## Complementary tables of figures

### Table A1

Shows the number of hectares of BMV land lost to development since 2010. Hectares lost of Grade 1 and 2 land are based on the 'Provisional' dataset and hectares lost in Grade 3a are based on available detailed survey information in the 'Post 1988' dataset. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data; Glenigan.

| Row Labels | Grade 1 | Grade 2 | Grade 3a (Identified) | BMV total |
|---|---|---|---|---|
| 2010 | 1.15 | 59.03 | 1.29 | 61.47 |
| 2011 | 1.87 | 102.32 | - | 104.19 |
| 2012 | 39.26 | 1.68 | - | 40.94 |
| 2013 | 3.94 | 107.36 | 0.87 | 112.17 |
| 2014 | 5.08 | 94.25 | 16.00 | 115.33 |
| 2015 | 484.44 | 278.42 | 197.17 | 960.04 |
| 2016 | 34.85 | 363.94 | 17.28 | 416.07 |
| 2017 | 110.04 | 414.43 | 81.07 | 605.54 |
| 2018 | 132.88 | 855.15 | 139.44 | 1,127.47 |
| 2019 | 220.71 | 1,252.16 | 313.40 | 1,786.27 |
| 2020 | 93.03 | 802.42 | 172.10 | 1,067.55 |
| 2021 | 154.91 | 1,158.48 | 222.79 | 1,536.18 |
| 2022 | 752.38 | 4,637.93 | 1,091.94 | 6,482.26 |
| Total | 2,034.5 | 10,127.6 | 2,253.4 | 14,415.5 |

### Table A2

The hectares of Grade 1, 2 and 3 land according to the 'Provisional' dataset and the hectares of Grade 3a and 3b according to the 'Post 1988' dataset in England, which have been developed since 2010, by region. Data: Provisional ALC 1:250,000 dataset; Post 1988 ALC Site Data; Glenigan.

| Region | Grade 1 | Grade 2 | Grade 3a (Identified) | BMV Total (Grade 1, 2 and identified Grade 3a) |
|---|---|---|---|---|
| East Midlands | 238 | 1,315 | 417 | 1,970 |
| East of England | 243 | 2,887 | 103 | 3,232 |
| London | 2 | - | - | 2 |
| North East | - | 251 | 63 | 314 |
| North West | 111 | 971 | 173 | 1,255 |
| South East | 577 | 1,802 | 541 | 2,920 |
| South West | 313 | 674 | 329 | 1,316 |
| West Midlands | 90 | 1,050 | 489 | 1,629 |
| Yorkshire and the Humber | 461 | 1,178 | 138 | 1,777 |
| Total | 2,035 | 10,128 | 2,253 | 14,415 |

# Supplementary analyses

## Likelihood of BMV land dataset

While the analyses in this report provide us with some insight into the quantities of BMV land which have been developed, the limited size of the Post 1988 Site Survey dataset means it is difficult to determine the true extent of BMV land take due to limited knowledge of the relative proportions of Grade 3a and 3b land.

Due to this, complementary analyses using Natural England's 'Likelihood' of BMV land dataset were undertaken to gain a strategic insight into the BMV land take for development and give some initial indication as to the full extent of BMV land being lost. This dataset is used to show the best available estimate of agricultural land quality at the date of compilation (April 2022) expressed in terms of the proportion of land likely to be classified as BMV, either 'High', 'Moderate' or 'Low' (see Box 2 for the breakdown of these categories).

As the Likelihood dataset is based on a proportion of land being BMV, our results have been made on conservative estimates which account for the probability that a development may not be on BMV land. For example, 60% of the total estimated land take is presented in Table 3A for the 'High' category, 40% of the land take for 'Moderate' and 20% for the 'Low' category.

Table A3 shows the likelihood of an area of land being either Grade 1, 2 or 3a, details of the likelihood categories can be found in Box 2. The areas of England which are likely to have high proportions of BMV land are predominantly found in the East of England, followed by the East and West Midlands, and Yorkshire and the Humber.

