

Appendices to the Habitats Regulations Assessment Site Report for Kirksanton

EN-6: Revised Draft National Policy Statement for Nuclear Power Generation

Planning for New Energy Infrastructure

October 2010

Habitats Regulations Assessment of the revised draft Nuclear National Policy Statement

Habitats Regulations Assessment (HRA) screening and Appropriate Assessment (AA) of the revised draft Nuclear NPS including potentially suitable sites, has been undertaken in parallel with the Appraisal of Sustainability (AoS). These strategic assessments are part of an ongoing assessment process that will continue with project level assessments. Applications to the IPC for development consent will need to take account of the issues identified and recommendations made in the strategic, plan level HRA/AA; and include more detailed, project level HRA as necessary.

The Habitats Regulations Assessment is provided in the following documents:

HRA Non-Technical Summary

Main HRA Report of the revised draft draft Nuclear NPS

- Introduction
- Methods
- Findings

Annexes to the Main HRA Report: Reports on Sites

- Site HRA Reports
- Technical Appendices

All documents are available on the website of the Department of Energy and Climate Change at www.energynpsconsultation.decc.gov.uk

This document is the Appendices to the HRA site report for Kirksanton.

This document has been produced by the Department of Energy and Climate Change based on technical assessment undertaken by MWH UK Ltd with Enfusion Ltd and Nicholas Pearson Associates Ltd.

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Appendix 1: European Site Characterisations

Natura 2000 Site Identification				
Natura 2000 Designation	Radius (measured from central grid reference point, MAGIC)			
	5km	10km	15km	20km
SAC	<ul style="list-style-type: none"> • Morecambe Bay SAC 	<ul style="list-style-type: none"> • Duddon Mosses SAC 	<ul style="list-style-type: none"> • Drigg Coast SAC • Subberthwaite, Blawith and Torver Low Commons SAC 	<ul style="list-style-type: none"> • Roudsea Wood and Mosses SAC
SPA	<ul style="list-style-type: none"> • Duddon Estuary SPA 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Morecambe Bay SPA 	<ul style="list-style-type: none"> • None
Ramsar	<ul style="list-style-type: none"> • Duddon Estuary Ramsar 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Morecambe Bay Ramsar 	<ul style="list-style-type: none"> • None

Natura 2000 Site Characterisations

Special Areas of Conservation (SAC)¹

1. Morecambe Bay
2. Duddon Mosses
3. Drigg Coast
4. Subberthwaite, Blawith and Torver Low Commons
5. Roudsea Wood and Mosses

Special Protection Areas (SPA)²

1. Duddon Estuary
2. Morecambe Bay

Ramsar Sites³

1. Morecambe Bay
2. Duddon Estuary

All core site specific information unless otherwise stated has been referenced from Natural England Sources ([Natura 2000 Management Plans](#)) (Nature on the Map) and the Joint Nature Conservation Committee website ([Protected Sites](#)).

¹ **Special Areas of Conservation (SACs)** are classified under the Habitats Directive and provide rare and vulnerable animals, plants and habitats with increased protection and management.

² **Special Protection Areas (SPAs)** are classified under the Birds Directive to help protect and manage areas which are important for rare and vulnerable birds because they use them for breeding, feeding, wintering or migration. Together SAC's and SPA's make up the Natura 2000 series.

³ **Ramsar sites** are designated under the Convention on Wetlands of International Importance. The broad objectives are to stem the loss and progressive encroachment on wetlands now and in the future. These are often coincident with SPA sites designated under the Birds Directive. Although RAMSAR sites are not considered part of the Natura

Special Areas of Conservation

Site Name: Morecambe Bay

- Location Grid Ref: 540709 N/ 025742 W
- JNCC Site Code: [UK0013027](#)
- Size: 61506.22 ha
- Designation: SAC

Morecambe Bay SAC	
Site Description	<p>Source: http://www.ukmarinesac.org.uk/pdfs/casestudy-morecambebay.pdf</p> <p>Morecambe Bay European marine site extends along the North West coast of England from Walney Island, through Barrow-in-Furness to Fleetwood in the south. As well as the embayment, the site comprises four main estuaries of the Bay's major rivers, the Leven, the Kent, the Lune and the Wyre. These drain into the Ulverston, Lancaster and Grange Channels, which converge and pour their waters into the 'Lune Deep', a steep-sided subtidal channel that was formed during the Ice Age.</p> <p>Morecambe Bay is the second largest embayment in the UK, with 310km² of intertidal sandflats and mudflats making it the largest continuous intertidal area in the whole of Britain. The Bay is broad and shallow with a large tidal range of up to 10.5 metres at spring tides and an ebbing tide that can fall back to 12km. This reveals half of the Bay's total area as expanses of sands, meandering channels and tidal pools. The outer parts of Morecambe Bay are predominantly mobile well-sorted sands with fringing shingle.</p> <p>Towards the inner bay and estuaries the sediments become muddier and less saline allowing saltmarshes to develop on the higher shore levels. Boulder scars or "skears" occur around the Bay, relics of boulder clays eroded following the last glaciation. The diversity and composition of biological</p>

Morecambe Bay SAC	
	<p>communities that occur in or on the sediments of Morecambe Bay are influenced by a number of key ecological factors. These include the hydrophysical regime, the nutrient levels, temperature, oxygen levels, salinity and the composition of the substrate. The Bay is also important as a fish nursery area and is an important habitat for migratory fish species such as Atlantic Salmon, Sea Trout and Eels.</p>
Qualifying Features	<p>Source: http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0013027</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p>1130 <u>Estuaries</u></p> <p>Morecambe Bay in North West England is the confluence of four principal estuaries, the Leven, Kent, Lune and Wyre (the latter lies just outside the site boundary), together with other smaller examples such as the Keer. Collectively these form the largest single area of continuous intertidal mudflats and sandflats in the UK and the best example of muddy sandflats on the west coast. The estuaries are macro-tidal with a spring tidal range of 9 m. The significant tidal prisms of the estuaries result in the Bay being riven by large low-water channel systems. The Kent, Leven and Lune estuaries have been modified variously by railway embankments, flood embankments and training walls but support extensive intertidal areas. Although cobble 'skears' and shingle beaches occur at their mouths, the estuaries consist predominantly of fine sands and muddy sands. The estuaries support dense invertebrate communities, their composition reflecting the salinity and sediment regimes within each estuary. Extensive saltmarshes and glasswort <i>Salicornia</i> spp. beds are present in the Lune estuary, contrasting with the fringing saltmarshes and more open intertidal flats of the Leven and Kent estuaries. Most of the saltmarshes are grazed, a characteristic feature of North West England. In the upper levels of the saltmarshes there are still important transitions from saltmarsh to freshwater and grassland vegetation. Water quality is generally good.</p> <p>1140 <u>Mudflats and sandflats not covered by seawater at low tide</u></p> <p>Morecambe Bay in North West England is the confluence of four principal estuaries, the Leven, Kent, Lune and Wyre (the latter lies just outside the site boundary), together with other smaller</p>

	Morecambe Bay SAC
	<p>examples such as the Keer. Collectively these form the largest single area of continuous intertidal mudflats and sandflats in the UK and the best example of muddy sandflats on the west coast. At low water, large areas of sandflats are exposed, and these range from the mobile fine sands of the outer Bay to more sheltered sands in the inner areas. With increasing shelter in the Bay's adjoining estuaries, finer sediments settle out and form extensive mudflats, supporting a particularly rich and diverse range of infaunal species.</p> <p>1160 <u>Large shallow inlets and bays</u></p> <p>Morecambe Bay in North West England is the second-largest embayment in the UK, after the Wash. It is a large, very shallow, predominantly sandy bay bordered on the south by the channel of the Lune estuary and on the north by Walney Channel. At low tide vast areas of intertidal sandflats are exposed, with small areas of mudflat, particularly in the upper reaches of the associated estuaries. The sediments of the bay are mobile and support a range of community types, from those typical of open coasts (mobile, well-sorted fine sands), grading through sheltered sandy sediments to low-salinity sands and muds in the upper reaches. Apart from the areas of intertidal flats and subtidal sandbanks, Morecambe Bay supports exceptionally large beds of mussels <i>Mytilus edulis</i> on exposed 'scars' of boulder and cobble, and small areas of 1170 Reefs with furoid algal communities. Of particular note is the rich community of sponges and other associated fauna on tide-swept pebbles and cobbles at the southern end of Walney Channel.</p> <p>1220 <u>Perennial vegetation of stony banks</u></p> <p>Morecambe Bay represents perennial vegetation of stony banks in North West England. Walney Island on the shores of Morecambe Bay is a barrier island fringed by shingle with a partial sand covering. Two areas of exposed vegetated shingle occur at the extremes of the barrier. The southern area has been highly modified by eutrophication from a large gull colony, resulting in communities that are unusually species-rich for pioneer shingle vegetation. Perennial rye-grass <i>Lolium perenne</i>, Common Chickweed <i>Stellaria media</i> and Biting Stonecrop <i>Sedum acre</i> are constant elements, with Dove's-foot Crane's-bill <i>Geranium molle</i> an unusual and important feature.</p>

Morecambe Bay SAC	
	<p>1310 <u>Salicornia and other annuals colonising mud and sand</u></p> <p>Two types of pioneer saltmarsh are represented at Morecambe Bay in North West England. Pioneer Glasswort <i>Salicornia</i> spp. saltmarsh occurs intermittently along the coastline of the bay, forming a transition from the extensive intertidal sand and mudflats to the distinctive saltmeadows at this site. The Sea Pearlwort <i>Sagina maritima</i> community occurs in open pans on the upper marsh.</p> <p>1330 <u>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)</u></p> <p>Morecambe Bay is characteristic of saltmarshes in North West England, with large areas of closely grazed upper marsh. The mid-upper marsh vegetation is strongly dominated by the saltmarsh-grass/fescue <i>Puccinellia / Festuca</i> communities, of which over 1,000ha occur here, and by smaller areas of Saltmarsh Rush <i>Juncus gerardii</i> community. National Vegetation Classification (NVC) type SM18 <i>Juncus maritimus</i> community is also more strongly represented here than elsewhere in England. The plant species include both southern elements, such as Lesser Centaury <i>Centaureum pulchellum</i>, and northern elements, such as Saltmarsh Flat-sedge <i>Blysmus rufus</i> and Few-flowered Spike-rush <i>Eleocharis quinqueflora</i>.</p> <p>2120 <u>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes')</u></p> <p>Shifting dune vegetation forms a major component of the active sand dune systems at the entrance to Morecambe Bay on Walney Island and the Duddon Estuary at Sandscale Haws. A small area is also present at the entrance to the Wyre. Sandscale Haws supports a mosaic of shifting communities, which form a continuous block around the seaward edge of this site. There are transitions to 2110 Embryonic shifting dunes. The prograding shingle spits at either end of Walney Island support dune systems at South End and North End Haws. Species associated with these shifting dunes include Sea Holly <i>Eryngium maritimum</i>, Sea Spurge <i>Euphorbia paralias</i>, Portland Spurge <i>Euphorbia portlandica</i> and Sea Bindweed <i>Calystegia soldanella</i>.</p> <p>2130 <u>Fixed dunes with herbaceous vegetation ('grey dunes')</u> * Priority feature</p>

	Morecambe Bay SAC
	<p>Sandscale Haws at the entrance to the Duddon Estuary supports the largest area of calcareous fixed dunes in Cumbria, which contrast with the acidic dunes at the adjacent North End Haws on Walney Island. South End Haws on Walney Island supports a smaller area of fixed dunes. North Walney and Sandscale in particular show well-conserved structure and function. The fixed dunes support a rich plant diversity including Wild Pansy <i>Viola tricolor</i>, Lady's Bedstraw <i>Galium verum</i>, Common Restharrow <i>Ononis repens</i> and the uncommon Dune Fescue <i>Vulpia membranacea</i> and Dune Helleborine <i>Epipactis dunensis</i>.</p> <p>2190 <u>Humid dune slacks</u></p> <p>Dune slacks are particularly well-represented at Sandscale Haws, the largest calcareous dune system in Cumbria. The slacks support a good range of vegetation communities and are very species-rich. Several uncommon species including Marsh Helleborine <i>Epipactis palustris</i>, Dune Helleborine <i>Epipactis dunensis</i> and Coralroot Orchid <i>Corallorhiza trifida</i> occur.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>1110 <u>Sandbanks which are slightly covered by sea water all the time</u></p> <p>1150 <u>Coastal lagoons</u> * Priority feature</p> <p>1170 <u>Reefs</u></p> <p>2110 <u>Embryonic shifting dunes</u></p> <p>2150 <u>Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)</u> * Priority feature</p> <p>2170 <u>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)</u></p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1166 <u>Great Crested Newt</u> <i>Triturus cristatus</i></p>

	Morecambe Bay SAC
	<p>The site, located on the southern shore of the Duddon estuary in North West England, consists of a large sand dune complex containing both permanent and ephemeral waterbodies and man-made scrapes. Breeding colonies of Great Crested Newts are known in approximately 20 of these ponds, and are believed to utilise 200 ha of the 282 ha site, foraging widely over foreshore, yellow dunes, dune-heath and scrub.</p>
Conservation Objectives	<p><i>Source: English Nature (2000) Morecambe Bay European Marine Site: English Nature’s advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc.) Regulations 1994</i></p> <p>Conservation objectives for each qualifying feature are set out below.</p> <p><u>Large shallow inlets and bays</u></p> <p>English Nature (2000) provides the following conservation objective for this feature:</p> <p>“Subject to natural change, maintain the large shallow inlets and bays in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Intertidal boulder and cobble skew communities • Subtidal boulder and cobble skew communities • Brittlestar bed communities • Intertidal boulder clay communities • Coastal lagoon communities • Intertidal mudflat and sandflat communities • Pioneer saltmarsh communities • Saltmarsh communities” <p>English Nature (2000) provides detailed information on how favourable condition of this feature is to be assessed. In summary, favourable condition for this feature means that there is little deviation from the established baseline for the following attributes, subject to natural change:</p>

	Morecambe Bay SAC
	<ul style="list-style-type: none"> • Extent of the habitat features • Morphological equilibrium of the component estuaries – as measured using tidal prism, tidal cross-section and monitoring of the saltmarsh boundary • Water clarity • Water density – salinity and water temperature • Extent and species composition of characteristic biotopes (animal communities) • Presence and abundance of characteristic species <p><u>Mudflats and sandflats</u></p> <p>English Nature (2000) states that the conservation objective for mudflats and sandflats is as follows:</p> <p>“Subject to natural change, maintain the mudflats and sandflats not covered by seawater at low tide (intertidal mudflats and sandflats) in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Mud communities • Sand communities • Eelgrass bed communities” <p>English Nature (2000) provides detailed information on how favourable condition of this feature is to be assessed. In summary, favourable condition for this feature means that there is little deviation from the established baseline for the following attributes, subject to natural change:</p> <ul style="list-style-type: none"> • Extent of the habitat features • Sediment particle size distribution • Sediment penetrability - this measures vulnerability to erosion • Sediment level of organic carbon - high levels of organic content can lead to low oxygen levels which are detrimental to the important animal communities • Topography – shore profile • Nutrient enrichment – as measured by extent and depth of macroalgal mats – high nutrient

	Morecambe Bay SAC
	<p>levels are detrimental to the important animal communities</p> <ul style="list-style-type: none"> • Density of eelgrass shoots <p><u>Shingle vegetation</u> English Nature (2000) does not provide a conservation objective for shingle vegetation. Based on the format set out in English Nature (2000), it has been assumed that it would be:</p> <p>Subject to natural change, maintain the perennial vegetation of stony banks (shingle vegetation) in favourable condition. This is likely to be assessed using similar methods as described for the other habitats where information is available and ensure there is little or no deviation from the established baseline, assessed by monitoring the extent and species composition of the habitat.</p> <p><u>Pioneer saltmarsh</u> English Nature (2000) provides a conservation objective for pioneer saltmarsh:</p> <p>“Subject to natural change, maintain the Glasswort <i>Salicornia</i> spp and other annuals colonising mud and sand (pioneer saltmarsh) in favourable condition.”</p> <p>Favourable condition of this feature is defined as little or no deviation from the established baseline for the attributes listed below, subject to natural change:</p> <ul style="list-style-type: none"> • Extent of the habitat • Patterns, density and morphology of creeks and pans – important for coastal processes • Species composition of vegetation – should match characteristic vegetation community <p><u>Saltmarsh</u> The conservation objective for saltmarsh is given in English Nature (2000) as follows:</p>

	Morecambe Bay SAC
	<p>“Subject to natural change, maintain the Atlantic salt meadows <i>Glauco-Puccinellietalia</i> (saltmarsh) in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Low marsh communities • Mid marsh communities • High marsh communities • Transitional high marsh communities” <p>Also subject to natural change, favourable condition is identified as little or no deviation from the established baseline for a number of attributes:</p> <ul style="list-style-type: none"> • Extent of habitat features • Range and distribution of characteristic vegetation communities – sites with a full range of communities are in best condition • Vegetation structure, as measured by range and distribution of vegetation heights – important for maintenance of rare plant species as well as bird communities • Species composition of vegetation – should match characteristic vegetation community in each area <p><u>Shifting dunes</u></p> <p>English Nature (2000) does not provide a conservation objective for shifting dunes. Based on the format set out in English Nature (2000), it has been assumed that it would be:</p> <p>Subject to natural change, maintain the shifting dunes along the shoreline with <i>Ammophila arenaria</i> (‘white dunes’ or shifting dunes) in favourable condition. This is likely to be assessed using similar methods as described for the other habitats where information is available and ensure there is little or no deviation from the established baseline, assessed by monitoring the extent and species composition of the habitat.</p>

Morecambe Bay SAC																																											
	<p><u>Fixed dunes</u> English Nature (2000) does not provide a conservation objective for fixed dunes. Based on the format set out in English Nature (2000), it has been assumed that it would be:</p> <p>Subject to natural change, maintain the fixed dunes in favourable condition. This is likely to be assessed using similar methods as described for the other habitats where information is available and ensure there is little or no deviation from the established baseline, assessed by monitoring the extent and species composition of the habitat.</p>																																										
Component SSSIs	<p>SSSIs including condition status:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d3d3d3;">SAC Component Sites</th> <th style="background-color: #d3d3d3;">Favourable</th> <th style="background-color: #d3d3d3;">Unfavorable recovering</th> <th style="background-color: #d3d3d3;">Unfavorable no change</th> <th style="background-color: #d3d3d3;">Unfavorable declining</th> <th style="background-color: #d3d3d3;">Destroyed, part destroyed</th> </tr> </thead> <tbody> <tr> <td>Duddon Estuary SSSI</td> <td>93.13%</td> <td>4.53%</td> <td>1.61%</td> <td>0.67%</td> <td>0.05%</td> </tr> <tr> <td>Lune Estuary SSSI</td> <td>98.29%</td> <td>1.71%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Morecambe Bay SSSI</td> <td>94.35%</td> <td>4.68%</td> <td>0.97%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Skelwith Hill SSSI</td> <td>100%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>South Walney and Piel Channel Flats SSSI</td> <td>93.57%</td> <td>6.43%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Wyre Estuary SSSI</td> <td>100%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> </tbody> </table>	SAC Component Sites	Favourable	Unfavorable recovering	Unfavorable no change	Unfavorable declining	Destroyed, part destroyed	Duddon Estuary SSSI	93.13%	4.53%	1.61%	0.67%	0.05%	Lune Estuary SSSI	98.29%	1.71%	0%	0%	0%	Morecambe Bay SSSI	94.35%	4.68%	0.97%	0%	0%	Skelwith Hill SSSI	100%	0%	0%	0%	0%	South Walney and Piel Channel Flats SSSI	93.57%	6.43%	0%	0%	0%	Wyre Estuary SSSI	100%	0%	0%	0%	0%
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Morecambe Bay SAC	
<p>Key Environmental Conditions (factors that maintain site integrity)</p>	<p>Source: SSSI citations and English Nature’s Views About Manangement for component SSSIs listed above.</p> <ul style="list-style-type: none"> • Maintain morphological equilibrium of the estuary, including sedimentation patterns and budgets. The primary management principle for ‘active process sites’ is to avoid interfering with the natural processes that maintain the features. Any development or activity that restricts natural processes is likely to damage the interest features of the site for exmample construction of structures or defences, removal of material such as sand and gravel or even tree planting, should this result in stabilization of normally unstable soils. • Avoidance of constraints to response to sea level rise and changing sediment regimes. Management needs to create space to enable landward roll-back to take place in response to sea-level rise, and should allow the system to be dynamic and retain flexibility to respond to associated changes such as the movement of physical features within the system for example migrating subtidal sandbanks. • Maintain temperature and salinity levels within natural range; • Avoidance of changes to drainage patterns. • Avoidance of pollution • Avoidance of nutrient enrichment • Appropriate grazing of saltmarsh communities (much of this habitat within the site is ungrazed, especially within Tummer Hill and Wyre Estuary and here a wide range of less common grazing-sensitive species occur) • Maintain minimal impact of fishing, bait digging and dredging • High enough water table for dune slacks • Avoidance of damaging levels of erosion from human activities – vegetated shingle habitats are especially vulnerable to damage from trampling. • No increase in organic matter in sediments • No physical constraints to managed realignment if required in response to coastal squeeze

Morecambe Bay SAC	
	<ul style="list-style-type: none"> • Control of bracken/scrub • Control of invasive and/or non-native species • Great Crested Newts require suitable foraging and refuge habitat; ponds with relatively unpolluted water of roughly neutral pH; some ponds with water throughout the breeding/tadpole development season
SAC Condition Assessment	See component SSSI condition information
Vulnerabilities (includes existing pressures and trends)	<p>Source: http://www.jncc.gov.uk/ProtectedSites/SACselection/n2kforms/UK0013027.pdf</p> <p>There are a wide range of pressures on Morecambe Bay but the site is relatively robust and many of these pressures have only slight or local effects on its interests. The interests depend largely upon the coastal processes operating within the Bay, which have been affected historically by human activities including coastal protection and flood defence works. Opportunities to reverse coastal squeeze are being explored. The saltmarsh is traditionally grazed and is generally in favourable condition for its bird interest. Most of the saltmarsh is traditionally grazed and is utilised by breeding, wintering and migrating birds for feeding, roosting and nesting purposes. Positive management is being secured through Non-governmental Organisation (NGO) reserve management plans, Natural England's Site Management Statements and Coastal Wildlife Enhancement Scheme, the European Marine Site Management Schemes for the Duddon Estuary and Morecambe Bay, and the Duddon Estuary and Morecambe Bay Partnerships. These aim for sustainable use of the site, taking account of other potential threats including commercial fisheries, aggregate extraction, gas exploration, recreation and other activities.</p> <p><i>Source: English Natura (2000) Morecambe Bay European Marine Site: English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc) Regulations 1994</i></p> <p><u>Large shallow inlets and bays</u></p> <ul style="list-style-type: none"> • Removal and/or smothering of embayment habitats.

	Morecambe Bay SAC
	<ul style="list-style-type: none"> • Coastal Squeeze: sedimentary areas protected by hard defences will suffer the greatest impact of sea level rise. Erosive forces would become more dominant and losses of fine sediment would produce narrower intertidal areas, with coarser sediment. The change of sediment characteristics would reduce the content of organic matter in the sediments and change the community structure accordingly. Taken to its conclusion, a greater proportion of estuaries on open-coasts would become marine and sandy and the brackish section would move inland and up-river. In more sheltered areas, there would be more deposition, extending areas of fine sediment and marsh. However, this process would cease once the sediment supply was reduced and ultimately erosion would become the dominant process. • Physical damage resulting from siltation, abrasion and/or selective extraction. • Increased synthetic, non synthetic toxic and/or radionuclide contamination. • Nutrient and/or organic enrichment. • Increases in turbidity. • Introduction of microbial pathogens, introduction of non-native species and/or selective extraction of species for which the site has been selected or which form important food sources for such species. <p><u><i>Intertidal mudflats and sandflats</i></u></p> <ul style="list-style-type: none"> • Removal and/or smothering • Coastal Squeeze: see above. • Physical damage resulting from siltation and/or abrasion and/or selective extraction. English Natura (2000) states that the eelgrass communities are subject to high levels of existing abrasion, nutrient enrichment and organic enrichment and introduction of non-native species/translocation • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Nutrient and/or organic enrichment • Increases in turbidity

	Morecambe Bay SAC
	<ul style="list-style-type: none"> • Biological disturbance through the introduction of non-native species, microbial pathogens and/or selective extraction of species <p><u>Pioneer saltmarsh</u></p> <ul style="list-style-type: none"> • Removal of pioneer saltmarsh habitats • Coastal Squeeze: see above. • Physical damage resulting from abrasion • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Translocation of species • Introduction of non-native species and/or translocation of species, for example, invasive Cord-grass <i>Spartina anglica</i> is becoming heavily established within Duddon estuary. <p><u>Saltmarsh</u></p> <ul style="list-style-type: none"> • Removal of saltmarsh habitats • Coastal Squeeze: see above. • Physical damage resulting from abrasion and/or selective extraction • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Translocation of species <p>All of the above features were assessed as subject to high levels of introduction of microbial pathogens and most as experiencing high levels of changes in turbidity English Nature (2000).</p> <p><u>Shingle vegetation</u></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing

	Morecambe Bay SAC
	<ul style="list-style-type: none"> • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Introduction of non-native species and/or translocation of species <p><i>Shifting dunes</i></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing • Introduction of non-native species and/or translocation of species <p><i>Fixed dunes</i></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing • Introduction of non-native species and/or translocation of species
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • Non-governmental Organisation (NGO) / National / Crown Estate / Private. NGO reserve management plans, EN's site Management Statements and Coastal WES, the European Marine Site Management Schemes for the Duddon Estuary and Morecambe Bay, and Duddon Estuary and Morecambe Bay Partnerships.
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Barrow Port Area Action Plan: Report to inform Habitat Regulations Assessment Stage 1 (Screening), August 2007: The Barrow Port Area Action plan seeks to achieve a new mixed-use development incorporating the existing commercial port with new housing, a marina, cruise facility, water sports and employment. Given that Morecambe Bay SAC and the Barrow Port Area overlap, the potential for significant effects on the integrity of this site was concluded. No Appropriate Assessment report was available.

	Morecambe Bay SAC
	<ul style="list-style-type: none"> <li data-bbox="667 323 2029 614"> <p>• Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect.</p> <li data-bbox="667 655 2029 1023"> <p>• HRA Screening of Fleetwood – Thornton Area Action Plan (AAP) Source: http://www.wyrebc.gov.uk/Page.aspx?DocID=8710&PgID=48016 This screening assessment concludes that there will be no direct effects upon habitats within the SAC or upon the great crested newt population within it as a result of policies set out within the AAP. The potentially significant effects which require more consideration (and therefore will be subject to Appropriate Assessment) relate to the disturbance of wintering and migratory birds using the SPA/Ramsar site and high tide roost sites outside of the designated site boundaries (noise and visual disturbance from human activity) and to potential decreases in habitat quality within the designated sites through pollution from construction and operation of the proposed developments</p> <li data-bbox="667 1064 2029 1173"> <p>• Appropriate Assessment of Core Strategy for Lancaster City Council (September 2007): Some policies could facilitate development affecting European Sites but Policy E1 precludes any development which might have an adverse effect on Morecambe Bay SAC</p> <li data-bbox="667 1214 2029 1319"> <p>• Appropriate Assessment of Mussel Fishery in Morecambe Bay Source: http://www.seafish.org/upload/file/inshore/Case7_Morecambe_Mussels.doc As the competent authority for the European Marine Site in Morecambe Bay, NWNWSFC concluded that the</p>

	Morecambe Bay SAC
	<p>proposal to hand gather seed mussels from a specific area of Heysham Flats with restrictions on access to the fishing ground would not adversely effect the integrity of Morecambe Bay SAC, SPA and Ramsar site, and permitted the fishery.</p> <ul style="list-style-type: none"> • Appropriate Assessment Screening of South Lakeland District Council’s Core Strategy Source:http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf Increase in visitor pressure both from an increase in local residents and an increase in tourism poses risks in terms of damage to sites and disturbance to protected species at Morecambe Bay SAC/ SPA/ Ramsar and Morecambe Bay Pavements SAC. A number of policies contribute by cumulatively increase the potential for a likely significant effect. • Appropriate Assessment for Lancaster City Council: Coastal Defence Works on Morecambe Town Frontage Very little information available, brief summary available at: http://www.yaec.co.uk/Project%20Details/A2104%20Morecambe%20AA/MorecambeAA_Page.htm • Habitat Regulations Assessment: Screening statement to accompany Bolton’s Core Strategy Preferred Option Report (May 2008) Source:http://www.bolton.gov.uk/pls/portal92/docs/PAGE/LGNL/DOCUMENTS/BUSINESS/P%20L%20A%20N%20N%20I%20N%20G/G%20R%20A%20P%20E%20S/HRA%20SCREENING%20OPINION%20BOLTON%20PREFERRED%20OPTIONS.PDF Significant effects of Bolton’s core strategy on Morecambe Bay SAC are assessed as possible. • Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies:

	Morecambe Bay SAC
	<p>Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Morecambe Bay SAC are assessed as being possible.</p> <ul style="list-style-type: none">• HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.

Site Name: Duddon Mosses

- Location Grid Ref: 54 15 25 N, 03 11 34 W
- JNCC Site Code: [UK0019833](#)
- Size: 313.07 ha.
- Designation: SAC

Duddon Mosses SAC	
Site Description	<p>Source: http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/nnr/1006954.aspx</p> <p>The Duddon Mosses are an internationally important system of active raised mires that extend north from the edge of the Duddon Estuary up the low coastal flood plains of the River Duddon and Kirkby Pool. The mires stretch from the coast to upland fringe and the site as a whole is of international importance for its active raised mire. Areas of uncut peat on the reserve support plants such as Cross-leaved Heath and Hare's-tail Cottongrass while wetter areas in the peat-cut hollows are home to sphagnum, cranberry, bilberry, Round-leaved Sundew and Bog-rosemary. Other areas consist of marshy grassland with populations of Marsh Pennywort, Heath Spotted-orchid and Bog-myrtle. The mosses, together with areas of wet woodland, support birds such as Nightjar, Woodcock, Curlew, Tawny and Barn Owls. Over 170 species of Lepidoptera have been recorded at the site, including the Large Heath butterfly, and moths such as the Small Elephant Hawk, Silver Hook, Coast Dart and the Marsh Oblique Barred. Other scarce invertebrates such as the Dead-nettle Leaf Beetle, Leaf Roller Beetle and Bog Bush Cricket are also found here.</p>
Qualifying Features	<p>Source: http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0019833</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p>7110 Active raised bogs * Priority feature</p> <p>This complex in North West England is found in the plain of the Duddon estuary. In the southern part of the complex, where there are transitions from saltmarsh to bog, the vegetation is rich in the rare <i>Sphagnum pulchrum</i>. Further north a variety of raised bog conditions can be observed, from</p>

Duddon Mosses SAC							
	<p>hand-cut and vigorously regenerating cuttings, to domes of uncut bog, which display significant areas of actively-growing bog vegetation.</p> <p>7120 <u>Degraded raised bogs still capable of natural regeneration</u></p> <p>This bog complex is within the tributary plains of the Duddon estuary in south Cumbria. The contiguity of the original peat domes has been severed by road construction and agricultural conversion. On some of the component bogs peat-cutting has left a drained surface which is now only partially 7110 active raised bog. The degraded raised bog is mostly dominated by Purple Moor Grass <i>Molinia caerulea</i>, although pockets of raised bog plants including bog-mosses <i>Sphagnum</i> spp. offer good prospects for regeneration provided the hydrology is repaired. Degraded bog also occurs around the edges of discrete domes of active bog due to deep regional drainage and agricultural use of the surrounding land. There is no present-day peat-extraction on this site.</p>						
Conservation Objectives	<ul style="list-style-type: none"> No conservation objectives were available but proxy conservation objectives are given below and are based on conservation objectives where available for similar sites: <p>Subject to natural change, to maintain, in favourable condition:</p> <ul style="list-style-type: none"> Active raised bogs Degraded raised bogs still capable of natural regeneration 						
Component SSSIs	SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed	
	Duddon Mosses SSSI	6.46%	22.52%	30.94%	40.07%	0.00%	

Duddon Mosses SAC	
Key Environmental Conditions (factors that maintain site integrity)	<p><i>Source: A statement of English Nature’s views about the management of Duddon Mosses Site of Special Scientific Interest (2005).</i></p> <ul style="list-style-type: none"> • Lowland raised bogs are peat-forming wetlands which form where certain plants decompose slowly under waterlogged conditions. Alterations to the rate of water loss will destabilize them. A raised bog is so-called because its plants die, consolidate and stack up as peat above the groundwater. • Water inputs are from precipitation alone and are therefore low in solutes, so significant increases in the base or nutrient status of the system will alter the vegetation cover in favour of non-bog species. • The habitat can become very acid in the absence of groundwater, actively increased by <i>Sphagnum</i> mosses. Management must therefore ensure a high and stable water table in the peat, not falling more than about 10cm below the surface over the course of a year. • The living layer of vegetation acts as a 'natural' regulator for water loss, so destruction or alteration of the vegetation will have significant implications for the long-term stability of the ecosystem as a whole. • Management must ensure encroachment by trees and scrub (especially birch) is avoided - cut and drained peatlands are particularly prone to encroachment. • Game bird feeding must not be carried out on the surface of the bog in order to avoid the addition of unwanted nutrients.
SAC Condition Assessment	<ul style="list-style-type: none"> • See component SSSI condition assessment.
Vulnerabilities (includes existing pressures and trends)	<p><i>Source: http://www.jncc.gov.uk/ProtectedSites/SACselection/n2kforms/UK0019833.pdf</i></p> <p>Past drainage for peat extraction has lowered the water table and allowed scrub to spread across the mosses. The majority of landowners have management agreements with English Nature to allow</p>

	Duddon Mosses SAC
	<p>restoration work. A programme of scrub removal and ditch-blocking is being undertaken, with positive results.</p> <p><i>Source: Joint Nature Conservation Committee. 2007. Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006. Peterborough: JNCC. Available from: www.jncc.gov.uk/article17</i></p> <ul style="list-style-type: none"> • Water abstraction Past and continuing loss of area by drainage and conversion to intensive agriculture has adversely affected the UK resource of lowland raised bogs. This habitat type frequently occurs in drained agricultural landscapes. Perimeter drainage and water abstraction from underlying aquifers may limit the rewetting potential of certain sites. Raised bogs drained either directly or indirectly (for example, via historical domestic peat cutting) degenerate without conservation management. • Grazing A lack of grazing coupled with drier conditions has favoured the expansion of scrub and tall heather to the detriment of bog species. However, over-grazing can lead to trampling and compaction as well as contamination. • Peat extraction The extraction of peat and/or underlying mineral deposits both in existing and proposed new areas. • Burning Burning was once a management tool used to open the open bog landscape and create a diverse surface structure. Burning on lowland raised bogs is now not encouraged with the consequential losses in bog vegetation. • Built development Linear developments and other land reclamation for built development (including waste disposal) affect many areas. Such developments have long-term repercussions on the stability of the ecosystem. • Fragmentation On a local scale lowland raised bog was more extensive and continuous in the past, but since the 19th Century this habitat has become more fragmented. It is not realistic that these bogs will once again become reconnected, but it is important that they do

Duddon Mosses SAC	
	<p>not become isolated islands within intensively drained landscapes. To this end water margins and other wetlands play an important role in connectivity.</p> <ul style="list-style-type: none"> • Absence of or inappropriate management Lack of or inappropriate management of existing bogs leads to drying out, scrub encroachment and succession to woodland. • Forestry operations In addition to the direct impacts of existing plantations on deep peat, successive rotations dry out neighbouring areas and act as an invasive seed source. • Air pollution Based on an assessment of the exceedence of relevant critical loads, air pollution is considered to be a potentially significant pressure to the structure and function of this habitat.
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • Managed as a National Nature Reserve by Natural England
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Appropriate Assessment Screening of South Lakeland District Council’s Core Strategy Source:http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf This screening report concluded that no significant effects on Duddon Mosses SAC were likely. Preferred options are not likely to have a significant effect upon the conservation objectives of this site, although there is an opportunity to support the restoration of bogs in general, which provide wider benefits such contributing to reducing incidents of flash flooding through the retention and slow release of water as well as acting a carbon store. • Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it’s wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect.

	Duddon Mosses SAC
	<ul style="list-style-type: none"> <li data-bbox="674 320 2042 539"> <p>• HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.</p> <li data-bbox="674 579 2042 798"> <p>• Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Duddon Mosses SAC are assessed as being unlikely.</p>

Site Name: Drigg Coast

- Location Grid Ref: 54 21 02 N, 03 25 47 W
- JNCC Site Code: [UK0013031](#)
- Size: 1397.44 ha.
- Designation: SAC

Drigg Coast SAC	
Site Description	<p><i>Source: English Nature (2000) Drigg Coast European Marine Site: English Nature’s advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc) Regulations 1994</i></p> <p>This site is one of the best examples in the UK of a small bar-built estuary complex. Whilst there are 47 bar built estuaries in Britain, this is the only one on the North West coast of England (the main concentrations being the Welsh, East Anglian and Southern coasts) and only 3 others have been selected as candidate SACs. The estuary complex is one of the most natural and least developed in the UK, with little industry and virtually no artificial coastal defences. It contains some of the best examples of little disturbed transitions to freshwater and sand dune habitats of any estuary in the UK.</p> <p>The estuary complex is fed by the Rivers Irt, Mite and Esk which discharge through a mouth that has been narrowed by large sand and shingle spits on which the Drigg and Eskmeals dune systems have developed. The sediments within the estuary are largely muddy within the Rivers Irt and Mite, while those of the Esk are more sandy, particularly towards the mouth. There is a substantial freshwater influence in the upper reaches of all three rivers, with good development of associated animal communities. Within the site there is an excellent zonation of saltmarsh habitats from pioneer through to upper marsh and some of the least disturbed transitions to terrestrial habitats, particularly to sand dune, shingle and freshwater swamp. These transition habitats are absent in most other British estuaries.</p>

Drigg Coast SAC	
Qualifying Features	<p>Source: http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013031</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p>1130 Estuaries</p> <p>Drigg is an example of a small, bar-built estuary on the North West coast of England. It is fed by three rivers (the Irt, Mite and Esk) which discharge through a mouth that has been narrowed by large sand and shingle spits. The sediments within the estuary are largely muddy within the Rivers Irt and Mite, while those of the Esk are more sandy, particularly towards the mouth. There is a substantial freshwater influence in the upper reaches of all three rivers, with good development of associated animal communities. Within the site are some of the least-disturbed transitions to terrestrial habitats of any estuary found in the UK.</p> <p>2150 Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) * Priority feature</p> <p>Drigg represents Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) in North West England. There are substantial areas of the habitat type, showing a wide range of ecological variation. Some areas are dominated by Heather <i>Calluna vulgaris</i> and Bell Heather <i>Erica cinerea</i>. Within the dry dune heath are wetter areas in which Cross-leaved Heath <i>Erica tetralix</i> is prominent. There are large areas of acidic dune grassland with a prominent lichen component and also areas where Sand Sedge <i>Carex arenaria</i> grows in carpets of the moss <i>Racomitrium canescens</i>.</p> <p>2170 Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)</p> <p>Drigg contains a number of dunes with <i>Salix repens</i> ssp. <i>argentea</i>. These span a range of hydrological conditions from very wet to relatively dry. The slacks also grade into more acidic 2190 Humid dune slacks with some interesting intermediate types. This site is representative of dunes with <i>Salix repens</i> ssp. <i>argentea</i> in North West England.</p>

Drigg Coast SAC	
	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>1140 <u>Mudflats and sandflats not covered by seawater at low tide</u></p> <p>1310 <u>Salicornia and other annuals colonising mud and sand</u></p> <p>1330 <u>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)</u></p> <p>2110 <u>Embryonic shifting dunes</u></p> <p>2120 <u>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (‘white dunes’)</u></p> <p>2130 <u>Fixed dunes with herbaceous vegetation (‘grey dunes’)</u> * Priority feature</p> <p>2190 <u>Humid dune slacks</u></p>
Conservation Objectives	<p>Source: English Nature (2000) Drigg Coast European Marine Site: English Nature’s advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc) Regulations 1994</p> <p>Subject to natural change, maintain the estuaries in favourable condition , in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities • Saltmarsh communities • Boulder and cobble scar communities <p>Conservations objectives were not available for those features which are not covered under Regulation 33(2) proxy conservation objectives are given below and are based on conservation objectives where available for similar sites:</p> <p>Subject to natural change, to maintain, in favourable condition:</p> <ul style="list-style-type: none"> • Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)

Drigg Coast SAC													
	<ul style="list-style-type: none"> • Dunes with <i>Salix repens ssp argentea</i> • Mudflats and sandflats not covered by seawater at low tide • <i>Salicornia</i> and other annuals colonising mud and sand • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) • Embryonic shifting dunes • Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (`white dunes`) • Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature • Humid dune slacks 												
Component SSSIs	<p>Component SSSI (27 units) condition status</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="background-color: #d3d3d3;">SAC component site</th> <th style="background-color: #d3d3d3;">Favourable</th> <th style="background-color: #d3d3d3;">Unfavourable recovering</th> <th style="background-color: #d3d3d3;">Unfavourable no change</th> <th style="background-color: #d3d3d3;">Unfavourable declining</th> <th style="background-color: #d3d3d3;">Destroyed, part destroyed</th> </tr> </thead> <tbody> <tr> <td style="background-color: #d3d3d3;">Drigg Coast SSSI</td> <td>90.12%</td> <td>3.07%</td> <td>4.53%</td> <td>2.27%</td> <td>0.00%</td> </tr> </tbody> </table>	SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed	Drigg Coast SSSI	90.12%	3.07%	4.53%	2.27%	0.00%
SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed								
Drigg Coast SSSI	90.12%	3.07%	4.53%	2.27%	0.00%								
Key Environmental Conditions (factors that maintain site integrity)	<p>Source: HRA of the NW Regional Spatial Strategy (Scott Wilson, 2008)</p> <ul style="list-style-type: none"> • Maintain morphological equilibrium of the estuary, including sedimentation patterns • Maintain temperature and salinity levels within natural range • Avoidance of pollution • Avoidance of nutrient enrichment • Appropriate grazing of saltmarsh communities • No physical constraints to natural migration of mobile habitats such as dunes • Maintain minimal impact of fishing, bait digging and dredging • High enough water table for dune slacks • Avoidance of damaging levels of erosion from human activities 												

Drigg Coast SAC	
	<ul style="list-style-type: none"> • No increase in organic matter in sediments • No physical constraints to managed realignment if required in response to coastal squeeze • Control of bracken/ scrub • Control of invasive and/or non-native species
SAC Condition Assessment	See component SSSI condition assessment
Vulnerabilities (includes existing pressures and trends)	<p>Source: http://www.jncc.gov.uk/protectedsites/sacselection/n2kforms/UK0013031.pdf</p> <p>The estuary and sand dunes systems are still relatively 'natural' and there is no threat at present of any development that may affect estuarine processes. Much of the sand dune area is under Countryside Stewardship Agreements or as a Cumbrian Wildlife Trust Reserve. The vulnerability of the marine site will be further identified through English Nature's work to develop and promote the necessary conservation measures for UK marine SACs. English Nature has developed guidance on setting and reviewing conservation objectives, identified key human activities which may affect Annex I and Annex II interests, identified the necessary survey management and monitoring systems, and increased the awareness of those most closely involved in the use and management of marine SACs. English Nature's advice under Regulation 33 has been issued and a brief management scheme statement drafted.</p> <p>Source: English Nature (2000) Drigg Coast European Marine Site - English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc) Regulations 1994:</p> <p>General advice to the vulnerability of specific interest feature of the Drigg Coast European marine site is listed below. Also an explanation of the sensitivity of the interest feature is detailed with an explanation of their exposure and vulnerability to damage or disturbance.</p>

	Drigg Coast SAC
	<p>Physical loss:</p> <ul style="list-style-type: none"> • All the sub-features are sensitive to physical loss, particularly through removal. Removal of saltmarshes may occur through direct land claim, coastal construction, and, for the boulder and cobble scar communities, through the harvesting of species such as mussels. Coastal development could create a barrier to the inland expansion of saltmarsh in response to sea level rise, and thus may result in loss of the important transitions to terrestrial habitats which currently occur on the Drigg Coast European marine site. Changes to coastal processes can alter the tidal regime, which may also result in the loss of elements of the estuary complex. Whilst such activities have occurred on the site in the past and have affected the condition of the features, for example depletion of mussel populations, currently the sub-features of the site are not exposed to activities resulting in their physical loss, and hence are not currently considered to be vulnerable. <p>Physical damage:</p> <ul style="list-style-type: none"> • The boulder and cobble scars with mussel beds are highly sensitive to physical damage through siltation. These epifaunal communities can be damaged by siltation of fine material which may clog their feeding or respiratory structures. However the current exposure to siltation within the estuary is low, and hence the vulnerability score of estuaries to this form of operation is low. <p>Toxic contamination:</p> <ul style="list-style-type: none"> • Both intertidal mudflat and sandflat communities and boulder and cobble scar communities are highly sensitive to toxic contamination from introduction of synthetic and non-synthetic compounds such as PCBs (PolyChlorinated Biphenyls) and heavy metal based compounds. Saltmarsh communities are highly sensitive to the introduction of non-synthetic compounds. Such contaminants may have lethal or sub-lethal effects on marine organisms and this will vary

	Drigg Coast SAC
	<p>according to the state and availability of the compound and the characteristics of the organisms of the receiving systems.</p> <ul style="list-style-type: none"> • Lethal effects can remove more pollution sensitive individuals and species, leaving pollution tolerant and opportunistic species. Sub-lethal effects may alter functions of organisms such as reproduction, physiology, genetics and health which will ultimately reduce their fitness for survival (Elliot and others 1998). Sheltered low energy areas such as estuaries tend to concentrate these pollutants which bind to fine particles and settle out onto mudflats and sandflats. • Current exposure to toxic contamination within the Drigg Coast European marine site is low and hence the vulnerability is currently considered to be low. The Drigg Coast European marine site (the estuary at Ravenglass) is an area where fine sediments are deposited on the sheltered, low energy inter-tidal mudflats and the peripheral saltmarshes. It is known that such fine sediments have an enhanced capacity to adsorb radionuclides discharged to sea (for example, from Sellafield) (IAEA, 1985; Cole and others 1999). These habitats are, therefore, areas of increased radiation exposure from external sources. The local organisms can also accumulate the radionuclides either in association with ingested sediments or by metabolic incorporation into tissues (MAFF, 1999) leading to internal radiation exposure. • The magnitude of the potential effects is dependent on the level of contamination. Historic radionuclide discharges from Sellafield (Woodhead, 1984, 1986) have resulted in increased levels of radionuclides in some locations of the north-east Irish Sea. Recent reviews have been published on the effects of increased radiation exposure on wild organisms, including effects on mortality rate, reproductive capacity and mutation rate (IAEA, 1992; UNSCEAR, 1996). These

	Drigg Coast SAC
	<p>indicate that, on the basis of current understanding, and for those organisms where we have reliable radiation exposure information, the existing levels of contamination should not give rise to effects on populations in the Irish Sea) Non-toxic contamination.</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities are sensitive to nutrient and organic enrichment. An increase in the nutrient loading within the estuary, as a result of, for example, domestic sewage discharges, can result in increased growth of algae and phytoplankton. Increased levels of opportunistic algae such as <i>Enteromorpha</i> spp. may result in algal mats, with anoxic conditions in the sediment beneath the algal mats, and consequent reduction in diversity and abundance of infauna (Simpson, 1997). • Increased organic material content of the water column and sediments can also result in reduced oxygen levels due to the increased activity of aerobic bacteria which break down organic material. This can have knock-on effects for marine animals which require oxygen for their healthy functioning. Given the current exposure of the estuary sub-features to nutrient enrichment, they are currently considered to be moderately vulnerable to this operation. <p>Biological disturbance:</p> <ul style="list-style-type: none"> • Saltmarsh communities are sensitive to biological disturbance in the form of expansion of the invasive species Cord Grass <i>Spartina anglica</i>. This species currently occurs in very small amounts on the site, probably spread from elsewhere, and its current distribution within the site appears to be stable. However, given the right conditions, it can be a robust and aggressive plant, and there are concerns about any increases in its distribution on the site.
Landowner/ Management	<ul style="list-style-type: none"> • Not available

Drigg Coast SAC	
Responsibility	
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Drigg Coast SAC are assessed as being possible. • Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect. • HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.