### Table A3

Shows the hectares of land within England which fall into 'High', 'Moderate' or 'Low' likelihood of being BMV land. Data: Likelihood of 'Best and most versatile' (BMV) land/ALC Strategic Map

| Region | High | Moderate | Low |
|---|---|---|---|
| East Midlands | 540,193 | 481,762 | 341,292 |
| East of England | 945,344 | 431,137 | 216,432 |
| London | 8,057 | 6,164 | 7,831 |
| North East | 75,387 | 199,734 | 431,093 |
| North West | 240,429 | 232,307 | 679,513 |
| South East | 410,838 | 625,829 | 430,315 |
| South West | 477,820 | 667,416 | 938,988 |
| West Midlands | 519,162 | 392,691 | 187,285 |
| Yorkshire and the Humber | 511,336 | 241,719 | 573,304 |
| Total | 3,728,566.00 | 3,278,759.00 | 3,806,053.00 |

Our analysis found that it is likely that 18,772 hectares of BMV land have been used for development since 2010 — this is equivalent to 0.44% of the total BMV land available in England (Table A4) according to this dataset. Two regions, the East Midlands and West Midlands, have had the greatest BMV land losses in total terms and as a proportion of the amount of BMV land they have available, with 4,194 hectares (0.72%) and 3,631 hectares (0.72%), respectively. Figure A1 shows that the general trend since 2010 has been an increase in the use of BMV land for development (with particular peaks in 2019 and 2022) and that the usage of High Likelihood land has been increasing in particular. It is important to note that the relatively smaller numbers in the 'Low' category is likely due to our development dataset being based on the 'Provisional' BMV dataset, and as a result will not be a complete picture of all development on BMV land.

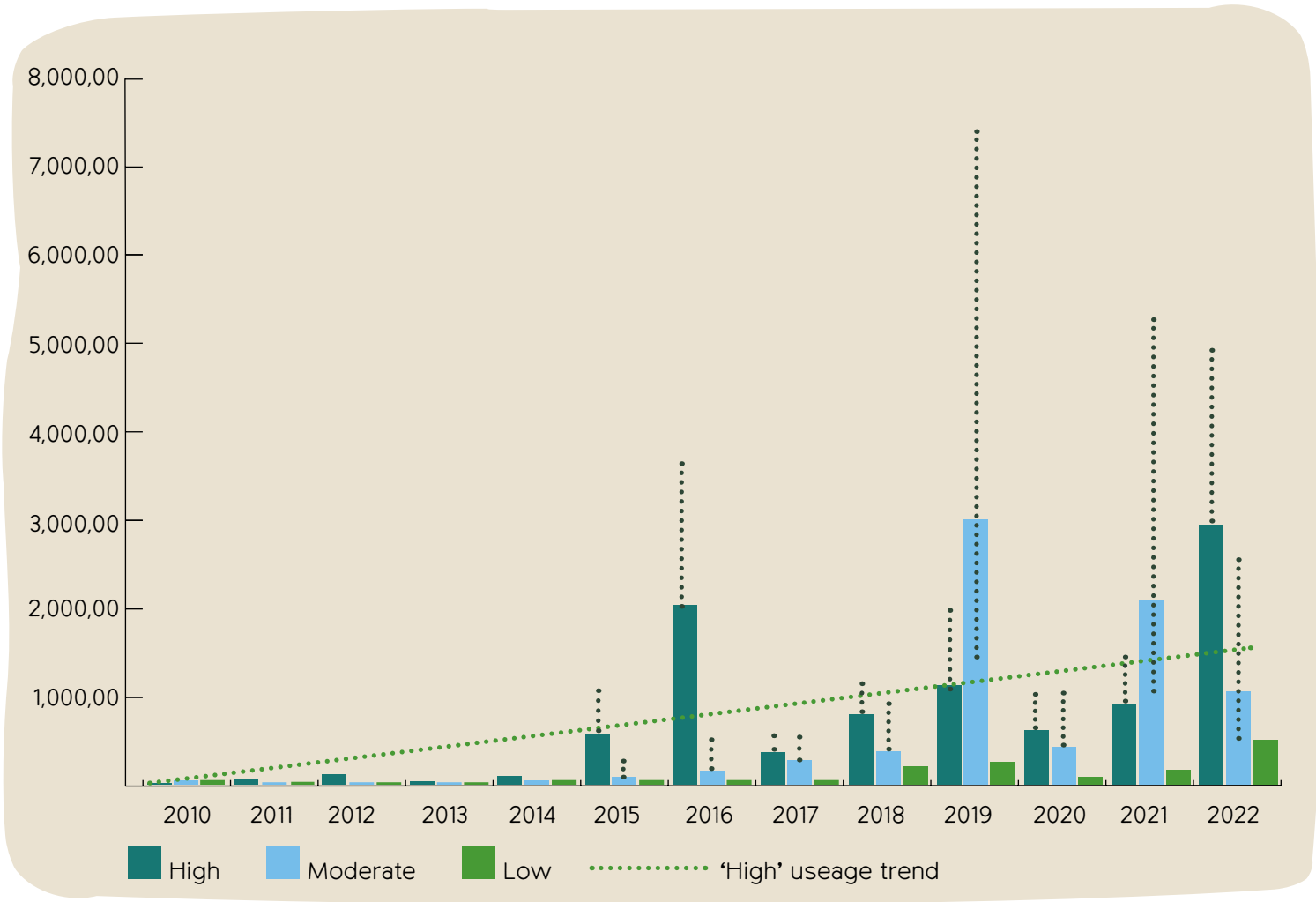
### Table A4

Shows the hectares of land within England which fall into 'High', 'Moderate' or 'Low' likelihood of being BMV land which have been developed, along with the percentage of this development as a proportion of the amount of that land type available in that region. Data: Likelihood of 'Best and most versatile' (BMV) land; ALC Strategic Map; Glenigan.

| Region | High | Moderate | Low | Total |
|---|---|---|---|---|
| East Midlands | 3,215 (0.99) | 834 (0.43) | 145 (0.21) | 4,194 (0.72) |
| East of England | 1,790 (0.32) | 438 (0.25) | 131 (0.30) | 2,360 (0.30) |
| London | 10 (0.20) | 48 (1.95) | 15 (0.99) | 73 (0.83) |
| North East | 89 (0.20) | 286 (0.36) | 225 (0.26) | 601 (0.28) |
| North West | 760 (0.53) | 419 (0.45) | 114 (0.08) | 1,292 (0.35) |
| South East | 1,044 (0.42) | 601 (0.24) | 222 (0.26) | 1,867 (0.32) |
| South West | 713 (0.25) | 473 (0.18) | 382 (0.20) | 1,568 (0.21) |
| West Midlands | 813 (0.26) | 2,762 (1.76) | 56 (0.15) | 3,631 (0.72) |
| Yorkshire and the Humber | 1,276 (0.42) | 1,755 (1.82) | 156 (0.14) | 3,187 (0.62) |
| Total | 9,709 (0.43) | 7,617 (0.58) | 1,446 (0.19) | 18,772 (0.44) |

## Figure A1

Shows the hectares of land within England which fall into 'High', 'Moderate' or 'Low' likelihood of being BMV land which have been developed. Error bars show variation within the likelihood category. Trendline shows the rate of 'High' probability land being developed since 2010. Data: Likelihood of 'Best and most versatile' (BMV) land/ALC Strategic Map/ Glenigan