Site Name: Subberthwaite, Blawith and Torver Low Commons

- Location Grid Ref: 54 17 47 N, 03 07 23 W
- JNCC Site Code: [UK00302850](#)
- Size: 1865.17 ha

- **Desingation: SAC**

Subberthwaite, Blawith and Torver Low Commons SAC	
Site Description	<p>Source: Subberthwaite, Blawith and Torver Low Commons SSSI citation</p> <p>Subberthwaite, Blawith and Torver Low Commons are situated on the broad hilly plateau bounded by the settlements of Torver, Woodland, Grizebeck, Lowick and Blawith, 4 km south of the village of Coniston and east of Broughton in Furness. The underlying rocks of Silurian slates and shales have given rise to an irregular landscape of rocky hills interspersed with broad shallow valleys. Bracken, acid grassland and heather with some areas of scrub and woodland occur on drier ground whilst mires occur extensively on the valley bottoms, in rocky basins and on slopes.</p> <p>The mires are of particular interest and four main types occur within the site. Valley mires, which are peatlands with a central watercourse, are the most important, and the area contains the greatest concentration and extent of the habitat in Cumbria. Basin mires (developed in rock basins, with no stream), flushes (wet hillside mires) and swamps (found on tarn edges) are also present. At least 17 different plant communities occur in these mires, sometimes in mosaics or showing transitions to other habitats such as tarns. Subberthwaite, Blawith and Torver Low Commons supports the greatest variety of mire communities known for any mire SSSI in South Cumbria, and the vegetation mosaics and transitions are particularly well displayed.</p> <p>Small streams or soakways weave through these carpets of vegetation frequently splitting and then rejoining to form a complete pattern. The waters have often arisen from springs beyond the mire and contain minerals and nutrients which enable a range of different plant species to occur very locally in and around the streams. The Bottle Sedge <i>Carex rostrata</i> often occurs in the open water and bog pondweed is also frequently present along with Bogbean <i>Menyanthes trifoliata</i>, Common Cottongrass, Few-flowered Spike-rush <i>Eleocharis quinqueflora</i> and Marsh Arrowgrass <i>Triglochin palustris</i>. Below the surface of the water, Bladderworts <i>Utricularia intermedia</i> and <i>U minor</i> occur and</p>

Subberthwaite, Blawith and Torver Low Commons SAC	
	<p>occasionally the Stonewort <i>Chara globularis</i>, a type of algae. There is frequently a carpet of moss <i>Scorpidium scorpioides</i> on the shallow stream bed which gives way to <i>Drepanocladus revolvens</i> and <i>Sphagnum contortum</i> with some <i>S.auriculatum</i> in the soaking vegetation on the edges of the streams. White Beak-sedge <i>Rhynchospora alba</i>, Carnation Sedge, Common Butterwort <i>Pinguicula vulgaris</i>, Lesser Clubmoss <i>Selaginella selaginoides</i>, Intermediate Sundew <i>Drosera intermedia</i>, <i>Aneura pinguis</i> and <i>Campylium stellatum</i> are also typical of these flushed areas. The diminutive Bog Orchid <i>Hammarbya paludosa</i>, a nationally scarce species, occurs in the marginal vegetation in one of the mires.</p>
Qualifying Features	<p>Source: http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030285</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p>7140 Transition mires and quaking bogs</p> <p>This site in South West Cumbria supports some of the best examples of Transition mires and quaking bogs in the UK, with over 200 mires on a broad hilly plateau. The mires are dominated by tall sedges and rushes with mixed herbs, over a ground layer of bog-mosses <i>Sphagnum</i> spp. and feather-mosses including <i>Calliergon cuspidatum</i>. Twenty-six NVC types are represented, including M4 <i>Carex rostrata</i> – <i>Sphagnum recurvum</i> mire, M9 <i>Carex rostrata</i> – <i>Calliergon cuspidatum/giganteum</i> mire, and S27 <i>Carex rostrata</i> – <i>Potentilla palustris</i> tall-herb fen.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>7150 Depressions on peat substrates of the <i>Rhynchosporion</i></p>
Conservation Objectives	<ul style="list-style-type: none"> No conservation objectives were available but proxy conservation objectives are given below and are based on conservation objectives where available for similar sites:

Subberthwaite, Blawith and Torver Low Commons SAC						
	Subject to natural change, to maintain, in favourable condition: <ul style="list-style-type: none"> • Transition mires and quaking bogs • Depressions on peat substrates of the <i>Rhynchosporion</i> 					
Component SSSIs	Component SSSI (27 units) condition status					
	SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed
	Subberthwaite Blawith and Torver Low Commons SSSI	99.34%	0.6%	0%	0%	0%
Key Environmental Conditions (factors that maintain site integrity)	Source: A statement of English Nature’s views about the management of Subberthwaite, Blawith And Torver Low Commons Site of Special Scientific Interest (2004). <u>Transition mires and quaking bogs</u> <ul style="list-style-type: none"> • The maintenance of the characteristic composition and diversity of valley mires is dependent on the quantity and quality of the groundwater (although the quantity is not likely to be naturally constant throughout the seasons or between wet and dry years). The groundwater comes from aquifers and these may become depleted due to abstraction or failure to recharge. Transition towards rank vegetation can occur as a result of contamination from agricultural chemicals such as fertilizers, or by pollution leaking from landfill sites. • Drainage schemes should be designed not to intercept the sources of ground and surface water or to reduce the area they irrigate. The bed of the watercourse should not be lowered, nor should its water level be artificially raised. This will ensure that ‘headward’ erosion is not 					

Subberthwaite, Blawith and Torver Low Commons SAC	
	<p>triggered, in which increased flow gradually erodes the peat and silt on which the valley mires develop.</p> <ul style="list-style-type: none"> Grazing is important in the management of valley mire and it is often necessary to keep vegetation short and open around springs and flushes – livestock help to break up the tussocks of rank grasses for example. Purple Moor-grass and also limit the spread of willow, alder and birch carr. <p><u>Depressions on peat substrates of the <i>Rhynchosporion</i></u></p> <ul style="list-style-type: none"> Vegetation is affected by groundwater and its level relative to the land surface, fluctuations in ground water level and its constituents. It is essential to exclude undue concentrations of nitrogen and phosphorous, any increase in which would result in the development of eutrophic fen. Basin mires are unlikely to be suitable for grazing animals.
SAC Condition Assessment	See component SSSI condition assessment
Vulnerabilities (includes existing pressures and trends)	<p>Source: http://www.jncc.gov.uk/protectedsites/sacselection/n2kforms/UK0030285.pdf</p> <p>This site comprises a complex mosaic of over 200 discrete mires set within an agriculturally unimproved landscape. The mires are at or near favourable condition and would only be threatened by intensification of land-use on the surrounding commons or by interference with the site hydrology. There is a good liaison with a commoners association over part of the site. Lowland heath is not listed as a SAC feature on the site because of its degraded, unfavourable condition. Heathland may be inhibited from recovery by the livestock management regime but at current livestock levels this is not believed to be affecting the mire interest.</p> <p><i>Source: Joint Nature Conservation Committee. 2007. Second Report by the UK under Article 17 on</i></p>

Subberthwaite, Blawith and Torver Low Commons SAC	
	<p><i>the implementation of the Habitats Directive from January 2001 to December 2006. Peterborough: JNCC. Available from: www.jncc.gov.uk/article17</i></p> <ul style="list-style-type: none"> • Water abstraction Past and continuing loss of area by drainage and conversion to intensive agriculture has led to past losses of both habitats. Excessive water abstraction from aquifers has dried up or reduced spring line flows, and generally lowered water tables. Abstractions also have affected the natural balance between the differing water qualities of ground water and surface water. • Grazing Both under and over-grazing have been recorded as reasons for adverse condition of both habitats. • Fragmentation Small total area of habitat and critically small population sizes of several key species dependent on these two habitat types are also major pressures on these habitats. • Absence of or inappropriate management Lack of or inappropriate management of existing bogs, fens, wet heaths and blanket bogs leads to drying, scrub encroachment and succession to woodland. • Pollution Valley fens are particularly susceptible to agricultural run-off within the catchment. Enrichment or hypertrophication can result in substantial adverse changes to key plant communities. • Air pollution Based on an assessment of the exceedence of relevant critical loads air pollution is considered to be a potentially significant pressure to the structure and function of both habitats. • Burning Burning was once a management tool used to open the open raised bog landscape and create a diverse surface structure, and is still used on blanket bog areas. However, it can lead to damage to the core vegetation. • Forestry operations In addition to the direct impacts of existing plantations on deep peat, successive rotations dry out neighbouring areas and act as an invasive seed sources.

Subberthwaite, Blawith and Torver Low Commons SAC	
Landowner/ Management Responsibility	<ul style="list-style-type: none"> Information not available.
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria. to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect. HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made. Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Subberthwaite, Blawith and Torver Low Commons SAC are assessed as being unlikely.

Site Name: Roudsea Wood and Mosses

- Location Grid Ref: 54 13 04 N, 03 00 06 W
- JNCC Site Code: [UK0019834](#)
- Size: 470.45 ha
- Designation: SAC

Roudsea Wood and Mosses SAC	
Site Description	<p>Source: http://www.english-nature.org.uk/special/nnr/nnr_details.asp?nnr_name=&C=9&Habitat=0&natural_area=&local_team=0&spotlight_reserve=0&X=&NNR_ID=135</p> <p>Please note the following is a description of Roudsea Wood and Mosses NNR</p> <p>Roudsea Wood and Mosses NNR is a complex site comprising four main habitats: coastal saltmarsh, acid woodland, limestone woodland and lowland raised mire; plus the transitional zones between these habitats.</p> <p>Over 280 fungi and 500 plant species are found in the reserve the latter including the rare Large Yellow Sedge, Lancashire Whitebeam and True Fox Sedge.</p> <p>Animals seen at the site include Dormouse, Red Squirrel, Otter, Brown Hare and Harvest Mouse and the area supports over 50 species of breeding birds such as Nightjar, Skylark, Song Thrush, Spotted Flycatcher and Bullfinch.</p> <p>A large number of rare and scarce invertebrates are found at the site including the Bog-bush Cricket. The diverse moth population includes the Barred Tooth-stripe, Square Spotted Clay and Sword-grass. Scarce butterflies and moths found here include the High Brown Fritillary butterfly, Small Eggar, and Blotched Emerald.</p>

Roudsea Wood and Mosses SAC	
Qualifying Features	<p>Source: http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0019834</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p>7110 <u>Active raised bogs</u> * Priority feature</p> <p>Roudsea consists of a complex of raised bogs on the northern shore of Morecambe Bay in North West England. Although the majority of the complex has undergone extensive drainage in the past, with domestic peat-cutting around the margins, drainage was abandoned many years ago and much of the area has recovered to a considerable degree. Less than 20% of the site is classified as 7120 degraded raised bog. Within the site there are transitions between acid bog and limestone woodland, with a number of scarce plant species including the rare large yellow-sedge <i>Carex flava</i>.</p> <p>7120 <u>Degraded raised bogs still capable of natural regeneration</u></p> <p>This is a complex of raised bogs on the northern shore of Morecambe Bay in North West England. Although the majority of the complex has undergone extensive drainage in the past, with domestic peat-cutting around the margins, drainage was abandoned many years ago and peat-formation has resumed over much of its area. Less than 20% of the site is classified as degraded raised bog. Within the site there are transitions between acid bog and limestone woodland, with a number of scarce plant species including the rare yellow sedge <i>Carex flava</i>.</p> <p>9180 <u>Tilio-Acerion forests of slopes, screes and ravines</u> * Priority feature</p> <p>Woodland at Roudsea, with others within the nearby Morecambe Bay Pavements, represents Tilio-Acerion forests on Carboniferous limestone in North West England. Although close to the northern limit of lime distribution, the ash <i>Fraxinus excelsior</i>-dominated woodland around Morecambe Bay contains many patches of small-leaved lime <i>Tilia cordata</i>, which survive sometimes with elm <i>Ulmus</i> spp., often along outcrop edges. There is a rich assemblage of rare species, including fingered sedge <i>Carex digitata</i>. A notable feature of this wood is the sudden vegetation change across the boundaries between the limestone, where the <i>Tilio-Acerion</i> occurs, and acid peats or Silurian slates.</p>

Roudsea Wood and Mosses SAC													
	<p>91J0 <u>Taxus baccata woods of the British Isles</u> * Priority feature</p> <p>The yew <i>Taxus baccata woods</i> of Roudsea Wood have strong similarities with the yew stands at the nearby Morecambe Bay Pavements. They are both on the northern Carboniferous Limestone, and as in the Wye Valley yew occurs both as dense groves and as scattered trees in the understorey of ash or ash-elm <i>Fraxinus-Ulmus</i> woodland.</p>												
Conservation Objectives	<ul style="list-style-type: none"> No conservation objectives were available but proxy conservation objectives are given below and are based on conservation objectives where available for similar sites: <p>Subject to natural change, to maintain, in favourable condition:</p> <ul style="list-style-type: none"> Active raised bogs Degraded raised bogs still capable of natural regeneration <i>Tilio-Acerion</i> forests of slopes, screes and ravines <i>Taxus baccata</i> woods of the British Isles 												
Component SSSIs	<p>Component SSSI (11 units) condition status</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="background-color: #d3d3d3;">SAC component site</th> <th style="background-color: #d3d3d3;">Favourable</th> <th style="background-color: #d3d3d3;">Unfavourable recovering</th> <th style="background-color: #d3d3d3;">Unfavourable no change</th> <th style="background-color: #d3d3d3;">Unfavourable declining</th> <th style="background-color: #d3d3d3;">Destroyed, part destroyed</th> </tr> </thead> <tbody> <tr> <td style="background-color: #d3d3d3;">Roudsea Wood and Mosses SSSI</td> <td>2.35%</td> <td>61.99%</td> <td>4.65%</td> <td>31.01%</td> <td>0.00%</td> </tr> </tbody> </table>	SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed	Roudsea Wood and Mosses SSSI	2.35%	61.99%	4.65%	31.01%	0.00%
SAC component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed								
Roudsea Wood and Mosses SSSI	2.35%	61.99%	4.65%	31.01%	0.00%								
Key Environmental Conditions (factors that maintain site integrity)	<p>Source: A statement of English Nature's views about the management of Roudsea Wood and Mosses Site of Special Scientific Interest (2004).</p> <p><u>Active and degraded raised bogs</u></p> <ul style="list-style-type: none"> Lowland raised bogs are peat-forming wetlands which form where certain plants decompose 												

	Roudsea Wood and Mosses SAC
	<p>slowly under waterlogged conditions. Alterations to the rate of water loss will destabilize them. A raised bog is so-called because its plants die, consolidate and stack up as peat above the groundwater.</p> <ul style="list-style-type: none"> • Water inputs are from precipitation alone and are therefore low in solutes, so significant increases in the base or nutrient status of the system will alter the vegetation cover in favour of non-bog species. • On the Mosses, management of the water levels is essential to restore the moss vegetation. This involves a programme of blocking the 55 miles of 18th century ditches with dams, and the removal of invading birch, pine and rhododendron. This work is helping to restore the Mosses as active raised mires. • The habitat can become very acid in the absence of groundwater, actively increased by <i>Sphagnum</i> mosses. Management must therefore ensure a high and stable water table in the peat, not falling more than about 10cm below the surface over the course of a year. • The living layer of vegetation acts as a 'natural' regulator for water loss, so destruction or alteration of the vegetation will have significant implications for the long-term stability of the ecosystem as a whole. • Management must ensure encroachment by trees and scrub (especially birch) is avoided - cut and drained peatlands are particularly prone to encroachment. • Game bird feeding must not be carried out on the surface of the bog in order to avoid the addition of unwanted nutrients. <p><u>Broadleaved semi-natural woodland</u></p> <ul style="list-style-type: none"> • Avoidance of over-grazing from deer as this impoverishes the ground flora and creates difficulties for regeneration which may impact the woodland structure. Fencing is necessary to prevent damage to new stems. • Management of non-native species - invasion by sycamore, beech and other species • Avoidance of unsympathetic forestry practices for example planting of inappropriate conifer and broadleaved trees.

Roudsea Wood and Mosses SAC	
	<ul style="list-style-type: none"> • Avoidance of inappropriate management – coppicing is carried out along the limestone ridge. • Avoidance of nutrient enrichment - Ash woods can be negatively affected by nutrient enrichment arising from spray drift or run-off from adjacent agricultural land. This can lead to changes in soils and ground flora. • Maintenance of air quality
SAC Condition Assessment	See SSSI condition status for specific information on condition.
Vulnerabilities (includes existing pressures and trends)	<p>Source: http://www.jncc.gov.uk/ProtectedSites/SACselection/n2kforms/UK0019834.pdf</p> <p>In the latter part of the 20th century, coppicing of the woodland ceased and lower water tables on the bogs, caused by drainage for peat-cutting, had allowed scrub to spread across them. Most of the site is now managed as a National Nature Reserve. Woodland management is carried out and much scrub has been cleared from Deer Dike Moss and ditches blocked to allow regeneration of the bog vegetation. Management of the southern bog, recently added to the National Nature Reserve, has been addressed in the management plan.</p>
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • Managed as a National Nature Reserve by Natural England
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Appropriate Assessment Screening of South Lakeland District Council’s Core Strategy Source: http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf This screening report concluded that no significant effects on Roudsea Wood and Mosses SAC were likely. Preferred options are not likely to have a significant effect upon the conservation objectives of this site, although there is an opportunity to support the restoration of bogs in general, which provide wider benefits such contributing to reducing incidents of flash flooding through the retention and slow release of water as well as acting a carbon store. • Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is

	Roudsea Wood and Mosses SAC
	<p>being developed to provide guidance on local planning policy across Cumbria to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect.</p> <ul style="list-style-type: none"> <li data-bbox="622 579 2042 722"> <p>• Appropriate Assessment Screening of South Lakeland District Council's Core Strategy Source: http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf This screening report concluded that no significant effects on Roudsea Wood and Mosses SAC are likely as a result of policies within the Core Strategy.</p> <li data-bbox="622 762 2042 946"> <p>• Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Roudsea Wood and Mosses SAC are assessed as being unlikely.</p> <li data-bbox="622 986 2042 1200"> <p>• HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.</p>

Special Proctect Areas

Site Name: Duddon Estuary

- Location: 02 57 21 W, 54 07 19 N
- JNCC Site Code: [UK9005031](#)
- Size: 37404.6 ha
- Desingtion: SPA

Duddon Estuary SPA	
Site Description	<p>Source: http://www.jncc.gov.uk/default.aspx?page=1981</p> <p>The Duddon Estuary is located North West of Morecambe Bay on the coast of Cumbria in North West England. It is formed where the River Duddon and the smaller Kirkby Pool opens into the Irish Sea. It is a complex site, mostly consisting of intertidal sand and mud-flats, important for large numbers of wintering and passage waterbirds. A range of grazed and ungrazed saltmarsh habitats occurs around the edge of the estuary, especially the sheltered inner section. The site is the most important in Cumbria for sand-dune communities including large areas of calcareous dunes at Sandscale and Haverigg Haws and contrasting acid dunes on North Walney. There are a number of settlements and industrial areas on the periphery of the site. Artificial habitats include slag banks and a flooded iron-ore working known as Hodbarrow Lagoon forms the largest coastal lagoon in North West England. The intertidal sand- and silt-flats contain abundant invertebrates that support important numbers of wintering waterbirds, especially waders, during the migration and winter periods. Saltmarshes, sand dunes and Hodbarrow Lagoon act as important high-tide roosts for wintering waders and wildfowl. High-tide roosts are also found outside the site boundary on the landward side. The site is also of importance for breeding terns which nest in dune areas and slag banks, and feed in the shallow waters of the estuary and surrounding waters. Hodbarrow Lagoon is a key high-tide roosting site for terns.</p>

Duddon Estuary SPA	
Qualifying Features	<p>Source: http://www.jncc.gov.uk/pdf/SPA/UK9005031.pdf</p> <p>Article 4.1 qualification</p> <p>During the breeding season the area regularly supports:</p> <p><i>Sterna sandvicensis</i> (Western Europe/Western Africa) 3% of the population in Great Britain, 5 year mean for 1992 to 1996</p> <p>Article 4.2 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Anas acuta</i> (North Western Europe) 4.7% of the NW European population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Anser brachyrhynchus</i> (Eastern Greenland/Iceland/UK) 1.1% of the World population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Arenaria interpres</i> (Western Palearctic - wintering) 2.4% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Calidris alpina alpina</i> (Northern Siberia/Europe/Western Africa) 3.8% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Calidris canutus</i> (North-eastern Canada/Greenland/Iceland/Northwestern Europe) 8.5% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Haematopus ostralegus</i> (Europe and Northern/Western Africa) 5.4% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Limosa lapponica</i> (Western Palearctic - wintering) 2.6% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p>

	Duddon Estuary SPA
	<p><i>Numenius arquata</i> (Europe - breeding) 3.9% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Pluvialis squatarola</i> (Eastern Atlantic - wintering) 1.1% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Tadorna tadorn</i> (North Western Europe) 2.1% of the NW European population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Tringa tetanus</i> (Eastern Atlantic - wintering) 3.6% of the East Atlantic Flyway population 5 year peak mean for 1989/90 to 1993/94</p> <p>On passage the area regularly supports: <i>Charadrius hiaticula</i> (Europe/Northern Africa - wintering) 1.5% of the international population (unspecified) 5 year peak mean for 1991/92 to 1995/96</p> <p>Article 4.2 Qualification: an internationally important assemblage of birds</p> <p>During the breeding season the area regularly supports:</p> <p>61858 seabirds (5 year peak mean 28/09/1999) Including: <i>Sterna sandvicensis</i> .</p> <p>Over winter the area regularly supports: 210668 waterfowl (5 year peak mean 28/09/1999) Including: <i>Anser brachyrhynchus</i> , <i>Tadorna tadorna</i>, <i>Anas acuta</i>, <i>Haematopus ostralegus</i>, <i>Pluvialis squatarola</i>, <i>Calidris canutus</i>, <i>Calidris alpina alpina</i>, <i>Limosa lapponica</i>, <i>Numenius arquata</i>, <i>Tringa totanus</i>, <i>Arenaria interpres</i>.</p>
Conservation Objectives	The conservation objectives for the internationally important populations of the regularly occurring Annex 1 bird species areas as follows:

	Duddon Estuary SPA
	<p>Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex 1 bird species, under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Shallow coastal waters <p>The conservation objective for the internationally important populations of the regularly occurring migratory bird species is as follows:</p> <p>Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring migratory species, under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflats and sandflat communities • Intertidal and subtidal boulder and cobble skear communities • Saltmarsh communities <p>The conservation objective for the internationally important assemblage of waterfowl is as follows:</p> <p>Subject to natural change, maintain in favourable condition the habitats for the internationally important assemblage of waterfowl under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities • Intertidal and subtidal boulder and cobble skear communities • Saltmarsh communities

Duddon Estuary SPA						
Component SSSIs	Component SSSI (36 units) condition status					
	SPA component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed
	Duddon Estuary SSSI	93.13%	4.53%	1.61%	0.67%	0.05%
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> Avoidance of pollution Management of saltmarsh grazing Control of bait digging and dredging Maintenance of prey availability for example control of shell-fishing Maintenance of uninterrupted views Open ground with short vegetation cover for feeding and roosting birds Maintain hydrology of wet grassland (for waders) Limited disturbance to birds (land and waterbased) No physical constraints to natural migration of mobile habitats Maintenance of natural sedimentation patterns Control of non-native species 					
SPA Condition Assessment	<ul style="list-style-type: none"> See component SSSI condition assessment 					
Vulnerabilities (includes existing pressures and trends)	<p>Source: http://www.jncc.gov.uk/pdf/SPA/UK9005081.pdf</p> <p>The site is subject to a wide range of pressures such as land-claim for agriculture, overgrazing, dredging, overfishing, industrial uses and unspecified pollution. However, overall the site is relatively robust and many of those pressures have only slight to local effects and are being addressed thorough Management Plans. The breeding tern interest is very vulnerable and the colony has recently moved to the adjacent Duddon Estuary. Positive management is being secured through management plans for non-governmental organization reserves, English Nature Site Management</p>					

	Duddon Estuary SPA
	<p>Statements, European Marine Site Management Scheme, and the Morecambe Bay Partnership.</p> <p><i>Source: English Nature (2000) Duddon Estuary European Marine Site: English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats, etc) Regulations 1994</i></p> <p>Vulnerabilities identified for the internationally important populations of regularly occurring Annex 1 species are detailed below:</p> <ul style="list-style-type: none"> <p>• Physical loss / Removal Sandwich Tern (<i>Sterna sandvicensis</i>) are highly sensitive to the loss through removal of any important feeding habitats on which they depend. In the case of the Duddon Estuary European marine site, they are primarily dependant on shallow coastal water. Loss of shallow coastal waters through changes in sea defence structures would result in a reduction in important feeding habitat which supports sand eels, spratt and other species on which feeding birds depend.</p> <p>Removal of feeding habitat through coastal protection works may also lead to changes in coastal processes, for example, increased wave exposure and changes in subtidal channels. This can exacerbate habitat loss and can change the nature of existing sediments, thus further influencing changes in feeding areas. Due to their high sensitivity and current, low, level of exposure, shallow coastal waters are moderately vulnerable to removal.</p> <p>• Non-toxic contamination / Changes in nutrient and organic loading Changes in nutrient and organic loading can have a variety of effects upon the habitats within the Duddon Estuary that support Annex 1 species. The most notable habitats are the intertidal mud and sand flats and the intertidal and subtidal boulder and cobble skewer communities. Nutrient and organic loading can affect bird feeding habitats either positively by increasing food availability or negatively by altering species composition to less favourable prey species. Organic or nutrient loading can reduce the availability of food for birds by increasing growth of algal mats in the intertidal area. Algal blooms</p>

	Duddon Estuary SPA
	<p>can reduce the surrounding water quality by causing the removal of oxygen as the bloom decomposes or occasionally by the release of toxins. Such deterioration in water quality can impact on marine communities and cause a reduction in food availability. Algal blooms also cause a reduction in water clarity, thereby reducing the visibility of prey items for sandwich tern. At present in the Duddon Estuary, the main sources of point source contamination enter these habitats through diffuse agricultural sources and point source discharges from sewage treatment works most notably at the towns of Millom and Askam-in-Furness. Crude sewage also enters the estuary through discharges at Broughton-in-Furness and Barrow-in-Furness. As mentioned previously (Section 3.2) the Urban Waste Water Treatment Directive and Bathing Water Directive are focussing on installing appropriate treatment to reduce the concentration of dissolved nutrients. The effect of this upon the Annex 1 species, and the European marine site in general is currently being researched. Given the current, medium level of exposure, these particular sub-features are moderately vulnerable to changes in nutrient and organic loading.</p> <ul style="list-style-type: none"> <p>Toxic contamination / Introduction of synthetic and non-synthetic compounds Sandwich terns are sensitive to the introduction of synthetic and non-synthetic compounds due to the accumulation of toxins through the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability and abundance of prey items caused by toxic contamination. The lethal effects of this contamination depend on the type and concentration of the toxic compound. Sub-lethal levels of exposure may affect bird's reproductive physiology, genetics and general health, which may ultimately reduce their fitness for survival. Industrial and domestic effluent discharges contain contaminants which build up in the food chain and may have toxic effects on sandwich terns and their prey; sandeels, spratt etc. In the Duddon Estuary at present, there are a number of industrial effluent disposal sites, namely a paper mill and ship building works at Barrow-in-Furness, and other industry at Askam in Furness and Millom. Discharges from these sites are covered by the Environment Agency discharge consents. The past industrial history of the Duddon Estuary has left a legacy of industrial waste including large slag heaps at Barrow, Askam and Millom. The extent, location,</p>

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	<p>contents and stability of other past industrial waste sites is less well known for example. waste disposal on North Walney. The impact on the bird populations of the estuary of leachate from past industrial sites and the reworking of existing sediments is unknown. Disturbance of anoxic sediments through activities such as commercial bait-digging can result in “hot spots” for heavy metals such as cadmium and lead. Due to the current exposure levels and the sensitivity rating, sandwich terns are moderately vulnerable to the effects of toxic contamination.</p> <ul style="list-style-type: none"> • Biological disturbance / Introduction of microbial pathogens Microbial pathogens can enter the Duddon Estuary via sewage discharges as mentioned previously. The main sewage outfall points can be found at Millom, Askam-in-Furness and Broughton-in-Furness. Microbial pathogens can enter the food chain of sandwich terns via the sandeels and sprat on which the birds feed in the shallow coastal waters of the Duddon Estuary. With the introduction of secondary or appropriate sewage treatment work in the estuary, the level of input of microbial pathogens is likely to be reduced. As mentioned in Section 3.2 however, this relationship is currently being researched. At present however, microbial pathogens within the estuary are deemed to be of high exposure, and thus sub-features are experiencing moderate vulnerability • Selective extraction of species Sandwich terns are sensitive to selective extraction of species. This can include selective extraction of species for which the site has been selected or which form important food sources for the Annex 1 birds, for example, over fishing and bait digging. Selective extraction may reduce the suitability of the habitat to feeding by sandwich terns. The intertidal food web is very complex and many communities interdepend on each other for their healthy functioning. At the present level of exposure, mainly caused by the seasonal fishing activities carried out throughout the estuary, sandwich terns are deemed to be moderately vulnerable to the effects of selective extraction of species. <p>Vulnerabilities for the internationally important assemblage of waterfowl including internationally important populations of regularly occurring migratory species are detailed below:</p>

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	<ul style="list-style-type: none"> <li data-bbox="629 357 2042 979"> <p>• Physical loss / removal Internationally important bird species such as Knot, Pintail and Redshank are highly sensitive to removal of important feeding and roosting habitat such as intertidal mud and sand flats, intertidal and subtidal boulder and cobble skears and saltmarshes. The physical loss of intertidal habitats may be caused directly through change of land use (for example, land claim or harvesting) or indirectly as a consequence of changes to sedimentation processes (for example, coastal defence or construction activities). The effects of a possible rise in sea level resulting in coastal squeeze may also result in the removal of intertidal habitats. Loss of intertidal sediment habitat could reduce the supply of marine invertebrates upon which many waders depend as an important source of food and may reduce the availability of roosting areas. Loss by removal of intertidal habitats may also lead to changes in coastal processes. For example, increased wave exposure can exacerbate habitat loss and change the nature of existing sediments, thus further influencing changes in feeding and roosting areas. Waterfowl and migratory species in the Duddon Estuary are highly sensitive to the effects of habitat removal. This activity has been assigned a moderate exposure rating based on the current level of operations, These two ratings result in the internationally important assemblage of waterfowl (including internationally important populations of regularly occurring migratory species) being awarded a high vulnerability rating to physical loss.</p> <li data-bbox="629 1023 2042 1348"> <p>• Physical damage / Abrasion Intertidal and subtidal boulder and cobble skears and saltmarsh communities within the Duddon Estuary that support waterfowl and migratory species, are moderately sensitive to physical damage by abrasion, which can reduce their suitability as feeding and roosting areas. Damage to intertidal and subtidal boulder and cobble skears can be caused by the use and landing of 4WD vehicles and boats which can disturb the form and integrity of the features. Damage to saltmarsh is mainly caused by grazing animals and recreational users. Damage by abrasion can reduce the suitability of these areas as feeding and roosting habitats. Knot, for example, are particularly dependant on the boulder and cobble skewer habitat for feeding. Any activity that reduces the area and integrity of this habitat may have</p>

	Duddon Estuary SPA
	<p>detrimental consequences on the suitability of the site. Current levels of exposure to abrasion can be regarded as medium, which results in the previously mentioned habitats being moderately vulnerable to the effects of abrasion.</p> <ul style="list-style-type: none"> • Non-physical disturbance / Noise and visual disturbance Waterfowl are highly sensitive to noise and visual disturbance by human activities when they are feeding or roosting. Examples of such disturbance include construction work, rambling, watersports and bait digging. They are particularly sensitive to disturbance in the winter months when cold temperatures and increased energy requirements are combined with short daylight hours available for feeding. Continued disturbance may force birds to change feeding and roosting sites which often results in increased energy use and reduced intake rates. If birds are continually disturbed from feeding or roosting sites, the resulting effect may be the long term loss of available habitat. Birds' ability to change feeding areas is also dependant on the availability of alternative suitable feeding sites nearby. Such sites may already support a capacity level of feeding birds. The arrival of new birds may result in competition for prime feeding sites, with some individuals forced onto less favourable sites. Birds forced onto poor feeding areas may not maintain sufficient fat reserves for survival during winter high spring tides, birds are pushed high up the shore to small roost areas, which are left uncovered by the tide. They can easily be disturbed at these areas, and if forced to fly off will waste their limited energy reserves. In the Duddon Estuary, the main sites vulnerable to disturbance are those most popular with users, namely the important redshank feeding areas around Askam Pier and the high tide roosts located along the Cumbrian Coastal Way. This level of physical disturbance has been assessed as being a medium exposure activity. This coupled with high sensitivity to disturbance results in the migratory species and waterfowl assemblage being awarded a high vulnerability rating. • Toxic contamination / introduction of synthetic and non-synthetic compounds The regularly occurring migratory species and the waterfowl assemblage are sensitive to the introduction of synthetic and non-synthetic compounds due to the accumulation of toxins through

	Duddon Estuary SPA
	<p>the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability of prey items caused by toxic contamination. The lethal effects of this contamination depend on the type and concentration of the toxic compound. Sub-lethal levels of exposure may affect the functioning of organisms such as reproduction physiology, genetics and general health that will ultimately reduce fitness for survival. Industrial and domestic effluent discharges contain contaminants that build up in the food chain and may have toxic effects on pintail, knot and their prey. In the Duddon Estuary at present, there are a number of industrial effluent disposal sites, namely a paper mill and ship building works at Barrow-in-Furness, and other industry at Askam-in-Furness and Millom. Discharges from these sites are covered by Environment Agency discharge consents. The past industrial history of the Duddon Estuary has left a legacy of industrial waste including large slag heaps at Barrow, Askam and Millom. The extent location, contents and stability of other past industrial waste sites is less well known for example industrial waste disposal on North Walney. The impact on the bird populations of the estuary of leachate from past industrial sites and the reworking of existing sediments is unknown. Disturbance of anoxic sediments through activities such as commercial bait-digging can result in “hot spots” for heavy metals such as cadmium and lead. Due to the current exposure levels and the sensitivity rating, the migratory species and waterfowl assemblage are moderately vulnerable to the effects of toxic contamination.</p> <ul style="list-style-type: none"> • Non toxic contamination / Changes in nutrient and organic loading Changes in nutrient and organic loading can have a variety of effects upon the habitats within the Duddon Estuary which support waterfowl and migratory species. The most notable habitats are the intertidal mud and sand flats and the intertidal and subtidal boulder and cobble skewer communities. Nutrient and organic loading can affect bird feeding habitats either positively by increasing food availability or negatively by altering species composition to less favourable prey species. Organic or nutrient loading can reduce the availability of food for birds by increasing growth of algal mats in the intertidal area. Algal blooms can reduce the surrounding water quality by causing the removal of oxygen as the bloom decomposes or occasionally by the release of

	Duddon Estuary SPA
	<p>toxins. Such deterioration in water quality can impact on marine communities and cause a reduction in food availability. Algal blooms also cause a reduction in water clarity, thereby reducing the visibility of prey items for Pintail, Knot and Redshank. At present in the Duddon Estuary, the main sources of point source contamination enter these habitats through diffuse agricultural sources and point source discharges from sewage treatment works most notably at the towns of Millom and Askam-in-Furness. Crude sewage also enters the estuary through discharges at Broughton-in-Furness and Barrow-in-Furness. As mentioned previously (Section 3.2) the Urban Waste Water Treatment Directive and Bathing Water Directive are focussing on installing appropriate treatment to reduce the concentration of dissolved nutrients. The effect of this upon the internationally important species, and the European marine site in general is currently being researched. Given the current, medium level of exposure, these particular sub-features are moderately vulnerable to changes in nutrient and organic loading.</p> <ul style="list-style-type: none"> • Biological disturbance / Introduction of microbial pathogens Microbial pathogens can enter the Duddon Estuary via sewage discharges and can affect all sub-features of the migratory species and waders and wildfowl. As has been mentioned in the previous section, the main sewage outfall points can be found at Millom, Askam-in-Furness and Broughton-in-Furness. Shellfish are particularly vulnerable to microbial pathogens that can enter the food chain of particular birds, for example, Knot, which are specialist feeders of such prey species. With the introduction of secondary or appropriate sewage treatment work in the estuary, the level of input of microbial pathogens is likely to be reduced. As mentioned in Section 3.2 however, this relationship is currently being researched. At present however, microbial pathogens within the estuary are deemed to be of high exposure, and thus sub-features are experiencing moderate vulnerability. • Selective extraction of species Migratory species and the waterfowl assemblage are moderately sensitive to the effects of selective extraction of species. This can include selective extraction of species for which the site has been selected or which form important

Duddon Estuary SPA	
	<p>food sources for the migratory species and waterfowl. The intertidal sediment food web is very complex and many communities are interdependent on each other for their healthy functioning. Selective extraction of elements of the ecosystem, for example extensive removal of prey species such as lugworms and ragworms through commercial bait-digging activities may reduce the suitability of the habitat to feeding. The current extent of commercial bait digging on the Duddon estuary is unknown. Where bird species feed on less optimal habitats they will use greater energy to find a smaller amount of food. This is likely to have a particularly severe effect on the knot population which roost and feed in large numbers. A reduction in food availability in the Duddon Estuary is likely to have an enormous impact both on the general health of individuals and the suitability of the site. At present in the Duddon Estuary, migratory bird species and the waterfowl assemblage are moderately exposed to these activities. As a result, particular sub-features have been awarded a moderate vulnerability score.</p>
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • European Marine Site Management Schemes for the Duddon Estuary and Morecambe Bay, and Duddon Estuary and Morecambe Bay Partnerships.
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Barrow Port Area Action Plan: Report to inform Habitat Regulations Assessment Stage 1 (Screening), August 2007: The Barrow Port Area Action plan seeks to achieve a new mixed-use development incorporating the existing commercial port with new housing, a marina, cruise facility, water sports and employment. The potential for significant effects on the integrity of Duddon Estuary SPA was concluded. No Appropriate Assessment report was available. • Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria. to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could

	Duddon Estuary SPA
	<p>potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect.</p> <ul style="list-style-type: none"> <li data-bbox="622 432 2040 576"> <p>• Appropriate Assessment Screening of South Lakeland District Council’s Core Strategy Source: http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf This screening report concluded that no significant effects on Duddon Estuary SPA are likely as a result of policies within the Core Strategy.</p> <li data-bbox="622 616 2040 799"> <p>• Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Duddon Estuary SPA are assessed as being possible.</p> <li data-bbox="622 839 2040 1054"> <p>• HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.</p>

Site Name: Morecambe Bay

- Location: 03 15 24 W, 54 10 39 N
- JNCC Site Code: [UK9005081](#)
- Size: 6806.3 ha
- Designation: SPA

Morecambe Bay SPA	
Site Description	<p>Morecambe Bay is located on the Irish Sea coast of North West England. It is one of the largest estuarine systems in the UK and is fed by five main river channels (the Leven, Kent, Keer, Lune and Wyre) which drain through the intertidal flats of sand and mud. Mussel <i>Mytilus edulis</i> beds and banks of shingle are present, and locally there are stony outcrops. The whole system is dynamic, with shifting channels and phases of erosion and accretion affecting the estuarine deposits and surrounding saltmarshes. The flats contain an abundant invertebrate fauna that supports many of the waterbirds using the bay. The capacity of the bay to support large numbers of birds derives from these rich intertidal food sources together with adjacent freshwater wetlands, fringing saltmarshes and saline lagoons, as well as dock structures and shingle banks that provide secure roosts at high tide. The site is of European importance throughout the year for a wide range of bird species. In summer, areas of shingle and sand hold breeding populations of terns, whilst very large numbers of geese, ducks and waders not only overwinter, but (especially for waders) also use the site in spring and autumn migration periods. The bay is of particular importance during migration periods for waders moving up the west coast of Britain.</p>

Morecambe Bay SPA	
Qualifying Features	<p>Article 4.1 Qualification</p> <p>During the breeding season:</p> <p>Little Tern <i>Sterna albifrons</i>, 26 pairs representing at least 1.1% of the breeding population in Great Britain (Count, as at 1994)</p> <p>Sandwich Tern <i>Sterna sandvicensis</i>, 290 pairs representing at least 2.1% of the breeding population in Great Britain (5 year peak mean for 1992 to 1996)</p> <p>Over winter:</p> <p>Bar-tailed Godwit <i>Limosa lapponica</i>, 2,611 individuals representing at least 4.9% of the wintering population in Great Britain (5 year peak mean for 1991/92 to 1995/96)</p> <p>Golden Plover <i>Pluvialis apricaria</i>, 4,097 individuals representing at least 1.6% of the wintering population in Great Britain (5 year mean for 1991/92 to 1995/96)</p> <p>Article 4.2 Qualification by supporting populations of European importance of the following migratory species:</p> <p>During the breeding season:</p> <p>Herring Gull <i>Larus argentatus</i>, 11,000 pairs representing at least 1.2% of the breeding Northwestern Europe (breeding) and Iceland/Western Europe - breeding population (5 year mean 1992 to 1996)</p> <p>Lesser Black-backed Gull <i>Larus fuscus</i>, 22,000 pairs representing at least 17.7% of the breeding Western Europe/Mediterranean/Western Africa population (5 year mean 1992 to 1996)</p>

	Morecambe Bay SPA
	<p>On passage:</p> <p>Ringed Plover <i>Charadrius hiaticula</i>, 693 individuals representing at least 1.4% of the Europe/Northern Africa - wintering population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Sanderling <i>Calidris alba</i>, 2,466 individuals representing at least 2.5% of the Eastern Atlantic/Western and Southern Africa - wintering population (Count as at May 1995)</p> <p>Over winter:</p> <p>Curlew <i>Numenius arquata</i>, 13,620 individuals representing at least 3.9% of the wintering Europe - breeding population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Dunlin <i>Calidris alpina alpina</i>, 52,671 individuals representing at least 3.8% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Grey Plover <i>Pluvialis squatarola</i>, 1,813 individuals representing at least 1.2% of the wintering Eastern Atlantic - wintering population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Knot <i>Calidris canutus</i>, 29,426 individuals representing at least 8.4% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Oystercatcher <i>Haematopus ostralegus</i>, 47,572 individuals representing at least 5.3% of the wintering Europe and Northern/Western Africa population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Pink-footed Goose <i>Anser brachyrhynchus</i>, 2,475 individuals representing at least 1.1% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean for 1991/92 to 1995/96)</p>

	Morecambe Bay SPA
	<p>Pintail <i>Anas acuta</i>, 2,804 individuals representing at least 4.7% of the wintering Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Redshank <i>Tringa totanus</i>, 6,336 individuals representing at least 4.2% of the wintering Eastern Atlantic - wintering population (5 year peak mean for 1989/90 to 1993/94)</p> <p>Shelduck <i>Tadorna tadorna</i>, 6,372 individuals representing at least 2.1% of the wintering Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Turnstone <i>Arenaria interpres</i>, 1,583 individuals representing at least 2.3% of the wintering Western Palearctic - wintering population (5 year peak mean for 1991/92 to 1995/96)</p> <p>Assemblage qualification: A seabird assemblage of international importance</p> <p>The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds</p> <p>During the breeding season, the area regularly supports 61,858 individual seabirds (5 year peak mean for 1991/92 to 1995/96) including: Herring Gull <i>Larus argentatus</i>, Lesser Black-backed Gull <i>Larus fuscus</i>, Little Tern <i>Sterna albifrons</i>, Sandwich Tern <i>Sterna sandvicensis</i>.</p> <p>Assemblage qualification: A wetland of international importance.</p> <p>The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl.</p> <p>Over winter, the area regularly supports 210,668 individual waterfowl (5 year peak mean for 1991/92 to 1995/96) including: Great Crested Grebe <i>Podiceps cristatus</i>, Bar-tailed Godwit <i>Limosa lapponica</i>,</p>

Morecambe Bay SPA	
	<p>Pink-footed Goose <i>Anser brachyrhynchus</i>, Shelduck <i>Tadorna tadorna</i>, Pintail <i>Anas acuta</i>, Oystercatcher <i>Haematopus ostralegus</i>, Grey Plover <i>Pluvialis squatarola</i>, Knot <i>Calidris canutus</i>, Dunlin <i>Calidris alpina alpina</i>, Curlew <i>Numenius arquata</i>, Golden Plover <i>Pluvialis apricaria</i>, Turnstone <i>Arenaria interpres</i>, Black-tailed Godwit <i>Limosa limosa islandica</i>, Cormorant <i>Phalacrocorax carbo</i>, Wigeon <i>Anas penelope</i>, Teal <i>Anas crecca</i>, Mallard <i>Anas platyrhynchos</i>, Eider <i>Somateria mollissima</i>, Goldeneye <i>Bucephala clangula</i>, Red-breasted Merganser <i>Mergus serrator</i>, Ringed Plover <i>Charadrius hiaticula</i>, Lapwing <i>Vanellus vanellus</i>, Sanderling <i>Calidris alba</i>, Redshank <i>Tringa totanus</i>, Whimbrel <i>Numenius phaeopus</i>.</p>
Conservation Objectives	<p>Subject to natural change, to maintain in favourable condition the habitats of the internationally important populations of regularly occurring bird species listed on Annex 1 of the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Shingle areas <p>Subject to natural change, to maintain in favourable condition the habitats of the internationally important assemblage of waterfowl and seabirds and the internationally important populations of regularly occurring migratory species, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities • Intertidal and subtidal boulder and cobble skear communities • Saltmarsh communities • Coastal lagoon communities

Morecambe Bay SPA						
Component SSSIs	SPA Component Sites	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed
	Cringlebarrow and Deepdale SSSI	94.48%	0%	5.52%	0%	0%
	Farleton Knott SSSI	42.98%	0%	6.94%	50.09%	0%
	Duddon Estuary SSSI	93.13%	4.53%	1.61%	0.67%	0.05%
	Gait Barrows SSSI	81.52%	16.95%	1.53%	0%	0%
	Hawes Water SSSI	29.43%	13.88%	40.96%	15.73%	0%
	Hutton Roof Crag SSSI	70.91%	25.26%	3.84%	0%	0%
	Lune Estuary SSSI	98.29%	1.71%	0%	0%	0%
	Marble Quarry and Hale Fell SSSI	0%	0%	100.00%	0%	0%
	Middlebarrow SSSI	0%	0%	59.44%	40.56%	0%

		Morecambe Bay SPA				
	Roudsea Woods and Mosses SSSI	2.35%	61.99%	4.65%	31.01%	0%
	Thrang End and Yealand Hall Allotment SSSI	27.45%	0%	0%	72.55%	0%
	Thrang Wood SSSI	100.00%	0%	0%	0%	0%
	Underlaid Wood SSSI	0%	7.57%	80.80%	11.62%	0%
	Whitbarrow SSSI	49.60%	41.27%	9.13%	0%	0%
	Wyre Estuary SSSI	100.00%	0%	0%	0%	0%
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • Avoidance of pollution • Management of saltmarsh grazing • Control of bait digging and dredging • Maintenance of prey availability for example control of shell-fishing • Maintenance of uninterrupted views • Open ground with short vegetation cover for feeding and roosting birds • Maintain hydrology of wet grassland (for waders) • Limited disturbance to birds (land and waterbased) • No physical constraints to natural migration of mobile habitats • Maintenance of natural sedimentation patterns • Control of non-native species 					

Morecambe Bay SPA	
SPA Condition Assessment	See SSSI condition status for specific information on condition.
Vulnerabilities (includes existing pressures and trends)	The site is subject to a wide range of pressures such as land-claim for agriculture, overgrazing, dredging, overfishing, industrial uses and unspecified pollution. However, overall the site is relatively robust and many of those pressures have only slight to local effects and are being addressed thorough Management Plans. The Natura 2000 data states that the breeding tern interest is very vulnerable and the colony has recently moved to the adjacent Duddon Estuary.
Landowner/ Management Responsibility	Non-governmental organisation (NGO) / National/Crown Estate / Private NGO reserve management plans, EN's site Management Statements and Coastal WES, the European Marine Site Management Schemes for the Duddon Estuary and Morecambe Bay, and Duddon Estuary and Morecambe Bay Partnerships.
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • Barrow Port Area Action Plan: Report to inform Habitat Regulations Assessment Stage 1 (Screening), August 2007: The Barrow Port Area Action plan seeks to achieve a new mixed-use development incorporating the existing commercial port with new housing, a marina, cruise facility, water sports and employment. Given that Morecambe Bay SPA and the Barrow Port Area overlap, the potential for significant effects on the integrity of this site was concluded. No Appropriate Assessment report was available. • Cumbria Wind Energy: Supplementary Planning Document: Habitat Regulations Assessment (June 2007): Cumbria Wind Energy Supplementary Planning Document (SPD) is being developed to provide guidance on local planning policy across Cumbria. to provide a county wide approach to wind energy development. The assessment has indicated that the draft SPD, in its current form, could result in likely significant effects on the integrity of European sites. Although the draft SPD is not site specific, it's wide ranging scope and landscape capacity findings could potentially result in wind energy development being proposed close to European sites or features which could create an adverse effect.