# Explanatory note re Digital ALC data

## There are four digital Agricultural Land Classification (ALC) datasets:

- Provisional ALC 1:250,000 dataset. Also available to view and down load from the website www.magic.gov.uk (select 'interactive map' then 'landscape' topic and a scale of 1:250 001 to view).
- Pre 1988 ALC site data – individual sites surveyed in more detail by MAFF (including subdivisions of Grade 3 Land) before 1988; individual sites mapped at varying scales and level of detail from 1:5,000 to 1:50,000 (typically 1:10,000). Older data for land assessed under 'old' ALC guidelines which have now been superseded. Original paper maps and reports have been scanned by DCS and held in 'Filestore' (password access). Survey files and other soil records are stored with TNT.
- Post 1988 ALC site data - individual sites surveyed in more detail by MAFF (including subdivisions of Grade 3 Land) between 1989 and 1999; individual sites mapped at varying scales and level of detail from 1:5,000 to 1:50,000 (typically 1:10,000). The most detailed and up to date dataset. Original paper maps and reports have been scanned by DCS and held in 'Filestore' (password access). Survey files and other soil records are stored with TNT.
- Likelihood of 'Best and most versatile' (BMV) land – (sometimes referred to as ALC Strategic Map) is derived from existing ALC, ALC climate data and Soil Association data (not current NSRI dataset but that originally digitised by FRCA from the published paper soil maps).

Defra is nominally the owner of all this data but Natural England acts as its guardian. Natural England is the only body holding the data, including all the paper site survey records which support them, and is the main source of expertise. (Julie Holloway is the national lead and Defra would refer all enquiries they receive to Julie).

The attached explanatory leaflet gives further background http://naturalengland.etraderstores.com/naturalenglandshop/product.aspx?ProductID=88ff926a-3177-4090-aecb-00e6c9030b29. The work on minerals and waste planning referred to in this leaflet is a statutory Natural England responsibility so we also use the data for day to day planning advice. It is also underpins the technical advice which Natural England uses to assist planners and others, including Defra, the public and consultants on soils and agricultural land in land use planning and related land evaluation work.

Natural England releases most of this ALC data in a digital format (subject to restrictions on the likelihood of BMV land dataset and pre 88 ALC data). As the digital requests are relatively few it is either done through the national GI Unit or (more commonly) from the GI people in Reading or Bristol, who used to have national responsibility for this. There is a protocol for the release of ALC data which is currently being updated, but there is a working draft, currently on the 'N' Drive at N:\Evidence\Science Development & Delivery\Geology, Landscape & Soils\ALC (filename: draft ALC data release procedure NE version Nov 08).

Gill Shaw is also running a project to get the site data more readily accessible including links to the scanned original site maps and reports (of which there are approximately 6000).

### Digital Data supply:

1. Natural England can supply Provisional ALC data (stored on Natural England repositories) to contractors and/or the public. It is also available on www.magic.gov.uk to download.

2. If people receive requests for the Pre or Post 1988 digital datasets (site specific surveys which include subdivisions of Grade 3 land) or 'Likelihood of best and most versatile land' data, they may wish to consult either Julie Holloway or Gill Shaw in the first instance.

3. The 'Likelihood of best and most versatile land' dataset should be accompanied by an explanatory note. Due to licence restrictions the digital dataset can only be supplied to public bodies or their contractors. There is no licence restriction on paper map extracts.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[10] DEFRA. Horticulture Statistics 2018.

[11] Based on the 400g of fruit and vegetables requirement for a an adult a day

[12] UK Parliament, House of Lords, Food Security, 13 June 2022, available at: https://hansard.parliament.uk/lords/2022-06-13/debates/932BFEF8-7348-40B1-B709-79CB78E6CE5F/FoodSecurity

[13] a spatial dataset of areas of land estimated to be at 1% or greater risk of flooding each year from rivers, or a 0.5% or greater chance from the sea when flood defences are ignored

[14] Met Office, Climate Change in the UK, available at: https://www.metoffice.gov.uk/weather/climate-change/climate-change-in-the-uk

[15] Flood Map for Planning (Rivers and Sea) - Flood Zone 3, available at: https://data.gov.uk/dataset/bed63fc1-dd26-4685-b143-2941088923b3/flood-map-for-planning-rivers-and-sea-flood-zone-3

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*Denis L Henshaw*
*Professor of Physics*

TO WHOM IT MAY CONCERN

May 2010

Dear Sir

**Adverse health effects of exposure to power frequency electric and magnetic fields (EMFs)**

I am writing in response to enquiries I have received on the above issue.