	Morecambe Bay SPA
	<ul style="list-style-type: none"> <p>• HRA Screening of Fleetwood – Thornton Area Action Plan (AAP) Source: http://www.wyrebc.gov.uk/Page.aspx?DocID=8710&PageID=48016 This screening assessment concludes that there will be no direct effects upon habitats within the SAC or upon the great crested newt population within it as a result of policies set out within the AAP. The potentially significant effects which require more consideration (and therefore will be subject to Appropriate Assessment) relate to the disturbance of wintering and migratory birds using the SPA, Ramsar site and high tide roost sites outside of the designated site boundaries (noise and visual disturbance from human activity) and to potential decreases in habitat quality within the designated sites through pollution from construction and operation of the proposed developments</p> <p>• Appropriate Assessment of Core Strategy for Lancaster City Council (September 2007): Some policies could facilitate development affecting European Sites but Policy E1 precludes any development which might have an adverse effect on Morecambe Bay SPA</p> <p>• Appropriate Assessment Screening of South Lakeland District Council’s Core Strategy Source: http://www.southlakeland.gov.uk/downloads/page2033/S_Lakeland_CS_HRA_report_070308.pdf Increase in visitor pressure both from an increase in local residents and an increase in tourism poses risks in terms of damage to sites and disturbance to protected species at Morecambe Bay SAC/ SPA/ Ramsar and Morecambe Bay Pavements SAC. A number of policies contribute by cumulatively increase the potential for a likely significant effect.</p> <p>• Habitat Regulations Assessment: Screening statement to accompany Bolton’s Core Strategy Preferred Option Report (May 2008) Source: http://www.bolton.gov.uk/pls/portal92/docs/PAGE/LGNL/DOCUMENTS/BUSINESS/P%20L%20A%20N%20N%20I%20N%20G/G%20R%20A%20P%20E%20S/HRA%20SCREENING%20OPINION%20BOLTON%20PREFERRED%20OPTIONS.PDF Significant effects of Bolton’s core strategy on Morecambe Bay SPA are assessed as possible.</p>

	Morecambe Bay SPA
	<ul style="list-style-type: none"> <li data-bbox="629 320 2011 501"> <p>• Habitat Regulations Assessment: Cumbria Minerals and Waste Development Framework: Submission Draft Core Strategy and Generic Development Control Policies: Details: http://www.cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/39518145940.pdf Significant effects of the Cumbria MWD Framework on Morecambe Bay SPA are assessed as being possible.</p> <li data-bbox="629 544 2011 756"> <p>• HRA of Lake District National Park Core Strategy Preferred Options (May 2008) Source: http://www.lake-district.gov.uk/lake_district_docs95/habitat_regulations_assessment_of_core_strategy.pdf This initial review of the preferred options identified several policies which have the potential to result in indirect and possibly significant effects on European Sites within and adjacent to the LDNP boundary. Recommendations for possible policy amendments were made.</p>

Ramsar Sites

Site Name: Duddon Estuary

Location: 02 57 21 W, 54 07 19 N

JNCC Site Code: UK11022

Size: 37404.6 ha

Designation: Ramsar

Duddon Esturay Ramsar	
Site Description	Duddon Estuary is formed by the River Duddon and the smaller Kirkby Pool opening into the Irish Sea in south-western Cumbria. Most of the site consists of intertidal sand and mudflats, important for large numbers of wintering and passage waterfowl. A range of grazed and ungrazed saltmarsh habitats occur around the edge of the estuary, especially the sheltered inner section. The site is the most important in Cumbria for sand-dune communities including large areas of calcareous dunes at Sandscale and Haverigg Haws and contrasting acid dunes on North Walney. Artificial habitats include slag banks and a flooded mine working known as Hodbarrow Lagoon, the largest coastal lagoon in North West England.
Qualifying Features	<p>Source: http://www.jncc.gov.uk/pdf/RIS/UK11022.pdf</p> <p>Ramsar criterion 2:</p> <ul style="list-style-type: none"> • Supports nationally important numbers of the rare Natterjack toad (<i>Bufo calamita</i>), near the north western edge of its range (an estimated 18-24% of the British population). Supports a rich assemblage of wetland plants and invertebrates – at least one nationally scarce plant and at least two British Red Data Book invertebrates. <p>Ramsar criterion 4:</p>

Duddon Esturay Ramsar													
	<ul style="list-style-type: none"> The site supports nationally important numbers of waterfowl during spring and autumn passage. Ramsar criterion 5: Assemblages of international importance: Species with peak counts in winter: 26326 waterfowl (5 year peak mean 1998/99-2002/2003) <p>Ramsar Criterion 6 – species/populations occurring at levels of international importance:</p> <ul style="list-style-type: none"> Qualifying species /populations (as identified at designation): <p>Species with peak counts in winter</p> <ul style="list-style-type: none"> Northern Pintail <i>Anas acuta</i> (687 individuals representing an average of 1.1% of the population (5 year peak mean 1998/9 – 2002/3)) Red Knot <i>Calidris canutus islandica</i> (749 individuals representing an average of 0.2% of the GB population (5 year peak mean 1998/9 – 2002/3)) Common Redshank (wintering) <i>Tringa totanus totanus</i> (2197 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9 – 2002/3)) 												
Conservation Objectives	<ul style="list-style-type: none"> See Duddon Estuary SPA characterisation 												
Component SSSIs	<p>Component SSSI (36 units) condition status</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d3d3d3;">Ramsar component site</th> <th style="background-color: #d3d3d3;">Favourable</th> <th style="background-color: #d3d3d3;">Unfavourable recovering</th> <th style="background-color: #d3d3d3;">Unfavourable no change</th> <th style="background-color: #d3d3d3;">Unfavourable declining</th> <th style="background-color: #d3d3d3;">Destroyed, part destroyed</th> </tr> </thead> <tbody> <tr> <td style="background-color: #d3d3d3;">Duddon</td> <td style="text-align: center;">93.13%</td> <td style="text-align: center;">4.53%</td> <td style="text-align: center;">1.61%</td> <td style="text-align: center;">0.67%</td> <td style="text-align: center;">0.05%</td> </tr> </tbody> </table>	Ramsar component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed	Duddon	93.13%	4.53%	1.61%	0.67%	0.05%
Ramsar component site	Favourable	Unfavourable recovering	Unfavourable no change	Unfavourable declining	Destroyed, part destroyed								
Duddon	93.13%	4.53%	1.61%	0.67%	0.05%								

	Duddon Esturay Ramsar					
	Estuary SSSI					
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • See Duddon Estuary SPA characterisation 					
Ramsar Condition Assessment	<ul style="list-style-type: none"> • See Duddon Estuary SPA characterisation 					
Vulnerabilities (includes existing pressures and trends)	<ul style="list-style-type: none"> • See Duddon Estuary SPA characterisation 					
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • See Duddon Estuary SPA characterisation 					
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • See Duddon Estuary SPA characterisation 					

Site Name: Morecambe Bay

- Latitude: 540719N/025721W
- JNCC Site Code: [UK11045](#)
- Size: 37404.6 ha
- Designation: Ramsar

Morecambe Bay Ramsar	
Site Description	Morecambe Bay lies between the coasts of South Cumbria and Lancashire, and represents the largest continuous intertidal area in Britain. Morecambe Bay comprises the estuaries of five rivers and the accretion of mudflats behind Walney Island. The area is of intertidal mud and sandflats, with associated saltmarshes, shingle beaches and other coastal habitats. It is a component in the chain of west coast estuaries of outstanding importance for passage and overwintering waterfowl (supporting the third-largest number of wintering waterfowl in Britain), and breeding waterfowl, gulls and terns.
Qualifying Features	<p>Source: http://www.jncc.gov.uk/pdf/RIS/UK11045.pdf</p> <p>Ramsar criterion 4</p> <ul style="list-style-type: none"> • The site is a staging area for migratory waterfowl including internationally important numbers of passage Ringed Plover <i>Charadrius hiaticula</i>. <p>Ramsar criterion 5</p> <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> • Waterfowl <p>Ramsar criterion 6</p> <p>Species regularly supported during the breeding season:</p> <ul style="list-style-type: none"> • Lesser Black-backed Gull • Herring Gull

	Morecambe Bay Ramsar
	<ul style="list-style-type: none"> • Sandwich Tern <p>Species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> • Great Cormorant • Common Shelduck • Northern Pintail • Common Eider • Eurasian Oystercatcher • Ringed Plover • Grey Plover • Sanderling • Eurasian Curlew • Common Redshank • Ruddy Turnstone • Lesser Black-backed Gull <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> • Great Crested Grebe • Pink-footed Goose • Eurasian Wigeon • Common Goldeneye • Red-breasted Merganser • European Golden Plover • Northern Lapwing • Red Knot • Dunlin • Bar-tailed Godwit

	Morecambe Bay Ramsar
Conservation Objectives	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
Component SSSIs	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
Ramsar Condition Assessment	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
Vulnerabilities (includes existing pressures and trends)	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
Landowner/ Management Responsibility	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation
HRA/AA Studies undertaken that address this site	<ul style="list-style-type: none"> • See Morecambe Bay SPA characterisation

Appendix 2: Plans and Programmes Review

Regional

Plan	Potential impacts that could cause 'in-combination' effects
Cumbria Economic Strategy 2009-2019	<p>The strategy sets out Cumbria's vision <i>'to be an energised and healthy environment, and one of the fastest growing economies in the UK'</i></p> <p>The strategy identifies two strategic priorities:</p> <ul style="list-style-type: none"> • The opportunities of Energy and the Low Carbon Economy. • Raising the attractiveness of 'Destination Cumbria' as a place to live, invest, work and visit. • Major Projects for the West Cumbria region include: • The Britain's Energy Coast™ programme, a £2 billion package of regeneration projects to advance existing strengths in nuclear industry and promote diversification into other forms of low carbon industries such as renewable energy. The presence of at least one new nuclear station within Cumbria is a key component of the programme.
Offshore mineral and waste sites	<ul style="list-style-type: none"> • Indirect impacts as a result of new or intensification of minerals and waste development/ activities; disturbance; pollution.
Cumbria and Lake District Joint Structure Plan (2001-2016)	<ul style="list-style-type: none"> • Housing and employment focused away from area of search (at Whitehaven; Workington; Cleator Moor; Egremont) and generally away from European sites. • Recreation pressures may result from increased tourism related development/ activities and creation of Regional Parks near/ adjacent to European sites. • Development maintenance of coastal defences; potential for land take, pollution increase, disturbance/ severance of habitats and species. • Provision of wind farms and turbines; tidal/ wave power projects.

Plan	Potential impacts that could cause 'in-combination' effects
Cumbria Minerals and Waste Local Plan (1996-2006)	<ul style="list-style-type: none"> • Current plan has broadly sought to focus any required expansion/ extension on existing sites/ facilities. Potential expansion of sites with associated (ongoing) impacts of air/ water pollution. • Potential for indirect impacts associated with transport; air pollution.
Cumbria Local Transport Plan (LTP2) 2005/6 – 2011/12	<ul style="list-style-type: none"> • Morecambe Bay Barrage has potential effects; land take/ direct loss of habitat through development; increased transport movements; air pollution; disturbance/ severance of habitats and species. • Other transport projects have potential for localised effects; disturbance; pollution.
Shoreline Management Plan, Northwest Coastal Group River Wyre – Walney Island (11c) - lead authority Lancaster City Council Walney Island – St. Bees Head (11d) - lead authority Copeland Borough Council	<ul style="list-style-type: none"> • Development/ construction/ maintenance of coastal defences; potential for land take, pollution increase, disturbance/ severance of habitats and species.
United Utilities Draft Water Resources Management Plan 2008	<p>The options included in the Water Resources Management Plan could affect biodiversity through effects of:</p> <ul style="list-style-type: none"> • Construction, where the use or transport of materials have indirect impacts on biodiversity, • Where the construction sites and processes affect habitats, for example through tunnelling for pipelines, discharges to water, or use of land for equipment and plant. • There could also be effects during operation if the options affect the flows or levels of water and these affect the ecological status of the water bodies. <p>However site specific impacts were not explicit within the SEA report and no HRA was available.</p>

Local

Plan	Potential impacts that could cause 'in-combination' effects
<p>Copeland Borough Council Adopted Local Plan 2001 - 2016</p>	<ul style="list-style-type: none"> • Limited development and growth in area of search. • Potential future development associated with Millom Pier; potential for land take, disturbance/ of habitats and species. • On and off shore wind power (and/ or tidal) projects; potential for land take, disturbance/ of habitats and species. • Tourism may increase recreational pressures
<p>South Lakeland District Council Adopted Local Plan 2006</p>	<ul style="list-style-type: none"> • Housing and employment growth may lead to increased transport movements - the potential for in-combination effect is greater where housing sites are in proximity to European sites. • New communities require increased infrastructure – potential for land take, pollution increase, disturbance/ severance of habitats and species. • Growth in requirement for waste management/ transport disposal from new communities and businesses has the potential to increase pollution, and introduce land take issues. • On and off shore wind power projects; potential for land take, disturbance/ of habitats and species. • Tourism may increase recreational pressures. • Recreation pressures may result from housing developments near/ adjacent to European sites.
<p>Barrow-in-Furness Borough Council Local Plan Review 1996-2006 (Adopted 24th August 2001) Housing Chapter Alteration (Adopted 2 June 2006)</p>	<ul style="list-style-type: none"> • Limited development activities and direct effects anticipated. Effects are likely to be indirect associated with transport/ infrastructure. • Housing and employment growth may lead to increased transport movements - the potential for in-combination effect is greater where housing sites are in proximity to European sites. • New communities require increased infrastructure – potential for land take, pollution increase, disturbance/ severance of habitats and species.

Plan	Potential impacts that could cause 'in-combination' effects
	<ul style="list-style-type: none"> • Growth in requirement for waste management/ transport disposal from new communities and businesses has the potential to increase pollution, and introduce land take issues. • Tourism may increase recreational pressures. • Recreation pressures may result from housing developments near/ adjacent to European sites. • A screening report for a Habitat Regulation Assessment has been carried out of the Barrow Port AAP. Likely significant effects identified due to; the potential for inappropriate type and scale development; development of some sites; residential development; port facilities development; access improvements; development of the Barrow Marina Village and marina link; marina Village housing; development of Cavendish Dock as a wildlife attraction; development of a water sports centre including power boat facilities; Barrow Waterfront Gateway area for specific purposes including a cruise facility; development of the Waterfront Business Park.
<p>Gas Storage Facility, Gateway Storage Company Ltd (2007 – 2011/2)</p>	<ul style="list-style-type: none"> • Development adjacent to and within European sites, potential for land take pollution increase, disturbance / severance of habitats and species. • Growth in requirement for waste management/ transport disposal related to development proposal has the potential to increase pollution, and introduce land take issues.
<p>Walney Offshore Windfarm</p>	<ul style="list-style-type: none"> • The project is to develop a windfarm comprising up to 118 turbines, which would have onshore connection at Heysham and Fleetwood. The windfarm would cover an area of approximately 73km² with the closest turbine being 14km from the shore. The turbines would be set out in a grid pattern of around 18 x 6 turbines, approximately parallel to the Walney Island coastline; the hub heights would vary between Phase 1 (93 metres) and Phase 2 (116 metres). • Construction of the turbines and cable connections could lead to water and air quality impacts. Habitat loss / fragmentation impacts could also arise depending on the location of on-shore connections. In addition the turbines themselves could act as a barrier to migratory bird species present as qualifying interests within Duddon Estuary SPA / Ramsar and Morecambe Bay SPA / Ramsar. Direct mortality of birds as a result of collisions with turbines could also occur.

Plan	Potential impacts that could cause 'in-combination' effects
<p>West of Duddon Sands Offshore Windfarm</p>	<ul style="list-style-type: none"> • The project is to develop an 83 turbine offshore windfarm which would have an onshore connection at Heysham. The windfarm would cover an area of 66km² and the nearest turbine would be 14km from the shore (Walney Island).The turbines would be sited in a grid pattern and their hub height could range from 95 metres to 110 metres depending upon which size of turbines are used. • Construction of the turbines and cable connections could lead to water and air quality impacts. Habitat loss / fragmentation impacts could also arise depending on the location of on-shore connections. The turbines themselves could act as a barrier to migratory bird species present as qualifying interests within Duddon Estuary SPA / Ramsar and Morecambe Bay SPA / Ramsar. Direct mortality of birds as a result of collisions with turbines could also occur.

Other plans and programmes

Plan	Potential impacts that could cause 'in-combination' effects
<p>Morecambe Bay Estuary Strategy</p>	<p>The main objectives of the strategy are:</p> <ul style="list-style-type: none"> • Coastal defence: To ensure that coastal defence strategies are prepared in a manner which takes account of people's aspirations, sustain the habitats of the bay and extend its wildlife potential. • Fisheries: To encourage conditions in the bay which will benefit and sustain dependent fisheries. • Heritage and Landscape: To ensure that the character of Morecambe bay reflected in its distinctive landscape and cultural, built and archaeological heritage is appreciated, sustained and enhanced. • Industry, Transport and Development: To integrate the economic growth that will sustain the well being of the bay's communities with the need to sustain wildlife, heritage and landscape features. • Land Management To guide, assist and enable land managers to pursue their livelihood in a manner consistent with the need to minimise conflicts, taking account of the wildlife value, landscape character of the bay and local interests. • Pollution: To encourage improvements in environmental quality throughout the bay, address concerns about the effects of pollutants on people and wildlife, and to encourage regulatory authorities and operators to prevent illegal discharges to the bay. • Recreation and Tourism: To ensure that in the development and promotion of recreation and tourism the needs of the visitor are integrated with the needs of the local community and sustaining the natural environment. • Wildlife: To enhance the wildlife of the bay in an informed and sustainable way by promoting the importance and vulnerability of the wildlife resource and encouraging users to minimise adverse impacts upon it.

Plan	Potential impacts that could cause 'in-combination' effects
	<p>Policies seek to avoid adverse impacts on wildlife and where conflicts could exist, for example, promotion of tourism, safeguards and mitigation are incorporated. Therefore the strategy itself should not result in any 'in-combination' effects.</p>
<p>Duddon Estuary: A Partnership for Progress</p>	<p>The primary aim of the partnership is to promote the sustainable use of Duddon Estuary by balancing the demands on its natural resources with the economic, cultural and social needs of the area and by seeking to resolve conflicts of use, having regard to the needs of present and future generations. The partnership comprises steering and working groups made up of local councils (Barrow, South Lakeland and Copeland), the County Council, relevant planning authorities and Natural England.</p> <p>Whilst no specific proposals or policies as put forward by the Partnership have been made available, with the overall objective of promoting sustainable use of the estuary, the potential for significant adverse effects arising as a result of such policies is considered unlikely. Furthermore the Duddon Estuary Partnership offers a means to resolve conflicts of interest within Duddon Estuary which could ultimately mean adverse effects on Duddon Estuary SPA / Ramsar and Morecambe Bay SAC as a result of other plans and projects are avoided.</p>
<p>Morecambe Bay and Duddon Estuary Regional Park (2008)</p>	<p>Impacts, including habitat loss / fragmentation, disturbance, water and air quality as well as coastal squeeze could arise as a result of the following objectives:</p> <ul style="list-style-type: none"> • To develop a distinctive identity and positive brand image of the Morecambe Bay and Duddon Estuary Sub-region • To conserve and promote the sustainable development of the Regional Park's natural, built and cultural heritage assets • To develop and promote a wide range of high quality leisure and tourism facilities and events • To support the development of the North West Coastal Trail and provide good access to regional park resources • To play a part in the wider regeneration of the area by increasing employment and enhancing

Plan	Potential impacts that could cause 'in-combination' effects
	<p>business performance in leisure, sport and recreation and other Park related business sectors and retaining and attracting economic development and high level skills more generally</p> <ul style="list-style-type: none"> • To develop the role of the Regional Park as a unifying and binding force in the area. <p>Of particular relevance to Morecambe Bay SAC / SPA / Ramsar and Duddon Estuary SPA are suggestions for:</p> <ul style="list-style-type: none"> • A series of sports venues for power boating, new marina development at Barrow with a new watersports centre at Cavendish dock, a new national wind surfing and kite surfing centre at Earnse Point • An eco-holiday village development at Millom • A new observatory and visitor centre with an energy theme close to Heysham Power Station • A 'discovery' centre for green energy celebrating the energy coast and technologies at Millom. • Promotion of sustainable access to and within the park (resulting increase in visitor numbers), including ferry links across the bay – particularly to link Barrow, Blackpool and Heysham and to serve Piel Island and South Walney • Improved walking and cycle trails including renewal of the estuary bridges.

Appendix 3: Likely Significant Effect (LSE) Screening Table

SIGNIFICANT EFFECTS SCREENING (INCORPORATING IN-COMBINATION ASSESSMENT):

European Sites within a 20km radius of the nominated site

	Designation	Distance to nominated site
Drigg Coast	SAC	16.5km
Duddon Estuary	SPA	Adjacent
Duddon Estuary	Ramsar	Adjacent
Duddon Mosses	SAC	7.5km
Morecambe Bay	SAC	Adjacent
Morecambe Bay	SPA	12km
Morecambe Bay	Ramsar	12km
Roudsea Wood and Mosses	SAC	19km
Subberthwaite Blawith and Torver Low Commons	SAC	13.5km

The likely significant effects of the development of the nominated site on the above listed European sites located within a 20km radius of the nominated site have been assessed. Some of these European sites have been screened out for the reasons given below. For the remaining European sites, the assessment of the likely significant effects of the construction, operation and decommissioning phases of a new nuclear power station development are presented in tabular form.

European Sites within a 20km radius of the nominated site for which likely significant impacts are not considered not to arise:

- **Drigg Coast SAC:** This estuary complex contains some of the best examples of little disturbed transitions to freshwater and sand dune habitats of any estuary in the UK and its qualifying interests include: estuaries, Atlantic decalcified fixed dunes, dunes with *Salix repens ssp. Argentea*, mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows, embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria*, fixed dunes with herbaceous vegetation and humid dune slacks. Maintenance of morphological equilibrium (including sedimentation patterns) and water quality, notably temperature and salinity levels are key environmental factors maintaining the integrity of the qualifying features within the SAC. Given the distance of this SAC from the nominated site (15km to the north along the coast) there are no identified 'cause-effect' pathways between the identified impacts arising from the proposed development and the known environmental conditions and vulnerabilities at this site which could lead to an impact on the integrity of the site.
- **Subberthwaite, Blawith and Torver Low Commons SAC:** This site supports some of the best examples of transition mires and quaking bogs in the UK, with over 200 mires on a broad hilly plateau and this Annex 1 habitat type is the primary reason for selection of this site. Depressions on peat substrates of the *Rhynchosporion* are also present as a qualifying feature although were not a primary reason for the selection of this site. The maintenance of the characteristic composition and diversity of valley mires is largely dependent on the quantity and quality of the groundwater, the depletion or deterioration of which can lead to transition towards rank vegetation. Nutrient inputs for these habitats should remain low and it is essential to exclude undue concentrations of nitrogen and phosphorous, any increase in which could lead to the development of eutrophic fen. Given that the SAC lies within a different Water Resource Management Unit (WRMU) from the nominated site and therefore water quality impacts are not a potential issue, the only potential 'cause-effect' pathway between the identified impacts arising from the proposed development and the known environmental conditions (and vulnerabilities) at this site which could lead to an impact on the site relate to air quality. However, given the high level of regulatory control regarding emissions, it is considered that the SAC is sufficiently far enough away (more than 10km to the north east) for any of the predicted localised air quality impacts arising as a result of the construction, operation and decommissioning of the proposed nuclear development to have dispersed sufficiently to not result in a significant effect on the integrity of the site.

- **Roudsea Wood and Mosses SAC:** This site consists of a complex of raised bogs on the northern shore of Morecambe Bay including both active raised bogs and degraded raised bogs still capable of natural regeneration (the latter accounts for less than 20% of the SAC). Key environmental conditions maintaining these habitats in favourable condition include maintenance of hydrological regime (management of water levels is essential to restore the moss vegetation) and low nutrient status. Other qualifying features present include *Tilio-Acerion* forests of slopes, screes and ravines and *Taxus baccata* woods which have strong similarities with the yew stands at the nearby Morecambe Pavements. Within these woodlands, over-grazing by deer must be reduced as far as possible and nutrient enrichment or changes to air quality avoided. The SAC lies more than 15km to the east of the nominated site and is sufficiently distant to not be significantly impacted by the predicted localised air quality impacts arising as a result of the proposed development. Whilst there is coastal 'pathway' connecting the nominated site to the SAC, again, this distance is considered too great for any of the predicted localised water quality impacts to significantly impact upon the SAC interest features.
- **Duddon Mosses SAC:** The Duddon Mosses are an internationally important system of active raised mires that extend north from the edge of the Duddon Estuary up the low coastal flood plains of the River Duddon and Kirkby Pool. Modification to water table levels are an identified vulnerability for the qualifying habitats (raised bogs). However, owing to the absence of significant rivers or freshwater bodies in the vicinity of the nominated site, indirect cooling would be required and would abstract water from the Irish Sea⁴. The risk of significant effects occurring as a result of changes to water quality/quantity can therefore be ruled out. Air quality is also an identified vulnerability for the SAC through deposition of nitrogen with resulting changes in the vegetation leading to loss of typical bog species. However, given the distance of the SAC from the nominated site (over 9km away), the risk of significant effects as a result of changes in air quality is considered unlikely.

⁴ Nomination documents: RWE Siting Study: Kirksanton Nomination Form: Supporting Statement (March, 2009) at <http://www.nuclearpowersiting.decc.gov.uk/nomination/kirksanton/>

Morecambe Bay SAC

Unitary Authority: Cumbria and Lancashire

Source: Construction (duration approx 5 years)

Morecambe Bay SAC: Construction (duration approx 5 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from earthworks/ excavations and infrastructure provision (sedimentation, pollution incidents through water courses and cycles).
Potential effects on the SAC: Receptor	<p>Potential for:</p> <ul style="list-style-type: none"> • Change in sediment flows within the bay • Toxic contamination through the introduction of synthetic and non-synthetic compounds • Non-toxic contamination through organic and nutrient enrichment • Changes in turbidity and salinity <p>Could affect the status of the designated habitats, for example toxins can bind to sediments and bio-accumulate in saltmarsh plants.</p>
Risk of Likely Significant Effect (LSE)?	<p>The maintenance of morphological equilibrium of the estuary (including sediment flows, salinity, and trophic status) are key environmental conditions of the SAC.</p> <p>As the nominated site is adjacent to the SAC, significant effects on the SACs integrity cannot be ruled out at this stage.</p>
Potential Impacts - other Plans and	<p>Barrow Port Area Action Plan</p> <p>Water and air quality impacts could arise as a result of construction and operation of new marina and cruise facility</p>

Morecambe Bay SAC: Construction (duration approx 5 years)	
Water Resources/Quality	
Programmes	<p>Coastal Defence Works Morecambe Town Frontage Water and air quality impacts could arise as a result of construction of new sea defences</p> <p>Shoreline Management Plan Development/ construction/ maintenance of coastal defences could lead to water quality impacts</p> <p>Lancashire Minerals and Waste Local Plan Construction of increased handling capacity at Heysham Port could lead to water and air quality impacts</p> <p>Cumbria Local Transport Plan (LTP2) Morecambe Bay Barrage (part of longer term vision under the plan) could lead to significant water quality impacts through changes to sedimentation patterns as well as pollution incidents during construction</p> <p>Gas Storage Facility, Gateway Storage Company Ltd Development adjacent to and within European sites, potential for water and air quality impacts during construction and as a result of increased transport requirements</p> <p>Cumbria Minerals and Waste Development Framework HRA of framework concludes significant effects of the Cumbria MWD Framework on Morecambe Bay SAC are assessed as possible</p> <p>West of Duddon Sands / Walney Offshore Windfarm Proposals Water and air quality impacts could arise during the construction of on-shore cable connections</p>
Risk from 'In Combination' Effects?	Uncertain
A Required?	Yes

Morecambe Bay SAC: Construction (duration approx 5 years)	
Air Quality	
Potential Impacts: Pathway	Potential local impacts from increased traffic growth, and the emissions arising from construction activity. Likely to be restricted to a local level, for example, dust/ particulates.
Potential effects on the SAC: Receptor	<p>An increase in airborne pollutants can lead to nutrient loading and changes to water quality from aerial deposition.</p> <p>Changes in air quality can impact upon sensitive designated communities within the SAC, for example, it is suspected that nutrient deposition on many sand dunes is already above their critical threshold for impacts on vegetation (Jones <i>et al</i> 2002⁵ and 2004⁶). The consequence of this for dune slacks is the tendency to a speeded up succession away from dune slack vegetation.</p> <p>Shingle communities are vulnerable to smothering from airborne particulates and suffer reduced rates of growth.</p>
Risk of Likely Significant Effect (LSE)?	<p>Air quality has been identified as a vulnerability for the following designated habitats:</p> <ul style="list-style-type: none"> • Perennial vegetation of stony banks • Atlantic salt meadows • Humid dune slacks • Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) <p>As such, likely significant effects as a result of air quality impacts cannot be ruled out at this stage.</p>

⁵ Jones, M.L.M. *et al.* 2002. Changing nutrient budget of sand dunes: consequences for the nature conservation interest and dune management CEH, Bangor.

⁶ JONES, M.L.M. *et al.* 2004. Changes in vegetation and soil characteristics in coastal sand dunes along a gradient of atmospheric nitrogen deposition *Plant Biology* 6, 598-605.

Morecambe Bay SAC: Construction (duration approx 5 years)	
Air Quality	
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Water Quality (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Construction (duration approx 5 years)	
Habitat (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Construction of infrastructure, extension of site into 'buffer' habitats, possible development at the coastal fringes.
Potential effects on the SAC: Receptor	The exact location and extent of cooling water infrastructure and sea defences is unknown at this strategic stage and therefore direct habitat loss cannot be ruled out. In addition, indirect habitat loss / fragmentation effects could occur as a result of loss of buffer habitats, interruption of sediment flows through the construction of a Marine Off-loading Facility and cooling water system as well as dredging activities.
Risk of Likely Significant Effect (LSE)?	Any loss or modification to qualifying interests of the SAC is likely to result in a significant effect.
Potential Impacts - other Plans and Programmes	<p>Barrow Port Area Action Plan Habitat loss/fragmentation/coastal squeeze could arise as a result of construction and operation of new marina and cruise facility</p> <p>Coastal Defence Works Morecambe Town Frontage Habitat loss/coastal squeeze impacts could arise as a result of construction of new sea defences</p> <p>Shoreline Management Plan Development/ construction/ maintenance of coastal defences could lead to habitat loss/coastal squeeze</p> <p>Lancashire Minerals and Waste Local Plan Construction of increased handling capacity at Heysham Port could lead to direct and indirect habitat loss / coastal squeeze.</p> <p>Cumbria Local Transport Plan (LTP2) Morecambe Bay Barrage (part of longer term vision under the plan) could lead to significant habitat losses</p>

Morecambe Bay SAC: Construction (duration approx 5 years)	
Habitat (and Species) Loss and Fragmentation	
	<p>Gas Storage Facility, Gateway Storage Company Ltd Development adjacent to and within European sites, potential for direct habitat loss / fragmentation and coastal squeeze</p> <p>Cumbria Minerals and Waste Development Framework HRA of framework concludes significant effects of the Cumbria MWD Framework on Morecambe Bay SAC are assessed as possible</p> <p>West of Duddon Sands / Walney Offshore Windfarm Proposals Potential for direct habitat loss / fragmentation as a result of construction of on-shore grid connection facilities</p>
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Construction (duration approx 5 years)	
Coastal Squeeze	
Potential Impacts: Pathway	Construction of infrastructure and facilities relating to the operation of the nuclear power station may result in an encroachment upon land at the coastal fringes.
Potential effects on the SAC: Receptor	Any development encroaching on the coastal fringe may lead to habitats being 'squeezed' between an eroding seaward edge and fixed flood defence walls and lead to indirect loss of designated habitats.
Risk of Likely Significant Effect (LSE)?	Designated habitats between the nominated site and the seaward edge comprise sand dune progressions and shingle beach ⁷ Both of these habitats naturally migrate landward over time and the prevention of this could lead to a reduction in the overall extent of these habitats and significant effects.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Habitat (and Species) Loss and Fragmentation (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

⁷ RWE Siting Study: Kirksanton Nomination Form: Supporting Statement (March, 2009)

Source: Operation (duration approx 60 years)

Morecambe Bay SAC: Operation (duration approx 60 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential impacts on water quality and drainage from planned and accidental discharges (radioactive and non-radioactive), and from the abstraction and discharge of water for cooling (heated water up to 10° warmer than the receiving environment).
Potential effects on the SAC: Receptor	<p>Changes to water quality and of water temperature can impact species composition/ encourage excessive algal growth.</p> <p>Biocides used to clean cooling infrastructure could potentially affect the status of habitats.</p> <p>Localised abrasion of habitats can occur around discharge/abstraction points, which can also result in altered sediment regimes locally.</p>
Risk of Likely Significant Effect (LSE)?	<p>Pollution, nutrient enrichment, and an increase in organic matter in sediments are key vulnerabilities of the SAC.</p> <p>Potential for operational effects to change water quality and temperature to result in adverse effects on water quality need further investigation to determine whether changes are likely to be significant.</p>
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Water Quality (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Operation (duration approx 60 years)	
Air Quality	
Potential Impacts: Pathway	<p>Potential local impacts from increased development/ traffic growth (nitrogen oxides, sulphur dioxide).</p> <p>Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, volatile organic compounds and accidental radioactive emissions.</p>
Potential effects on the SAC: Receptor	<p>An increase in airborne pollutants can lead to nutrient loading and changes to water quality from aerial deposition, thus leading to changes in structure and composition of the qualifying habitats.</p> <p>Changes in air quality can impact upon sensitive designated communities within the SAC through bio-accumulation. For example saltmarsh plants are known to bio-accumulate toxic compounds and act as sinks for them.</p>
Risk of Likely Significant Effect (LSE)?	<p>An increase in airborne pollutants could significantly affect the favourable condition of:</p> <ul style="list-style-type: none"> • Perennial vegetation of stony banks • Atlantic salt meadows • Humid dune slacks • Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) <p>There is therefore the potential for significant effects to occur as a result.</p>
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Water Quality (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Operation (duration approx 60 years)	
Habitat (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through operation, for example to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	Additional construction activities arising from changes to the footprint of the site could increase loss of terrestrial, marine and sub-tidal habitats given the location of the proposed development site on the coast.
Risk of Likely Significant Effect (LSE)?	Any loss of designated habitats would be considered to be significant.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Habitat (and Species) Loss and Fragmentation (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Source: Decommissioning (duration approx 30 years)

Morecambe Bay SAC: Decommissioning (duration approx 30 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from [de]construction activities, earthworks, infrastructure, waste storage.
Potential effects on the SAC: Receptor	<p>Potential for:</p> <ul style="list-style-type: none"> • Change in sedimentation patterns • Toxic contamination through the introduction of synthetic and non-synthetic compounds • Non-toxic contamination through organic and nutrient enrichment • Changes in turbidity and salinity <p>These potential impacts could affect the favourable status of the designated habitats for example, toxins can bind to sediments and bio-accumulate in saltmarsh plants.</p>
Risk of Likely Significant Effect (LSE)?	The maintenance of morphological equilibrium of the estuary (including sedimentation patterns) and salinity, avoidance of pollution or nutrient enrichment, and no increase in organic matter in sediments are key environmental conditions of the site.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Water Quality (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Decommissioning (duration approx 30 years)	
Air Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from [de]construction activities, earthworks, infrastructure, waste storage.
Potential effects on the SAC: Receptor	An increase in airborne pollutants can lead to nutrient loading and changes to water quality from aerial deposition. Changes in air quality can impact upon sensitive designated communities within the SAC, for example it is suspected that nutrient deposition on many sand dunes is already above their critical threshold for impacts on vegetation (Jones <i>et al</i> 2002 and 2004). The consequence of this for dune slacks is the tendency to a speeded up succession away from dune slack vegetation.
Risk of Likely Significant Effect (LSE)?	Air quality has been identified as a vulnerability for the following designated habitats: <ul style="list-style-type: none"> • Perennial vegetation of stony banks • Atlantic salt meadows • Humid dune slacks • Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Water Quality (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SAC: Decommissioning (duration approx 30 years)	
Habitat (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through decommissioning activities for example to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	Additional construction activities required during decommissioning can result in a direct loss of terrestrial, marine and sub-tidal habitats.
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SAC, loss of designated habitats (which would be considered significant) cannot be ruled out at this stage.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Habitat Loss and Fragmentation (Construction)
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar

Unitary Authority: Cumbria and Lancashire

Source: Construction (duration approx 5 years)

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from earthworks/ excavations, infrastructure provision (sedimentation, pollution incidents).
Potential effects on the SAC: Receptor	<p>Organic or nutrient loading can reduce the availability of food for qualifying interests by increasing growth of algal mats notably in the intertidal mud and sand flats and the intertidal and subtidal boulder and cobble skear communities. Algal blooms can reduce water quality by causing the removal of oxygen or occasionally by the release of toxins. Such deterioration in water quality can impact on marine communities and cause a reduction in food availability for qualifying interests whilst the reduction in water clarity caused by algal blooms can reduce the visibility of prey items for species such as Sandwich Tern.</p> <p>Any release of toxins could impact on important bird assemblages of the SPA/Ramsar through accumulation within the foodchain. Sandwich terns, for example, are sensitive to the introduction of synthetic and non-synthetic compounds due to the accumulation of toxins through the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability and abundance of prey items caused by toxic contamination. In addition, Natterjack Toads are present as a qualifying feature of the Ramsar, using pools within the dune slacks, and are highly vulnerable to a deterioration in water quality, notably the introduction of toxic contaminants.</p> <p>Changes to sediment regimes and increased turbidity /siltation could result in mortality of filter feeding shellfish, upon which many of the qualifying species feed (for example Knot <i>Calidris canuta</i> are selective feeders, specialising in molluscs such as cockles).</p>

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Water Resources/Quality	
Risk of Likely Significant Effect (LSE)?	<p>The avoidance of pollution and the maintenance of site hydrology and sedimentation patterns are key environmental conditions that maintain site integrity.</p> <p>As the SPA/Ramsar is adjacent to the nominated site, significant effects as a result of impacts on water quality as a result of construction activities cannot be ruled out at this stage.</p>
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Air Quality	
Potential Impacts: Pathway	Potential local impacts from increased development/ traffic growth, and the emissions arising from construction activity. Likely to be restricted to a local level for example dust/ particulates.
Potential effects on the SAC: Receptor	An increase in airborne pollutants can lead to nutrient loading, possibly affecting species composition and structure of habitats within the SPA/Ramsar. This could cause a change in food sources and prey items which designated bird species of the SPA/Ramsar require.
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for each of the key supporting habitats for the SPA/ Ramsar qualifying species.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Habitats (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Construction of cooling water infrastructure, extension of site into 'buffer' habitats, possible development at the coastal fringes.
Potential effects on the SAC: Receptor	<p>The exact location and extent of cooling water infrastructure and sea defences is unknown at this strategic stage and therefore direct habitat loss within the SPA / Ramsar cannot be ruled out. In addition, the physical loss of intertidal habitats within the SPA / Ramsar may be caused indirectly as a consequence of changes to sedimentation processes (for example coastal defence or construction activities). Loss of shallow coastal waters which supports sand eel, spratt and other prey items could result in a reduction in important feeding habitat for qualifying interests such as Sandwich Terns. Internationally important populations of species including Knot, Pintail and Redshank are also highly sensitive to removal of important feeding and roosting habitat such as intertidal mud and sand flats, intertidal and subtidal boulder and cobble skears and saltmarshes.</p> <p>The consultation response received from Natural England has also confirmed that a large population of Natterjack Toads are present within and adjacent to the nominated site and impacts on this species (including injury / mortality of Natterjack Toads themselves) and loss / modification of their aquatic and terrestrial habitat cannot be ruled out.</p> <p>Direct loss or fragmentation of any habitat outside of the SPA / Ramsar could also reduce the availability of feeding and roosting habitat for qualifying interests. High-tide roosts for certain qualifying waterfowl are found outside the SPA / Ramsar boundary on the landward side.⁸</p>
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SPA/Ramsar it is possible that the development could lead to direct loss of habitat within or adjacent to the SPA/Ramsar.

⁸ <http://www.jncc.gov.uk/default.aspx?page=1981>

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Habitats (and Species) Loss and Fragmentation	
	Any loss of supporting habitat both within and outside the SPA/Ramsar could be considered significant.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Coastal Squeeze	
Potential Impacts: Pathway	Whereby construction areas, infrastructure and facilities require development of land at the coastal fringe
Potential effects on the SAC: Receptor	Any development encroaching on the coastal fringe such as the construction of sea defences and marine off-loading facility may lead to habitats being 'squeezed' between an eroding seaward edge and fixed landward boundary. This could result in the loss of supporting intertidal habitats, loss of sand dune habitat for Natterjack Toads and a reduction in the overall availability of feeding and roosting sites.
Risk of Likely Significant Effect (LSE)?	SPA and Ramsar qualifying interests are vulnerable to the physical loss of supporting habitats.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Noise/ Light/ Visual Disturbance	
Potential Impacts: Pathway	The construction phase extends over 5-6 years with potential for significant increases in noise/ light and visual changes during the construction period.
Potential effects on the SAC: Receptor	Waterfowl are highly sensitive to noise and visual disturbance by human activities when they are feeding or roosting and such impacts could arise as a result of construction activity as well as an influx of people into the area for the construction workforce. The qualifying waterfowl interest is particularly sensitive to disturbance in the winter months when cold temperatures and increased energy requirements are combined with short daylight hours available for feeding. Continued disturbance may force birds to change feeding and roosting sites which often results in increased energy use and reduced intake rates. If birds are continually disturbed from feeding or roosting sites, the resulting effect may be the long term loss of available habitat.
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SPA/Ramsar, it is likely disturbance could lead to significant effects on bird species for which the SPA and Ramsar are designated.
Potential Impacts - other Plans and Programmes	<p>Barrow Port Area Action Plan Disturbance impacts could arise as a result of construction and operation of new marina, cruise facility and watersports</p> <p>Shoreline Management Plan Development/ construction/ maintenance of coastal defences could lead to disturbance of interests</p> <p>Gas Storage Facility, Gateway Storage Company Ltd Development adjacent to and within European sites, potential for disturbance</p> <p>Cumbria Minerals and Waste Development Framework</p>

Duddon Estuary SPA/Ramsar: Construction (duration approx 5 years)	
Noise/ Light/ Visual Disturbance	
	<p>HRA of framework concludes significant effects of the Cumbria MWD Framework on Duddon Estuary SAC are assessed as possible</p> <p>West of Duddon Sands / Walney Offshore Windfarm Proposals Potential for disturbance of birds during construction (turbines and on-shore connections). Once built, turbines may act as barrier to movement to migratory bird species present within SPA / Ramsar</p>
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Source: Operation (duration approx 60 years)

Duddon Estuary SPA/Ramsar: Operation (duration approx 60 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential impacts on water quality and drainage from planned and accidental discharges (radioactive and non-radioactive), and from the abstraction and discharge of water for cooling (heated water up to 10°C warmer than the receiving environment).
Potential effects on the SAC: Receptor	<p>Changes to water quality and water temperature can encourage excessive algal growth. This in turn can affect associated invertebrate assemblages and ultimately could lead to a reduction in prey abundance for qualifying interests. The visibility of prey items may also be reduced where algal blooms are present.</p> <p>Thermal plumes associated with discharge of heated water could impact on invertebrates and fish populations both of which are prey items for qualifying interests within the SPA / Ramsar.</p> <p>Localised abrasion of habitats can occur around discharge/abstraction points, which can also result in altered sediment regimes locally, impacting upon filter-feeding shellfish and the qualifying interests they support for example knot feeding on cockles.</p> <p>Accidental release of pollutants entering the estuarine system and adjacent habitats may impact on key SPA/Ramsar interests for example toxins may bio-accumulate within supporting habitats such as mudflats and salt marsh which in turn could impact on birds which feed there. Biocides used to clean cooling infrastructure can be lethal to marine life, including fish and invertebrates upon which the qualifying bird interests feed.</p>
Risk of Likely Significant Effect (LSE)?	A key requirement for the qualifying interests of the SPA / Ramsar is that water quality, quantity and salinity as necessary for maintaining the favourable condition of key supporting habitats is maintained. The risk of significant effects as a result of water quality impacts therefore cannot be ruled out.

Duddon Estuary SPA/Ramsar: Operation (duration approx 60 years)	
Water Resources/Quality	
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Operation (duration approx 60 years)	
Air Quality	
Potential Impacts: Pathway	<p>Potential local impacts from increased development/ traffic growth (nitrogen oxides, sulphur dioxide).</p> <p>Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, volatile organic compounds.</p>
Potential effects on the SAC: Receptor	An increase in airborne pollutants can lead to nutrient loading, possibly affecting species composition and structure of key supporting habitats within the SPA/Ramsar. This could cause a reduction in the availability of prey items upon which designated bird species of the SPA/Ramsar depend.
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for each of the key supporting habits listed under the conservation objectives for the SPA / Ramsar and therefore at this stage the possibility of significant effects on the integrity of the SPA / Ramsar interest features cannot be ruled out.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Operation (duration approx 60 years)	
Habitat (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through operation, for example to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	<p>Additional construction activities arising from changes to the footprint of the site could lead to both direct and indirect loss / fragmentation of terrestrial, inter- and sub-tidal habitats that support the designated bird species of the SPA and Ramsar.</p> <p>Impingement of fish and invertebrates within the cooling water system could lead to a reduction in prey availability for the qualifying interests for the SPA / Ramsar.</p>
Risk of Likely Significant Effect (LSE)?	SPA designated species are vulnerable to the physical loss of supporting habitats, especially in the intertidal area.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Operation (duration approx 60 years)	
Noise/ Light/ Visual Disturbance	
Potential Impacts: Pathway	Potential for increased disturbance through site operations.
Potential effects on the SAC: Receptor	Birds are disturbed by sudden movements and noise which can displace them from their feeding and roosting grounds. This could occur as a result of routine maintenance operations as well as improvements to infrastructure / storage facilities etc.
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SPA/Ramsar, it is likely disturbance could lead to significant effects on bird species for which the SPA/Ramsar are designated.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Noise / Light / Visual Disturbance (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Source: Decommissioning (duration approx 30 years)

Duddon Estuary SPA/Ramsar: Decommissioning (duration approx 30 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from [de]construction activities, earthworks, infrastructure, waste storage.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Water quality and the maintenance of existing hydrological and sediment regimes are key environmental conditions that maintain site integrity. As the SPA/Ramsar is adjacent to the nominated site, significant impacts on water quality as a result of de-construction activities cannot be ruled out at this stage.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Decommissioning (duration approx 30 years)	
Air Quality	
Potential Impacts: Pathway	Potential local impacts from increased development/ traffic growth associated with decommissioning and the emissions arising from [de]construction activity. Likely to be restricted to a local level for example dust/ particulates.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for the each of the habitats listed within the conservation objectives for the SPA / Ramsar to be maintained in favourable condition. Significant effects on the integrity of the SPA / Ramsar cannot therefore be ruled out at this stage.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Decommissioning (duration approx 30 years)	
Habitats (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through decommissioning activities, for example, to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SPA and Ramsar it is possible the development could lead to direct loss of habitat within or adjacent to the SPA/Ramsar. Any loss of supporting habitat within the SPA/Ramsar would be considered significant.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Duddon Estuary SPA/Ramsar: Decommissioning (duration approx 30 years)	
Noise/ Light/ Visual Disturbance	
Potential Impacts: Pathway	Decommissioning activity and associated de-construction likely to result in significant local increases in noise events, light pollution and visual disturbance in and around the immediate vicinity of the site.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	As the nominated site is adjacent to the SPA/Ramsar, it is likely disturbance could lead to significant effects on bird species for which the SPA and Ramsar are designated.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Noise / Light / Visual Disturbance (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar

Unitary Authority: Cumbria and Lancashire

Source: Construction (duration approx 5 years)

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from earthworks/ excavations, infrastructure provision (sedimentation, pollution incidents).
Potential effects on the SAC: Receptor	<p>No direct effects on water quality of this SPA / Ramsar are considered likely given distance from nominated site (over 10km to the east). However, increased nutrient and sediment loading may affect species composition and structure of supporting habitats outside of the SPA/Ramsar which are used by the qualifying interests for the SPA / Ramsar (for example many bird species are common to both Duddon Estuary SPA / Ramsar and Morecambe Bay SPA / Ramsar and impacts on habitats within the former could result in indirect impacts on the integrity of the qualifying bird populations of the latter.</p> <p>In addition, any release of toxins could impact on important bird assemblages of the SPA/Ramsar where qualifying interests use directly impacted habitats for example where interests feed within habitats immediately adjacent to the nominated site within Duddon Estuary. Many waterfowl are vulnerable to the bioaccumulation of toxins through the food chain but may also be affected by a reduced palatability of prey items.</p>
Risk of Likely Significant Effect (LSE)?	<p>Vulnerabilities have been identified for the qualifying interests relating to water quality (both toxic and non-toxic contamination).</p> <p>Indirect impacts on the qualifying interests could occur as a result of effects on water quality impacting upon off-site feeding / roosting areas, such as those within Duddon Estuary. However, the significance of this is uncertain at this stage given that the interchange of birds between the two areas is not currently known.</p>

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Water Resources/Quality	
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Air Quality	
Potential Impacts: Pathway	Potential local impacts from increased development/ traffic growth, and the emissions arising from construction activity. Likely to be restricted to a local level, for example, dust/ particulates.
Potential effects on the SAC: Receptor	An increase in airborne pollutants can lead to nutrient loading, possibly affecting species composition and structure of off-site habitats utilised by the qualifying interests of the SPA/Ramsar. This could cause a reduction in food sources and prey items as well as changes to habitat composition affecting suitability as roosting areas (for example vegetation cover may increase, reducing sight lines).
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for each of the key supporting habitats for the SPA/ Ramsar qualifying species and where these habitats occur off-site and are utilised by qualifying interests (for example Duddon Estuary), there is the potential for effects to occur. However, the significance of this is uncertain given that the exact movements of qualifying interests within the wider landscape are currently unknown.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Habitats (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Construction of cooling water infrastructure, extension of site into 'buffer' habitats, possible development at the coastal fringes.
Potential effects on the SAC: Receptor	Loss or fragmentation (direct or indirect) of any off-site habitat used by the qualifying interests of the SPA/Ramsar site could reduce the availability of feeding and roosting habitat.
Risk of Likely Significant Effect (LSE)?	Direct loss of agricultural land (at the nominated site) as well as indirect loss of inter-tidal habitats within the Duddon Estuary as a result of changes to coastal processes could result in effects on the qualifying interests for the SPA/Ramsar, should they use these areas for feeding/roosting. Without a full understanding of the interchange of bird populations between Morecambe Bay and Duddon Estuary/nominated site likely significant effects should be assumed.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Coastal Squeeze	
Potential Impacts: Pathway	Whereby construction areas, infrastructure and facilities require development of land at the coastal fringe.
Potential effects on the SAC: Receptor	Any development encroaching on the coastal fringe may lead to habitats being 'squeezed' between an eroding seaward edge and fixed flood defence walls and lead to indirect loss of off-site habitats which may be used for roosting / feeding by the qualifying interests of the SPA/Ramsar.
Risk of Likely Significant Effect (LSE)?	SPA/Ramsar designated species are vulnerable to the physical loss of supporting habitats and without a full understanding of the interchange of bird populations between Morecambe Bay and Duddon Estuary/nominated site likely significant effects should be assumed.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Construction (duration approx 5 years)	
Noise/Light/Visual Disturbance	
Potential Impacts: Pathway	The construction phase extends over 5-6 years with potential for significant increases in noise/ light and visual changes during the construction period.
Potential effects on the SAC: Receptor	<p>Birds are disturbed by sudden movements and noise which can displace them from their feeding and roosting grounds. For example, Bar-tailed Godwits are under threat from the degradation of foraging sites with human disturbance being a contributing factor.</p> <p>Disturbance as a result of construction activities could reduce the suitability of off-site habitats (for example within the Duddon Estuary) leading to indirect effects on qualifying interests for the SPA/Ramsar where there is an interchange of bird populations between the two areas.</p> <p>Disturbance as a result of increased visitor pressure through an influx of people into the area to provide the additional work force could also lead to effects on the interest features for the SPA/Ramsar.</p>
Risk of Likely Significant Effect (LSE)?	Increased recreational pressure on this SPA/Ramsar and off-site disturbance from construction activities (where there is an interchange of populations between Duddon Estuary and Morecambe Bay) could lead to significant effects on bird species for which the SPA/Ramsar are designated.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Noise/Light/Visual Disturbance (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Source: Operation (duration approx 60 years)

Morecambe Bay SPA/Ramsar: Operation (duration approx 60 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential impacts on water quality and drainage from planned and accidental discharges (radioactive and non-radioactive), and from the abstraction and discharge of water for cooling (heated water up to 10°C warmer than the receiving environment).
Potential effects on the SAC: Receptor	<p>The following effects on water resources/quality within close proximity to the nominated site could impact upon bird interests for the SPA/Ramsar should they use these affected off-site habitats for roosting/feeding:</p> <ul style="list-style-type: none"> • Changes to water quality and water temperature can encourage excessive algal growth leading to a reduction in prey abundance as well as reduced visibility of prey items • Thermal plumes associated with discharge of heated water could impact on invertebrates and fish populations both of which are prey items for qualifying interests within the SPA/Ramsar • Localised abrasion of habitats can occur around discharge/abstraction points, which can also result in altered sediment regimes locally, impacting upon filter-feeding shellfish and the qualifying interests they support for example knot feeding on cockles • Accidental release of pollutants entering the estuarine system may impact on key SPA/Ramsar interests for example toxins may bio-accumulate within supporting habitats such as mudflats and salt marsh which in turn could impact on birds which feed there. Biocides used to clean cooling infrastructure can be lethal to marine life, including fish and invertebrates upon which the qualifying bird interests feed
Risk of Likely Significant Effect (LSE)?	A key requirement for the important bird populations present within the SPA/Ramsar is that water quality, quantity and salinity as necessary for maintaining the favourable condition of key supporting habitats for feeding, nesting and roosting birds is maintained. Usage of potentially affected habitats by the SPA/Ramsar interests is unknown at this stage and as such the risk of significant effects uncertain.