It is indeed unfortunate that the question of health effects of exposure to EMFs well below current exposure guidelines has not received the highest level of scientific or public health attention that it deserves. The evidence of adverse health effects from EMFs associated with the electricity supply, in particular magnetic field (MF) exposures around or below 1 microtesla (μT), is huge and it is quite clear across a range of outcomes. We have long passed the stage where application of the Precautionary Principle and of appropriate legislation against undue exposure is warranted, including a substantial lowering of permitted MF exposure limits, currently 100 μT. In the case of high voltage overhead powerlines, these should not be built close to houses or farms where cattle and poultry are housed.

The available evidence on adverse health effects of MF exposure speaks for itself. No longer can we talk of differing opinions of whether or not there are such adverse health effects: the question is not about what people think, rather it is about what the evidence says.

Official review bodies are usually constrained by their Terms of Reference and have not been in a position to access the bulk of our scientific knowledge of MF interactions with biological systems. As I will explain below, I estimate that such bodies have at most addressed only 10% of the available evidence/data.

I will deal in turn with some aspects of the available scientific evidence/data.

1. Epidemiological evidence

The epidemiological evidence of adverse health effects from EMFs from human population studies has emerged continuously in recent years and it continues to do so. Particular emphasis has been placed on MF exposures, although electric field, EF effects continue to be researched. It may be useful to consider what recent official reports have said concerning MF health effect in particular – see summary table attached.

Internationally, the first major report of note was the US NIEHS report of 1999 (see list of acronyms below). This concluded that both adult and childhood leukaemia was associated with EMF exposure. However, the 2002 IARC report (part of WHO) without apparent reference to the NIEHS

conclusions, concluded that childhood leukaemia was the only cancer associated with EMF (note that IARC is only concerned with non-cancer health outcomes). However, the California Department of Health Sciences report, also published in 2002 concluded that increased risk of five health outcomes was associated with MF exposures: (i) childhood leukaemia; (ii) adult leukaemia; (iii) adult brain cancer; (iv) amyotrophic lateral sclerosis, ALS (or motor neurone disease) and (v) miscarriage. More recently the EU SCENIHR report has associated childhood leukaemia and Alzheimer's disease to MF exposures. The 2007 WHO EHC Report appears to prevaricate on a range of health outcomes, admitting to the existence of evidence but saying simply that this is 'not as strong' as for childhood leukaemia. It is noteworthy that the various reported adverse health effects are associated with average MF exposures around or below 1 μT. In the specific case of childhood leukaemia, a doubling of risk is seen with average exposures above 0.4 μT.

The 2002 IARC and California Reports are now a little historic, but their findings have set the trend of perceived MF health effects in recent years. Given that these two reports were published at about the same time, a number of commentators have asked why two major reports using presumably the same available data came to quite different conclusions with respect to the many studies of adult leukaemia and adult brain cancer. This led my colleague Professor Mike O'Carroll and me to study what was said in both reports and to publish our findings in a learned peer-reviewed journal (O'Carroll & Henshaw 2007). We focused on adult leukaemia and adult brain cancer. We found that whereas the California report had looked at each individual study and at the overall findings of the studies in aggregate, the IARC report had made no attempt to look at the aggregate data. This was strange because IARC had listed in tables the findings from 33 studies of adult leukaemia and 43 studies of adult brain cancer. It was quite clear from inspection of these tables that there was a clear dominance of studies reporting a positive association with MF exposure. In the case of adult leukaemia, the association was, if anything, stronger than that for childhood leukaemia. In O'Carroll & Henshaw we concluded: *"IARC shows no evidence of considering the aggregation of results other than subjectively. It considered individual studies but this led to a tendency to fragment and dismiss evidence that is intrinsically highly significant".*

Naturally, I am critical of the 2002 IARC report for not carrying out a rather basic analysis of the overall data. However, this tendency has been repeated in later WHO Reports and by the UK NRPB (now subsumed into the HPA). In fact, these later reports fail to cite or in anyway discuss the conclusions of the California Report. I have to say that this is simply bad science and indeed it is unprofessional. Were any of these reports submitted for publication to a good scientific journal, failure to pick up these failures of citation and basic analysis would be picked up by the blind peer-review system and the reports would not be published. Instead, sadly, they enjoy a rather false sense of respectability. I am bound to say that Governments and Power Companies are being poorly advised if they seek to reply solely on advice from these sources.