Morecambe Bay SPA/Ramsar: Operation (duration approx 60 years)	
Water Resources/Quality	
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Operation (duration approx 60 years)	
Air Quality	
Potential Impacts: Pathway	<p>Potential local impacts from increased development/ traffic growth (nitrogen oxides, sulphur dioxide).</p> <p>Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, volatile organic compounds.</p>
Potential effects on the SAC: Receptor	An increase in airborne pollutants can lead to nutrient loading, possibly affecting species composition and structure of off-site habitats utilised by the qualifying interests of the SPA/Ramsar. This could cause a reduction in food sources and prey items as well as changes to habitat composition affecting suitability as roosting areas (for example vegetation cover may increase, reducing sight lines).
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for each of the key supporting habitats for the SPA/ Ramsar qualifying species and where these habitats occur off-site and are utilised by qualifying interests (for example Duddon Estuary), there is the potential for effects to occur. However, the significance of this is uncertain given that the exact movements of qualifying interests within the wider landscape are currently unknown.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Operation (duration approx 60 years)	
Habitat (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through operation, for example to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	Additional construction activities arising from changes to the footprint of the site could increase loss of off-site terrestrial, inter- and sub-tidal habitats which may support the designated bird species of the SPA and Ramsar.
Risk of Likely Significant Effect (LSE)?	SPA designated species are vulnerable to the physical loss of supporting habitats, especially in the intertidal area and without knowing off-site feeding/roosting locations for the qualifying interests, significant effects should be assumed.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Operation (duration approx 60 years)	
Noise/Light/Visual Disturbance	
Potential Impacts: Pathway	Potential for increased disturbance through site operations.
Potential effects on the SAC: Receptor	<p>Birds are disturbed by sudden movements and noise which can displace them from their feeding and roosting grounds such as that which could occur as a result of routine maintenance operations as well as improvements to infrastructure/storage facilities etc.</p> <p>This could impact upon habitats in close proximity to the nominated site which may be used as off-site feeding/roosting areas by the qualifying interests.</p>
Risk of Likely Significant Effect (LSE)?	Off-site disturbance from site operations (where there is an interchange of populations between Duddon Estuary and Morecambe Bay) could lead to significant effects on bird species for which the SPA/Ramsar are designated.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Noise/Light/Visual Disturbance (Construction).
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Source: Decommissioning (duration approx 30 years)

Morecambe Bay SPA/Ramsar: Decommissioning (duration approx 30 years)	
Water Resources/Quality	
Potential Impacts: Pathway	Potential effects on water quality and drainage from [de]construction activities, earthworks, infrastructure, waste storage.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Water quality and the maintenance of existing hydrological and sediment regimes are key environmental conditions that maintain the integrity of the SPA/Ramsar interest features. Without a detailed understanding of usage of potentially affected off-site habitats, significant effects should be assumed.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Decommissioning (duration approx 30 years)	
Air Quality	
Potential Impacts: Pathway	Potential local impacts from increased development/traffic growth associated with decommissioning and the emissions arising from [de]construction activity. Likely to be restricted to a local level for example dust/particulates.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Air quality is an identified vulnerability for supporting habitats for the SPA/Ramsar interest features and without a detailed understanding of usage of potentially affected off-site habitats, significant effects should be assumed.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Decommissioning (duration approx 30 years)	
Habitats (and Species) Loss and Fragmentation	
Potential Impacts: Pathway	Changes to footprint of site through decommissioning activities for example to accommodate waste storage, develop infrastructure.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Any loss of supporting habitat outside the SPA/Ramsar could lead to significant effects on the qualifying interests.
Potential Impacts - other Plans and Programmes	See Morecambe Bay SAC table above.
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Morecambe Bay SPA/Ramsar: Decommissioning (duration approx 30 years)	
Noise/Light/Visual Disturbance	
Potential Impacts: Pathway	Decommissioning activity and associated de-construction likely to result in significant local increases in noise events, light pollution and visual disturbance in and around the immediate vicinity of the site.
Potential effects on the SAC: Receptor	See Construction effects.
Risk of Likely Significant Effect (LSE)?	Increased recreational pressure on this SPA/Ramsar and off-site disturbance from construction activities (where there is an interchange of populations between Duddon Estuary and Morecambe Bay) could lead to significant effects on bird species for which the SPA/Ramsar are designated.
Potential Impacts - other Plans and Programmes	See other Plans and Programmes listed under Noise/Light/Visual Disturbance (Construction)
Risk from 'In Combination' Effects?	Uncertain
AA Required?	Yes

Appendix 4: HRA/ Appropriate Assessment Proforma

Morecambe Bay

- **Latitude:** 540709N/025742W
- **Size (ha):** 61506.22
- **Designation:** SAC

Morecambe Bay SAC	
Qualifying Features	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>1130 Estuaries</p> <p>1140 Mudflats and sandflats not covered by seawater at low tide</p> <p>1160 Large shallow inlets and bays</p> <p>1220 Perennial vegetation of stony banks</p> <p>1310 Salicornia and other annuals colonising mud and sand</p> <p>1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)</p> <p>2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes')</p> <p>2130 Fixed dunes with herbaceous vegetation ('grey dunes') * Priority feature</p> <p>2190 Humid dune slacks</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>110 Sandbanks which are slightly covered by sea water all the time</p> <p>1150 Coastal lagoons * Priority feature</p> <p>1170 Reefs</p> <p>2110 Embryonic shifting dunes</p>

Morecambe Bay SAC	
	<p>2150 Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) * Priority feature 2170 Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)</p> <p>Annex II species that are a primary reason for selection of this site: 1166 Great crested newt <i>Triturus cristatus</i></p>
<p>Conservation Objectives</p>	<p>Subject to natural change, maintain the large shallow inlets and bays in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Intertidal boulder and cobble skear communities • Subtidal boulder and cobble skear communities • Brittlestar bed communities • Intertidal boulder clay communities • Coastal lagoon communities • Intertidal mudflat and sandflat communities • Pioneer saltmarsh communities • Saltmarsh communities <p>Subject to natural change, maintain the mudflats and sandflats not covered by seawater at low tide (intertidal mudflats and sandflats) in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Mud communities • Sand communities • Eelgrass bed communities <p>Subject to natural change, maintain the Glasswort <i>Salicornia</i> spp and other annuals colonising mud and sand (pioneer saltmarsh) in favourable condition, in particular:</p> <ul style="list-style-type: none"> • The glasswort <i>Salicornia</i> spp communities

Morecambe Bay SAC	
	<p>Subject to natural change, maintain the Atlantic salt meadows <i>Glauco-Puccinellietalia</i> (saltmarsh) in favourable condition, in particular:</p> <ul style="list-style-type: none"> • Low marsh communities • Mid marsh communities • High marsh communities • Transitional high marsh communities <p>Subject to natural change, maintain other designated features in a favourable condition.</p>
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • Maintain morphological equilibrium of the estuary, including sedimentation patterns and budgets. The primary management principle for ‘active process sites’ is to avoid interfering with the natural processes that maintain the features. Any development or activity that restricts natural processes is likely to damage the interest features of the site for example construction of structures or defences, removal of material such as sand and gravel or even tree planting, should this result in stabilization of normally unstable soils. • Avoidance of constraints to response to sea level rise and changing sediment regimes. Management needs to create space to enable landward roll-back to take place in response to sea-level rise, and should allow the system to be dynamic and retain flexibility to respond to associated changes such as the movement of physical features within the system for example migrating subtidal sandbanks. • Maintain temperature and salinity levels within natural range; • Avoidance of changes to drainage patterns. • Avoidance of pollution • Avoidance of nutrient enrichment • Appropriate grazing of saltmarsh communities (much of this habitat within the site is ungrazed, especially within Tummer Hill and Wyre Estuary and here a wide range of less common grazing-sensitive species occur) • Maintain minimal impact of fishing, bait digging and dredging • High enough water table for dune slacks

Morecambe Bay SAC	
	<ul style="list-style-type: none"> • Avoidance of damaging levels of erosion from human activities – vegetated shingle habitats are especially vulnerable to damage from trampling. • No increase in organic matter in sediments • No physical constraints to managed realignment if required in response to coastal squeeze • Control of bracken/scrub • Control of invasive and/or non-native species • GREAT CRESTED NEWTS require suitable foraging and refuge habitat; ponds with relatively unpolluted water of roughly neutral pH; some ponds with water throughout the breeding/tadpole development season
<p>Vulnerabilities (includes existing pressures and trends)</p> <p><i>Details at Appendix 1</i></p>	<p><u>Large shallow inlets and bays</u></p> <ul style="list-style-type: none"> • Removal and/or smothering of embayment habitats. • Coastal Squeeze: sedimentary areas protected by hard defences will suffer the greatest impact of sea level rise. Erosive forces would become more dominant and losses of fine sediment would produce narrower intertidal areas, with coarser sediment. The change of sediment characteristics would reduce the content of organic matter in the sediments and change the community structure accordingly. Taken to its conclusion, a greater proportion of estuaries on open-coasts would become marine and sandy and the brackish section would move inland and up-river. In more sheltered areas, there would be more deposition, extending areas of fine sediment and marsh. However, this process would cease once the sediment supply was reduced and ultimately erosion would become the dominant process. • Physical damage resulting from siltation, abrasion and/or selective extraction. • Increased synthetic, non synthetic toxic and/or radionuclide contamination. • Nutrient and/or organic enrichment. • Increases in turbidity. • Introduction of microbial pathogens, introduction of non-native species and/or selective extraction of species for which the site has been selected or which form important food sources for such species.

	Morecambe Bay SAC
	<p><u><i>Intertidal mudflats and sandflats</i></u></p> <ul style="list-style-type: none"> • Removal and/or smothering • Coastal Squeeze: see above. • Physical damage resulting from siltation and/or abrasion and/or selective extraction. English Nature (2000) states that the eelgrass communities are subject to high levels of existing abrasion, • nutrient enrichment and organic enrichment and introduction of non-native species/translocation • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Nutrient and/or organic enrichment • Increases in turbidity • Biological disturbance through the introduction of non-native species, microbial pathogens and/or selective extraction of species <p><u><i>Pioneer saltmarsh</i></u></p> <ul style="list-style-type: none"> • Removal of pioneer saltmarsh habitats • Coastal Squeeze: see above. • Physical damage resulting from abrasion • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Translocation of species • Introduction of non-native species and/or translocation of species for example invasive cord-grass <i>Spartina anglica</i> is becoming heavily established within Duddon estuary. <p><u><i>Saltmarsh</i></u></p> <ul style="list-style-type: none"> • Removal of saltmarsh habitats • Coastal Squeeze: see above. • Physical damage resulting from abrasion and/or selective extraction • Increased synthetic, non synthetic toxic and/or radionuclide contamination

	Morecambe Bay SAC
	<ul style="list-style-type: none"> • Translocation of species <p>All of the above features were assessed as subject to high levels of introduction of microbial pathogens and most as experiencing high levels of changes in turbidity English Nature (2000).</p> <p><u>Shingle vegetation</u></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing • Increased synthetic, non synthetic toxic and/or radionuclide contamination • Introduction of non-native species and/or translocation of species <p><u>Shifting dunes</u></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing • Introduction of non-native species and/or translocation of species <p><u>Fixed dunes</u></p> <ul style="list-style-type: none"> • Removal of habitats • Physical damage resulting from abrasion and/or abstraction • Inappropriate scrub control • Inappropriate grazing • Introduction of non-native species and/or translocation of species

Morecambe Bay SAC	
<p>Predicted Impacts</p> <p><i>What are the issues arising from the plan and how might the site be affected?</i></p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Increased/ altered drainage from earthworks and excavation • Potential for toxic contamination from accidental leakage • Radioactive discharges (accidental and routine) • Alteration of flow from abstraction • Changes to water temperature from controlled discharge • Sedimentation and changes in organic and nutrient loading arising from construction during the construction and decommissioning phases <p>Air Quality</p> <ul style="list-style-type: none"> • Local level impacts (reduced air quality arising from increased emissions from road/ transport/ generation sources) arising from construction decommissioning activities. • Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, sulphur dioxides, volatile organic compounds and accidental radioactive emissions. <p>Habitat Loss and Fragmentation</p> <ul style="list-style-type: none"> • Construction activities (during construction, operation and decommissioning) have the potential to result in direct and indirect loss and fragmentation of key SAC habitats, for example, inter-tidal habitats. <p>Coastal Squeeze</p> <ul style="list-style-type: none"> • Any development encroaching on the coastal fringe may lead to habitats being 'squeezed' between an eroding seaward edge and fixed flood defence walls and lead to indirect loss of designated habitats.

	Morecambe Bay SAC
<p>Potential In-combination effects (screening)</p> <p><i>What other plans and programmes could lead to in-combinations effects?</i></p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Operation and decommissioning of existing nuclear power stations at Sellafield and Heysham as well as conventional power stations (Roosecote Power Station). • Shoreline Management Plan • Barrow Port Area Action Plan • Copeland Borough Adopted Local Plan • Shoreline Management Plan • Duddon Estuary and Morecambe Bay Regional Park Proposals • Gas Storage Facility, Gateway Storage Company Ltd • West of Duddon Sands and Walney Offshore Windfarms <p>Air Quality</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Shoreline Management Plan • Barrow Port Area Action Plan • Shoreline Management Plan • Lancashire Minerals and Waste Local Plan • Cumbria Local Transport Plan (LTP2) • Cumbria Minerals and Waste Development Framework • Gas Storage Facility, Gateway Storage Company Ltd • West of Duddon Sands and Walney Offshore Windfarms <p>Habitat Loss and Fragmentation / Coastal Squeeze</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Shoreline Management Plan

Morecambe Bay SAC	
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<p>Appropriate Assessment</p> <p>Likelihood of adverse effect on integrity:</p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Current Environment Agency data⁹ indicates that for the closest watercourse to the nominated site at Kirksanton (the manmade drainage channel known as Haverigg Pool) the ecological status is assessed as being ‘moderate’ with copper and zinc currently achieving ‘less than good’ status. No assessment of the chemical status of this watercourse had been made. By 2027 the EA predicts that the ecological status will increase to ‘good’. • Water quality measurements taken at the mouth of the River Duddon, close to the nominated site and within the SAC indicate that the ecological status here is also assessed as ‘moderate’, again with no information on chemical status available. Elements that are currently achieving ‘less than good’ status are: ammonia and dissolved oxygen. By 2027 the EA predicts that the ecological status will increase to ‘good’. • Current assessments for the coastal water quality, in front of the nominated site at Kirksanton and further out to sea than the SAC designation indicate that the ecological and chemical status of the environments here are ‘moderate’ and ‘good’ respectively, with the former predicted to improve to ‘good’ by 2027. The elements that are currently achieving ‘less than good’ ecological status here are macroalgae and dissolved inorganic nitrogen. • Groundwater quantitative and chemical quality status around the nominated site are assessed by the

⁹ Environment Agency River Basin Management Plans: Draft North West River Basin District, 2008. The data used in this assessment is taken from the Draft River Basin Management Plan, which was the most up to date plan available at the time. Draft plans were presented to the Government for approval in September 2009, with final plans published in December 2009
 UKTG – Water Framework Directive Website: <http://www.wfduk.org/>

	Morecambe Bay SAC
	<p>EA¹ as being 'good' although the groundwater body (West Cumbria Permo-Triassic sandstone aquifers) has an upward trend in pollutant concentrations with risks noted for nitrate, phosphate and hazardous substances as well as artificial flow pressures including abstraction.</p> <ul style="list-style-type: none"> • At present in the Duddon Estuary, the main source of contamination enters habitats within the SAC through diffuse agricultural sources and point source discharges from sewage treatment works most notably at the towns of Millom and Askham-in-Furness. Crude sewage also enters the estuary through discharges at Broughton-in-Furness and Barrow-in-Furness. As a result, it is therefore considered that habitats within the SAC are subject to a current medium level of exposure to nutrient and organic loading.¹⁰ • Exposure levels to synthetic and non-synthetic compounds within the estuary are also considered to be high. There are a number of industrial effluent disposal sites, namely a paper mill and ship building works at Barrow-in-Furness as well as other industry at Askham-in-Furness and Millom. Discharges from these sites are covered by EA consents. The past industrial history of the Duddon Estuary has left a legacy of industrial waste including slag heaps at Barrow, Askham and Millom. The extent, location, contents and stability of other past industrial waste sites is less well known, for example, waste disposal on North Walney¹⁰ • Radioactive discharges are subject to targets monitored by the EA and of the non-radioactive discharges, nitrate contributions are considered to be the most significant². In particular it is noted that there can be measurable localised impacts on sea nutrient levels in the vicinity of discharges. • Morecambe Bay SAC designated habitats are vulnerable to toxic and non-toxic contamination (Appendix 1, Site Characterisations) and whilst current water quality indicators show that generally ecological and chemical levels within coastal and freshwaters around Kirksanton to be generally 'moderate' or higher, there are some areas for concern, namely regarding nutrient loading from sewage treatment works and past industrial sources of synthetic and non-synthetic compounds. Without further information on discharge levels and quality arising from the development that planned radioactive and non-radioactive discharges will have, it is not possible at this stage to determine they

¹⁰ English Nature (2001) Duddon Estuary European Marine Site: English Nature's advice under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

	Morecambe Bay SAC
	<p>will not adversely impact upon the SAC.</p> <p>Air Quality</p> <ul style="list-style-type: none"> • The Environment Agency assesses that, non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared with other regulated industries and the Agency does not consider them to be an environmental priority. The Agency's most recent available assessment of radioactive aerial emissions indicates that all fall within authorised limits. • Changes in air quality can impact upon sensitive designated communities within the SAC. It is suspected that nutrient deposition on many sand dunes throughout the UK is already above their critical threshold for impacts on vegetation (Jones <i>et al</i> 2002¹¹ and 2004¹²). The consequence of this for dune slacks is the tendency to a speeded up succession away from dune slack vegetation. • Information provided by the UK Air Pollution Information System¹³ indicates that air quality within the area (centred on the SAC and including the nominated site, up to a resolution of 5km) is generally good with pollution levels for all key pollutants (sulphur dioxide, particulates, nitrogen dioxide etc.) typically low. However, sensitivities and critical loads have been identified for the interest features within the SAC and have revealed that for some pollutants, current deposition levels are close to or within exceedance level ranges. For saltmarsh, sand dunes and shingle habitats, current acid deposition levels when compared to critical loads for these habitats are in exceedance by 0.62kg

¹¹ Jones, M.L.M. *et al.* 2002. Changing nutrient budget of sand dunes: consequences for the nature conservation interest and dune management CEH, Bangor

¹² Jones, M.L.M. *et al.* 2004. Changes in vegetation and soil characteristics in coastal sand dunes along a gradient of atmospheric nitrogen deposition *Plant Biology* 6, 598-605

¹³ <http://www.apis.ac.uk/>

	Morecambe Bay SAC
	<p>eq/ha/yr.</p> <ul style="list-style-type: none"> • However, air quality data provided by the UK Air pollution Information System¹⁴ for other parts of Morecambe Bay SAC (close to Heysham) reveal that here nitrogen deposition for dune systems and perennial vegetation of stony banks are at, or are in exceedence of critical loads. • Air quality issues around the nominated site are considered to potentially be most significant during construction and decommissioning phases (transport etc). The potential for cumulative effects from other plans and programmes also arises as a result of the Barrow Area Action Plan which sets out policies for major redevelopment of Barrow including developments within and adjacent to the SAC. • Air quality is an identified vulnerability for, perennial vegetation of stony banks, Atlantic salt meadows, Humid dune slacks and Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>). Therefore, in the context of: known air quality conditions and the N2K site characterisation data which indicates that the qualifying features are considered vulnerable or at risk for issues of air quality; together with the risk of 'in-combination' effects it is not possible to conclude that that significant effects on the SAC as a result of air quality impacts can be ruled out at this stage. <p>Habitat Loss and Fragmentation/Coastal Squeeze</p> <ul style="list-style-type: none"> • The Shoreline Management Plan (Management Unit No. 8: Skeller Point to Haverigg) describes the coastal geomorphology and main pressures affecting the coastal habitats found immediately in front of the nominated site and which form part of the qualifying interest for Morecambe Bay SAC. • The direction of material drift is considered to be variable being determined disproportionately by severe storms at high sea levels. Residual tidal currents indicate a net south easterly drift whilst an annual average wave condition is directed to the north east. The presence of Selker Rocks is believed to have a sheltering affect for northerly storms encouraging the northerly drive of sediment although its influence is not fully understood at present. The blown sand which makes up the coast from Kirkstanton Haws through to Haverigg originates from the Duddon estuary sand bars.

¹⁴ <http://www.apis.ac.uk/>

Morecambe Bay SAC	
	<ul style="list-style-type: none"> • The coastline will continue to erode at a similar rate to that observed at present, estimated to be between 0.2 - 0.5/m year with a small area of accretion at Haverigg Point of around 0.3m/year. The erosion and consequent behaviour of the coast will change in approximately 100 years when the sand and gravel deposits are estimated to be exhausted and the more extensive boulder clay deposits that back them become exposed. The continued erosion of the outer Duddon sand bars would maintain the supply of material in the short term to the south length of the Unit between Haverigg and Kirkstanton Haws, but would eventually cause the coast to become more exposed and the coastline to start to recede. • The extent of loss / modification to marine and terrestrial habitats from the construction of cooling water culverts, sea defences and a marine off-loading facility is currently unknown, and its significance in the context of wider habitat changes cannot be assessed. It is possible that these changes may act cumulatively or accelerate changes anticipated in the longer term for this stretch of coastline in relation the primary designation features. At this strategic stage where detailed development plans are unknown, it is not possible to conclude that that there will not be adverse effects through habitat loss on the SAC.
<p>Possible Avoidance and Mitigation Measures – <i>includes recommendations for policy/proposals</i></p>	<p>Water Resource and Quality</p> <ul style="list-style-type: none"> • Adverse impacts upon surface, ground and estuarine waters should be avoided through the implementation of appropriate safety measures and water quality monitoring. This is primarily the responsibility of the Water Companies (resource planning) and the Environment Agency (abstraction licensing and discharge regulation). However, the Draft Nuclear NPS can require that control and regulation measures relating to supply and discharge are in place prior to the implementation of the nominated site proposals. • Primary data collection and subsequent laboratory analyses of samples for a full suite of parameters (including radioactive elements) should be undertaken to determine current exposure levels within the ecosystems

	Morecambe Bay SAC
	<p>Air Quality</p> <ul style="list-style-type: none"> • The Draft Nuclear NPS should take into account the potential for air quality impacts to arise, particularly at a local level. The implementation of public transport infrastructure and/or non-road transport means, phasing of development, and the implementation of robust monitoring at sites to track changes in air quality over time should be implemented. In addition, the potential for cumulative impacts to arise from other plans and programmes implemented which overlap with the nuclear development in future (for example, during the decommissioning phase of the development) should be considered. <p>Habitat Loss and Fragmentation/ Coastal Squeeze</p> <ul style="list-style-type: none"> • Where proposals for design and build remain under development, the Draft Nuclear NPS should seek to prioritise the avoidance of indirect habitat impacts and develop mitigation measures that protect the integrity of the designated site, for example, through amended designs for the sea defences (soft engineering) and marine off-loading facility (permeable to sediment movements) and use of directional drilling for the installation of cooling water pipes. • Habitat creation to replace habitats removed as a result of the development and to maintain connectivity of wildlife corridors around the development site should be undertaken as early as possible prior to the development works. • Any direct impacts that may not be mitigated for successfully should be addressed through appropriate compensation measures agreed with Statutory Bodies and implemented prior to the commencement of development proposals. • Further studies are necessary to determine the significance of potential impacts associated with the proposed development upon the ecological integrity of the SAC with regard to habitat loss/fragmentation and coastal squeeze.
Conclude no adverse effect on integrity?	It is not possible at this stage of the development of the Draft Nuclear NPS to say that proposals at Kirksanton will not have significant adverse effects on Morecambe Bay SAC as a result of impacts to water quality, air quality and habitat loss and fragmentation.