Notwithstanding this situation, as mentioned above, the February 2009 update of the EU SCENIHR report has added Alzheimer's disease as associated with MF exposures, based on recent studies that were not available to the earlier review bodies. Alzheimer's disease is highly prevalent in the aging population and of considerable public health significance. Of special note is the 1.5 to 2-fold increase in risk specifically seen near powerlines in Switzerland (Huss *et al.* 2008).

2. Magnetic fields and living systems

I now expand on my above comment that official review bodies have accessed at most only 10% of the relevant scientific data. The areas where MF interactions with living systems have been extensively discussed are:

1. The known ability of birds and other animals to detect tiny changes in the Earth's magnetic field (the Geomagnetic or GM) for the purposes of navigation.

2. The ability of plants to sense magnetic fields including power frequency AC fields.

3. Health effects arising from fluctuations in GM fields

4. The use of magnetic fields, including levels below the ICNIRP limit for medical treatment in wound & bone healing.

I will refer below to the 2008 Bioinitiative Report, but here is an extract of what it says about the use of MFs for medical treatment:

> **"Another Way of Looking at EMFs: Therapeutic Uses**
>
> Many people are surprised to learn that certain kinds of EMFs treatments actually can heal. These are medical treatments that use EMFs in specific ways to help in healing bone fractures, to heal wounds to the skin and underlying tissues, to reduce pain and swelling, and for other postsurgical needs. Some forms of EMFs exposure are used to treat depression. EMFs have been shown to be effective in treating conditions of disease at exposure levels far below current public exposure standards. This leads to the obvious question. How can scientists dispute the harmful effects of EMF exposures while at the same time using forms of EMF treatment that are proven to heal the body?
>
> **Medical conditions are successfully treated using EMFs at levels below current public safety standards, proving another way that the body recognizes and responds to low-intensity EMF signals. Otherwise, these medical treatments could not work. The FDA has approved EMFs medical treatment devices, so is clearly aware of this paradox.**
>
> Random exposures to EMFs, as opposed to EMFs exposures done with clinical oversight, could lead to harm just like the unsupervised use of pharmaceutical drugs. This evidence forms a strong warning that indiscriminate EMF exposure is probably a bad idea.
>
> **No one would recommend that drugs used in medical treatments and prevention of disease be randomly given to the public, especially to children. Yet, random and involuntary exposures to EMFs occur all the time in daily life.**

I would add that medical treatment is normally given for a fixed period and not continuously and chronically as for an MF exposure near powerlines.

It is in the field of animal navigation that most progress is currently being made in elucidating the *primary* mechanism by which MFs are known to interact with biological systems. The scientific literature in this field is vast but reference to five recent publications is given below (Ritz *et al.* 2000, 2004 & 2009; Begall *et al.* 2008, Burda *et al.* 2009). Current research suggests that birds posses a magnetic compass in the eye which functions by means of a process which is deeply rooted in chemistry known as the Radical Pair Mechanism. This is the mechanism by which low intensity MFs can increase the lifetime of free radicals. In birds, magneto-reception appears to occur in biological molecules known as cryptochromes, the same molecules that have been associated with magneto-reception in plants. Crucially, cryptochromes are present in human tissues generally, so here too they could be responsible for the primary detection of magnetic fields in man (though I stress such research has not yet been carried out). Whereas in birds the MF-induced increase in lifetime of free radicals is detected for the purposes of navigation, in general such an increase results in their greater ability to cause biological damage, especially in DNA.

The way in which MFs affect biological is becoming increasingly understood. A detailed description and excellent summary may be found in the Bionitiative Report. Here are some extracts

from Section 1 (note that this report also discusses health effects from radio frequency RF exposures, principally from mobile phones. The term 'ELF' refers to power frequency EMFs):

> **Page 17: Both ELF and RF exposures can be considered genotoxic (will damage DNA) under certain conditions of exposure, including exposure levels that are lower than existing safety limits.**
>
> **Very low-level ELF and RF exposures can cause cells to produce stress proteins, meaning that the cell recognizes ELF and RF exposures as harmful. This is another important way in which scientists have documented that ELF and RF exposures can be harmful, and it happens at levels far below the existing public safety standards.**

> **Page 18: There is substantial evidence that ELF and RF can cause inflammatory reactions, allergy reactions and change normal immune function at levels allowed by current public safety standards.**

> **Page 19: Oxidative stress through the action of free radical damage to DNA is a plausible biological mechanism for cancer and diseases that involve damage from ELF to the central nervous system.**

3. The 2007 BioInitiative Report

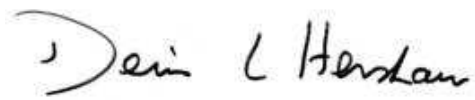
This is an independent report on EMF health effects, which covers both power frequency MFs and radio frequency EMFs such as from mobile phones. The authors include three former Presidents of the International Bioelectromagnetics Society and it presents an authoritative view of the state of the science and the need for precaution against exposure. The report may be accessed at: http://www.bioinitiative.org/index.htm

4. Summary

It is notable that some countries took action many years ago to limit public exposure to magnetic fields associated with high voltage powerlines, for example Sweden in 1996, Switzerland and Italy in 2000. Included in the substantial literature of EMF health effects is the 2007 study by Lowenthal *et al.* of increased risk of lymphoproliferative and myeloproliferative disorders in Tasmania.

It is indeed unfortunate that power companies and some governments continue to be ill advised on the adverse health effects of EMF exposures. In the case of overhead powerlines, we really are passed the stage where we should be erecting overhead powerlines close to house and centres of population.

Yours sincerely



Denis L Henshaw

**Review bodies' assessments of EMF causation of various diseases.**
**- health outcomes classified as Class 2B - possible causal.**

| Disease | IARC[1] 2002 | NIEHS 1999[2] | California 2002 | EU: SCENIHR[3] February 2009 |
|---|---|---|---|---|
| 1. Childhood Leukaemia | **Yes** | **Yes** | **Yes** | **Yes** |
| 2. Adult Leukaemia | | **Yes** | **Yes** | |
| 3. Adult brain cancer | | | **Yes** | |
| 4. Miscariage | | | **Yes** | |
| 5. ALS[4] | | | **Yes** | |
| 6. Alzheimer's disease | | | | **Yes[5]** |
| 7. Childhood brain tumours | | | | **Emerging evidence** |

[1]International Agency for Research on Cancer
[2]US National Institute of Environmental Sciences
[3]EU: Scientific Committee on Emerging and Newly Identified Health Risks: Possible effects of Electromagnetic Fields (EMF) on Human Health.
[4]Motor neurone disease
[5]Studies only recently published

**Table Note.** A doubling of childhood leukaemia risk is seen for average exposures above 0.4 μT. Other health risks refer generally to increased risk around or below 1 μT average exposure. The current ICNIRP exposure guidelines are set at 100 μT, 250 times higher than 0.4 μT where the doubling of childhood leukaemia risk is seen.

## Acronyms

HPA: Health Protection Agency (UK)
IARC: International Agency for Research on Cancer (a branch of WHO)
ICNIRP: International Commission on Non-ionising Radiation Protection
NIEHS: National Institute of Environmental Health Sciences (USA)
NRPB: National Radiological Protection Board (UK)
SCENIHR: Scientific Committee on Emerging and Newly Identified Health Risks (EU)
WHO: World Health Organisation
WHO EHC: World Health Organisation Environmental Health Criteria

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