Duddon Estuary

- Latitude: 025721W/ 540719N
- Size (ha): 37404.6
- Designation: SPA

Duddon Estuary SPA	
Qualifying Features	<p>Source: http://www.jncc.gov.uk/pdf/SPA/UK9005031.pdf</p> <p>Article 4.1 qualification</p> <p>During the breeding season the area regularly supports:</p> <p><i>Sterna sandvicensis</i> (Western Europe/Western Africa) 3% of the population in Great Britain, 5 year mean for 1992 to 1996</p> <p>Article 4.2 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Anas acuta</i> (North Western Europe) 4.7% of the NW European population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Anser brachyrhynchus</i> (Eastern Greenland/Iceland/UK) 1.1% of the World population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Arenaria interpres</i> (Western Palearctic - wintering) 2.4% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Calidris alpina alpina</i> (Northern Siberia/Europe/Western Africa) 3.8% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96</p> <p><i>Calidris canutus</i> (North-eastern Canada/Greenland/Iceland/Northwestern Europe)</p>

	Duddon Estuary SPA
	<p>8.5% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96 <i>Haematopus ostralegus</i> (Europe and Northern/Western Africa)</p> <p>5.4% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96 <i>Limosa lapponica</i> (Western Palearctic - wintering)</p> <p>2.6% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96 <i>Numenius arquata</i> (Europe - breeding)</p> <p>3.9% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96 <i>Pluvialis squatarola</i> (Eastern Atlantic - wintering)</p> <p>1.1% of the East Atlantic Flyway population 5 year peak mean for 1991/92 to 1995/96 <i>Tadorna tadorn</i> (North Western Europe)</p> <p>2.1% of the NW European population 5 year peak mean for 1991/92 to 1995/96 <i>Tringa tetanus</i> (Eastern Atlantic - wintering)</p> <p>3.6% of the East Atlantic Flyway population 5 year peak mean for 1989/90 to 1993/94 On passage the area regularly supports: <i>Charadrius hiaticula</i> (Europe/Northern Africa - wintering)</p> <p>1.5% of the international population (unspecified) 5 year peak mean for 1991/92 to 1995/96</p> <p>Article 4.2 Qualification: an internationally important assesmblage of birds</p> <p>During the breeding season the area regularly supports: 61858 seabirds (5 year peak mean 28/09/1999) Including: <i>Sterna sandvicensis</i> .</p> <p>Over winter the area regularly supports: 210668 waterfowl (5 year peak mean 28/09/1999) Including: <i>Anser brachyrhynchus</i> , <i>Tadorna tadorna</i> , <i>Anas acuta</i> , <i>Haematopus ostralegus</i> , <i>Pluvialis squatarola</i> , <i>Calidris canutus</i> , <i>Calidris alpina alpina</i> , <i>Limosa lapponica</i> , <i>Numenius arquata</i> , <i>Tringa totanus</i> , <i>Arenaria interpres</i> .</p>

	Duddon Estuary SPA
<p>Conservation Objectives</p>	<p>The conservation objectives for the internationally important populations of the regularly occurring Annex 1 bird species areas as follows:</p> <p style="padding-left: 40px;">Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex 1 bird species, under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Shallow coastal waters <p>The conservation objective for the internationally important populations of the regularly occurring migratory bird species is as follows:</p> <p style="padding-left: 40px;">Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring migratory species, under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflats and sandflat communities • Intertidal and subtidal boulder and cobble skear communities • Saltmarsh communities <p>The conservation objective for the internationally important assemblage of waterfowl is as follows:</p> <p style="padding-left: 40px;">Subject to natural change, maintain in favourable condition the habitats for the internationally important assemblage of waterfowl under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities • Intertidal and subtidal boulder and cobble skear communities

Duddon Estuary SPA	
	<ul style="list-style-type: none"> • Saltmarsh communities
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • Avoidance of pollution • Management of saltmarsh grazing • Control of bait digging and dredging • Maintenance of prey availability for example control of shell-fishing • Maintenance of uninterrupted views • Open ground with short vegetation cover for feeding and roosting birds • Maintain hydrology of wet grassland (for waders) • Limited disturbance to birds (land and waterbased) • No physical constraints to natural migration of mobile habitats • Maintenance of natural sedimentation patterns • Control of non-native species
Vulnerabilities (includes existing pressures and trends) <i>Details at Appendix 1</i>	<ul style="list-style-type: none"> • Physical loss / Removal Sandwich Terns (<i>Sterna sandvicensis</i>) are highly sensitive to the loss through removal of any important feeding habitats on which they depend. In the case of the Duddon Estuary European marine site, they are primarily dependant on shallow coastal water. In addition internationally important bird species such as Knot, Pintail and Redshank are also highly sensitive to removal of important feeding and roosting habitat such as intertidal mud and sand flats, intertidal and subtidal boulder and cobble skears and saltmarshes. • Physical damage / Abrasion Intertidal and subtidal boulder and cobble skears and saltmarsh communities within the Duddon Estuary that support waterfowl and migratory species, are moderately sensitive to physical damage by abrasion, which can reduce their suitability as feeding and roosting areas. Damage to intertidal and subtidal boulder and cobble skears can be caused by the use and landing of 4WD vehicles and boats which can disturb the form and integrity of the features. Damage to saltmarsh is mainly caused by grazing animals and recreational users. Damage by abrasion can reduce the suitability of these areas as feeding and roosting habitats. Knot, for example, are

	Duddon Estuary SPA
	<p>particularly dependant on the boulder and cobble skewer habitat for feeding. Any activity that reduces the area and integrity of this habitat may have detrimental consequences on the suitability of the site.</p> <ul style="list-style-type: none"> <li data-bbox="571 432 2045 831"> <p>• Non-toxic contamination / Changes in nutrient and organic loading Changes in nutrient and organic loading can have a variety of effects upon the habitats within the Duddon Estuary that support Annex 1 species. The most notable habitats are the intertidal mud and sand flats and the intertidal and subtidal boulder and cobble skewer communities. Nutrient and organic loading can affect bird feeding habitats either positively by increasing food availability or negatively by altering species composition to less favourable prey species. Organic or nutrient loading can reduce the availability of food for birds by increasing growth of algal mats in the intertidal area. Algal blooms can reduce the surrounding water quality by causing the removal of oxygen as the bloom decomposes or occasionally by the release of toxins. Such deterioration in water quality can impact on marine communities and cause a reduction in food availability. Algal blooms also cause a reduction in water clarity, thereby reducing the visibility of prey items for Sandwich Tern.</p> <li data-bbox="571 874 2045 1241"> <p>• Toxic contamination / Introduction of synthetic and non-synthetic compounds Sandwich Terns and regularly occurring migratory species and the waterfowl assemblage are sensitive to the introduction of synthetic and non-synthetic compounds due to the accumulation of toxins through the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability of prey items caused by toxic contamination. The lethal effects of this contamination depend on the type and concentration of the toxic compound. Sub-lethal levels of exposure may affect bird's reproductive physiology, genetics and general health, which may ultimately reduce their fitness for survival. Industrial and domestic effluent discharges contain contaminants which build up in the food chain and may have toxic effects on Sandwich Terns and their prey; sandeels, spratt etc.</p> <li data-bbox="571 1284 2045 1348"> <p>• Biological disturbance / Introduction of microbial pathogens Microbial pathogens can enter the Duddon Estuary via sewage discharges as mentioned previously. The main sewage outfall points</p>

Duddon Estuary SPA	
	<p>can be found at Millom, Askam-in-Furness and Broughton-in-Furness. Microbial pathogens can enter the food chain of Sandwich Terns via the sandeels and sprat on which the birds feed in the shallow coastal waters of the Duddon Estuary.</p> <ul style="list-style-type: none"> • Selective extraction of species Sandwich Terns are sensitive to selective extraction of species. This can include selective extraction of species for which the site has been selected or which form important food sources for the qualifying birds, for example, over fishing and bait digging. • Non-physical disturbance / Noise and visual disturbance Waterfowl are highly sensitive to noise and visual disturbance by human activities when they are feeding or roosting. Examples of such disturbance include construction work, rambling, watersports and bait digging. They are particularly sensitive to disturbance in the winter months when cold temperatures and increased energy requirements are combined with short daylight hours available for feeding. Continued disturbance may force birds to change feeding and roosting sites which often results in increased energy use and reduced intake rates. If birds are continually disturbed from feeding or roosting sites, the resulting effect may be the long term loss of available habitat
<p>Predicted Impacts</p> <p><i>What are the issues arising from the plan and how might the site be affected?</i></p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Increased/ altered drainage from earthworks and excavation • Potential for toxic contamination from accidental leakage • Radioactive discharges (accidental and routine) • Alteration of flow from abstraction • Changes to water temperature from controlled discharge • Sedimentation and changes in organic and nutrient loading arising from construction during the construction and decommissioning phases

	Duddon Estuary SPA
	<p>Air Quality</p> <ul style="list-style-type: none"> • Local level impacts (reduced air quality arising from increased emissions from road/ transport/ generation sources) arising from construction decommissioning activities. • Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, sulphur dioxides, volatile organic compounds and accidental radioactive emissions. <p>Habitat Loss and Fragmentation</p> <ul style="list-style-type: none"> • Construction activities (during construction, operation and decommissioning) have the potential to result in direct and indirect loss and fragmentation of key supporting habitats both within and outside the SPA for example inter-tidal habitats. <p>Coastal Squeeze</p> <ul style="list-style-type: none"> • Any development encroaching on the coastal fringe may lead to habitats being 'squeezed' between an eroding seaward edge and fixed flood defence walls and lead to indirect loss of supporting habitats. <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> • Local level impacts relating primarily to construction and decommissioning activities.
<p>Potential In-combination effects (screening)</p> <p><i>What other plans and programmes could lead to in-</i></p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Operation and decommissioning of existing nuclear power stations at Sellafield and Heysham as well as conventional power stations (Roosecote Power Station). • Shoreline Management Plan • Barrow Port Area Action Plan

	Duddon Estuary SPA
<i>combinations effects?</i>	<ul style="list-style-type: none"> • Copeland Borough Adopted Local Plan • Shoreline Management Plan • Duddon Estuary and Morecambe Bay Regional Park Proposals • Gas Storage Facility, Gateway Storage Company Ltd • West of Duddon Sands and Walney Offshore Windfarms <p>Air Quality</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Shoreline Management Plan • Barrow Port Area Action Plan • Shoreline Management Plan • Lancashire Minerals and Waste Local Plan • Cumbria Local Transport Plan (LTP2) • Cumbria Minerals and Waste Development Framework • Gas Storage Facility, Gateway Storage Company Ltd • West of Duddon Sands and Walney Offshore Windfarms <p>Habitat Loss and Fragmentation / Coastal Squeeze</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Shoreline Management Plan • Barrow Port Area Action Plan • Gas Storage Facility, Gateway Storage Company Ltd • Duddon Estuary and Morecambe Bay Regional Park Proposals • West of Duddon Sands and Walney Offshore Windfarms <p>Disturbance (noise, light and visual)</p>

Duddon Estuary SPA	
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<p>Appropriate Assessment</p> <p>Likelihood of adverse effect on integrity:</p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Current Environment Agency data¹⁵ indicates that for the closest watercourse to the nominated site at Kirksanton (the manmade drainage channel known as Haverigg Pool) the ecological status is assessed as being ‘moderate’ with copper and zinc currently achieving ‘less than good’ status. No assessment of the chemical status of this watercourse had been made. By 2027 the EA predicts that the ecological status will increase to ‘good’. • Water quality measurements taken at the mouth of the River Duddon, close to the nominated site and within the SPA indicate that the ecological status here is also assessed as ‘moderate’, again with no information on chemical status available. Elements that are currently achieving ‘less than good’ status are: ammonia and dissolved oxygen. By 2027 the EA predicts that the ecological status will increase to ‘good’. • Current assessments for the coastal water quality, in front of the nominated site at Kirksanton and further out to sea than the SPA designation indicate that the ecological and chemical status of the environments here are ‘moderate’ and ‘good’ respectively, with the former predicted to improve to

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	Duddon Estuary SPA
	<p>'good' by 2027. The elements that are currently achieving 'less than good' ecological status here are macroalgae and dissolved inorganic nitrogen.</p> <ul style="list-style-type: none"> • Groundwater quantitative and chemical quality status around the nominated site are assessed by the EA¹ as being 'good' although the groundwater body (West Cumbria Permo-Triassic sandstone aquifers) has an upward trend in pollutant concentrations with risks noted for nitrate, phosphate and hazardous substances as well as artificial flow pressures including abstraction. • At present in the Duddon Estuary, the main source of contamination enters habitats within the SPA through diffuse agricultural sources and point source discharges from sewage treatment works most notably at the towns of Millom and Askham in Furness. Crude sewage also enters the estuary through discharges at Broughton in Furness and Barrow in Furness. As a result, it is therefore considered that habitats within the SPA are subject to a current medium level of exposure to nutrient and organic loading.¹⁶ • Exposure levels to synthetic and non-synthetic compounds within the estuary are also considered to be high. There are a number of industrial effluent disposal sites, namely a paper mill and ship building works at Barrow in Furness as well as other industry at Askham in Furness and Millom. Discharges from these sites are covered by EA consents. The past industrial history of the Duddon Estuary has left a legacy of industrial waste including slag heaps at Barrow, Askham and Millom. The extent, location, contents and stability of other past industrial waste sites is less well known for example waste disposal on North Walney¹⁰ • Radioactive discharges are subject to targets monitored by the EA and of the non-radioactive discharges, nitrate contributions are considered to be the most significant². In particular it is noted that there can be measurable localised impacts on sea nutrient levels in the vicinity of discharges. • Supporting habitats for the SPA's designated features are vulnerable to toxic and non-toxic contamination (Appendix 1, Site Characterisations) and whilst current water quality indicators show that generally ecological and chemical levels within coastal and freshwaters around Kirksanton to be generally 'moderate' or higher, there are some areas for concern, namely regarding nutrient loading

¹⁶ English Nature (2001) Duddon Estuary European Marine Site: English Nature's advice under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

	Duddon Estuary SPA
	<p>from sewage treatment works and past industrial sources of synthetic and non-synthetic compounds. Without further information on discharge levels and quality arising from the development that planned radioactive and non-radioactive discharges will have, it is not possible at this stage to determine they will not adversely impact upon the SPA.</p> <p>Air Quality</p> <ul style="list-style-type: none"> • The Environment Agency assesses that, non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared with other regulated industries and the Agency does not consider them to be an environmental priority. The Agency’s most recent available assessment of radioactive aerial emissions indicates that all fall within authorised limits². • Changes in air quality can impact upon supporting habitats within the SPA. Information provided by the UK Air Pollution Information System¹⁷ indicates that air quality within the area (centred on the nominated site and including the SPA, up to a resolution of 5km) is generally good with pollution levels for all key pollutants (sulphur dioxide, particulates, nitrogen dioxide etc.) typically low. However, sensitivities and critical loads have been identified for supporting habitats within the SPA and have revealed that for some pollutants, current deposition levels are close to or within exceedance level ranges. For saltmarsh, sand dunes and shingle habitats, current acid deposition levels when compared to critical loads for these habitats are in exceedance by 0.62kg eq/ha/yr. • Air quality issues around the nominated site are considered to potentially be most significant during construction and decommissioning phases (transport etc). The potential for cumulative effects from other plans and programmes also arises as a result of policies within the Barrow Area Action Plan which sets out policies for major redevelopment of Barrow including developments within and adjacent to the SPA. • In the context of: known air quality conditions and the N2K site characterisation data which indicates

	Duddon Estuary SPA
	<p>that the qualifying features are considered vulnerable or at risk for issues of air quality; together with the risk of 'in-combination' effects it is not possible to conclude that that significant effects on the SPA as a result of air quality impacts can be ruled out at this stage.</p> <p>Habitat Loss and Fragmentation/Coastal Squeeze</p> <ul style="list-style-type: none"> • The Shoreline Management Plan (Management Unit No. 8: Skeller Point to Haverigg) describes the coastal geomorphology and main pressures affecting the coastal habitats found immediately in front of the nominated site and which form part of the Duddon Estuary SPA. • The direction of material drift is considered to be variable being determined disproportionately by severe storms at high sea levels. Residual tidal currents indicate a net south easterly drift whilst an annual average wave condition is directed to the north east. The presence of Selker Rocks is believed to have a sheltering affect for northerly storms encouraging the northerly drive of sediment although its influence is not fully understood at present. The blown sand which makes up the coast from Kirkstanton Haws through to Haverigg originates from the Duddon estuary sand bars. • The coastline will continue to erode at a similar rate to that observed at present, estimated to be between 0.2 - 0.5/m year with a small area of accretion at Haverigg Point of around 0.3m/year. The erosion and consequent behaviour of the coast will change in approximately 100 years when the sand and gravel deposits are estimated to be exhausted and the more extensive boulder clay deposits that back them become exposed. The continued erosion of the outer Duddon sand bars would maintain the supply of material in the short term to the south length of the Unit between Haverigg and Kirkstanton Haws, but would eventually cause the coast to become more exposed and the coastline to start to recede. • The extent of loss / modification to marine and terrestrial habitats from the construction of cooling water culverts, sea defences and a marine off-loading facility is currently unknown, and its significance in the context of wider habitat changes cannot be assessed. It is possible that these changes may act cumulatively or accelerate changes anticipated in the longer term for this stretch of coastline in relation the primary designation features. At this strategic stage where detailed

Duddon Estuary SPA	
	<p>development plans are unknown and bird distribution information within the SPA is unknown, it is not possible to conclude that that there will not be adverse effects through habitat loss on the SPA.</p> <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> • No published studies on disturbance of qualifying bird interests within the SPA were found. Information on waterbird trends at this site and their regional (sub-national) and national contexts contained within Wetland Bird Survey (WeBS) Reports were consulted and revealed that of a total of 9 species evaluated, alerts had been triggered for six¹⁸. Knot and Pintail and high alerts triggered whilst Shelduck, Red-breasted Merganser, Dunlin and Sanderling had medium alerts triggered. Reasons given for the decline in these species were varied but in the main could be attributed to large scale factors rather than site specific issues although recent improvements in sewage treatment within the area could have contributed to the decline of some species including Red-breasted Merganser. • Without knowing the full extent and nature of the development proposals, it is not possible to determine how the nature or timing of the development may affect interest feature birds or indeed to conclude that there will be no significant effect as a result of disturbance effects.
Possible Avoidance and Mitigation Measures – includes recommendations for	<p>Water Resource and Quality</p> <ul style="list-style-type: none"> • Adverse impacts upon surface, ground and estuarine waters should be avoided through the implementation of appropriate safety measures and water quality monitoring. This is primarily the responsibility of the Water Companies (resource planning) and the Environment Agency (abstraction

¹⁸ The Wetland Bird Survey (WeBS) Alerts: Duddon Estuary (data evaluated inters 2004/5 inclusive)

Duddon Estuary SPA	
<i>policy/proposals</i>	<p>licensing and discharge regulation). However, the Draft Nuclear NPS can require that control and regulation measures relating to supply and discharge are in place prior to the implementation of the nominated site proposals.</p> <ul style="list-style-type: none"> • Primary data collection and subsequent laboratory analyses of samples for a full suite of parameters (including radioactive elements) should be undertaken to determine current exposure levels within the ecosystems <p>Air Quality</p> <ul style="list-style-type: none"> • The Draft Nuclear NPS should take into account the potential for air quality impacts to arise, particularly at a local level. The implementation of public transport infrastructure and/or non-road transport means, phasing of development, and the implementation of robust monitoring at sites to track changes in air quality over time should be implemented. In addition, the potential for cumulative impacts to arise from other plans and programmes implemented which overlap with the nuclear development in future (for example during the decommissioning phase of the development) should be considered. <p>Habitat Loss and Fragmentation/ Coastal Squeeze</p> <ul style="list-style-type: none"> • Where proposals for design and build remain under development, the Draft Nuclear NPS should seek to prioritise the avoidance of indirect habitat impacts and develop mitigation measures that protect the integrity of the designated site for example through amended designs for the sea defences (soft engineering) and marine off-loading facility (permeable to sediment movements) and use of directional drilling for the installation of cooling water pipes. • Habitat creation to replace habitats removed as a result of the development and to maintain connectivity of wildlife corridors around the development site should be undertaken as early as possible prior to the development works. • Any direct impacts that may not be mitigated for successfully should be addressed through appropriate compensation measures agreed with Statutory Bodies and implemented prior to the commencement of development proposals.

Duddon Estuary SPA	
	<ul style="list-style-type: none"> • Further studies are necessary to determine the significance of potential impacts associated with the proposed development upon the ecological integrity of the SPA with regard to habitat loss/fragmentation and coastal squeeze.
Conclude no adverse effect on integrity?	It is not possible at this stage of the development of the Draft Nuclear NPS to say that proposals at Kirksanton will not have significant adverse effects on Duddon Estuary SPA as a result of impacts to water quality, air quality and habitat loss and fragmentation and disturbance.

Morecambe Bay

Latitude: 540719N /025721W

Size (ha): 37404.6

Designation: SPA

	Morecambe Bay SPA
<p>Qualifying Features</p>	<p>Article 4.1 Qualification</p> <p>During the breeding season:</p> <ul style="list-style-type: none"> • Little Tern <i>Sterna albifrons</i>, 26 pairs representing at least 1.1% of the breeding population in Great Britain • Sandwich Tern <i>Sterna sandvicensis</i>, 290 pairs representing at least 2.1% of the breeding population in Great Britain <p>Over winter:</p> <ul style="list-style-type: none"> • Bar-tailed Godwit <i>Limosa lapponica</i>, 2,611 individuals representing at least 4.9% of the wintering population in Great Britain • Golden Plover <i>Pluvialis apricaria</i>, 4,097 individuals representing at least 1.6% of the wintering population in Great Britain <p>Article 4.2 Qualification by supporting populations of European importance of the following migratory species:</p> <p>During the breeding season;</p> <ul style="list-style-type: none"> • Herring Gull <i>Larus argentatus</i>, 11,000 pairs representing at least 1.2% of the breeding Northwestern Europe (breeding) and Iceland/Western Europe - breeding population • Lesser Black-backed Gull <i>Larus fuscus</i>, 22,000 pairs representing at least 17.7% of the breeding

	Morecambe Bay SPA
	<p>Western Europe/Mediterranean/Western Africa population</p> <p>On passage;</p> <ul style="list-style-type: none"> • Ringed Plover <i>Charadrius hiaticula</i>, 693 individuals representing at least 1.4% of the Europe/Northern Africa - wintering population • Sanderling <i>Calidris alba</i>, 2,466 individuals representing at least 2.5% of the Eastern Atlantic/Western and Southern Africa - wintering population <p>Over winter;</p> <p>Curlew <i>Numenius arquata</i>, 13,620 individuals representing at least 3.9% of the wintering Europe - breeding population</p> <ul style="list-style-type: none"> • Dunlin <i>Calidris alpina alpina</i>, 52,671 individuals representing at least 3.8% of the wintering Northern Siberia/Europe/Western Africa population • Grey Plover <i>Pluvialis squatarola</i>, 1,813 individuals representing at least 1.2% of the wintering Eastern Atlantic - wintering population • Knot <i>Calidris canuta</i>, 29,426 individuals representing at least 8.4% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96) • Oystercatcher <i>Haematopus ostralegus</i>, 47,572 individuals representing at least 5.3% of the wintering Europe and Northern/Western Africa population • Pink-footed Goose <i>Anser brachyrhynchus</i>, 2,475 individuals representing at least 1.1% of the wintering Eastern Greenland/Iceland/UK population • Pintail <i>Anas acuta</i>, 2,804 individuals representing at least 4.7% of the wintering Northwestern Europe population • Redshank <i>Tringa totanus</i>, 6,336 individuals representing at least 4.2% of the wintering Eastern Atlantic - wintering population • Shelduck <i>Tadorna tadorna</i>, 6,372 individuals representing at least 2.1% of the wintering Northwestern Europe population

	Morecambe Bay SPA
	<ul style="list-style-type: none"> • Turnstone <i>Arenaria interpres</i>, 1,583 individuals representing at least 2.3% of the wintering Western Palearctic - wintering population <p>Assemblage qualification: A seabird assemblage of international importance</p> <p>The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds</p> <p>During the breeding season, the area regularly supports 61,858 individual seabirds including: Herring Gull <i>Larus argentatus</i>, Lesser Black-backed Gull <i>Larus fuscus</i>, Little Tern <i>Sterna albifrons</i>, Sandwich Tern <i>Sterna sandvicensis</i>.</p> <p>Assemblage qualification: A wetland of international importance.</p> <p>The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl</p> <p>Over winter, the area regularly supports 210,668 individual waterfowl including: Great Crested Grebe <i>Podiceps cristatus</i>, Bar-tailed Godwit <i>Limosa lapponica</i>, Pink-footed Goose <i>Anser brachyrhynchus</i>, Shelduck <i>Tadorna tadorna</i>, Pintail <i>Anas acuta</i>, Oystercatcher <i>Haematopus ostralegus</i>, Grey Plover <i>Pluvialis squatarola</i>, Knot <i>Calidris canutus</i>, Dunlin <i>Calidris alpina alpina</i>, Curlew <i>Numenius arquata</i>, Golden Plover <i>Pluvialis apricaria</i>, Turnstone <i>Arenaria interpres</i>, Black-tailed Godwit <i>Limosa limosa islandica</i>, Cormorant <i>Phalacrocorax carbo</i>, Wigeon <i>Anas penelope</i>, Teal <i>Anas crecca</i>, Mallard <i>Anas platyrhynchos</i>, Eider <i>Somateria mollissima</i>, Goldeneye <i>Bucephala clangula</i>, Red-breasted Merganser <i>Mergus serrator</i>, Ringed Plover <i>Charadrius hiaticula</i>, Lapwing <i>Vanellus vanellus</i>, Sanderling <i>Calidris alba</i>, Redshank <i>Tringa totanus</i>, Whimbrel <i>Numenius phaeopus</i>.</p>

Morecambe Bay SPA	
Conservation Objectives	<p>Subject to natural change, to maintain in favourable condition the habitats of the internationally important populations of regularly occurring bird species listed on Annex 1 of the Birds Directive, in particular:</p> <ul style="list-style-type: none"> • Shingle areas <p>Subject to natural change, to maintain in favourable condition the habitats of the internationally important assemblage of waterfowl and seabirds and the internationally important populations of regularly occurring migratory species, in particular:</p> <ul style="list-style-type: none"> • Intertidal mudflat and sandflat communities • Intertidal and subtidal boulder and cobble skew communities • Saltmarsh communities • Coastal lagoon communities
Key Environmental Conditions (factors that maintain site integrity)	<ul style="list-style-type: none"> • Avoidance of pollution • Management of saltmarsh grazing • Control of bait digging, shell fisheries and dredging • Maintenance of prey availability for example control of shell-fishing • Maintenance of uninterrupted views • Open ground with short vegetation cover for feeding and roosting birds • Maintain hydrology of wet grassland (for waders) • Limited disturbance to birds (land and waterbased) • No physical constraints to natural migration of mobile habitats • Maintenance of natural sedimentation patterns • Control of non-native species
Vulnerabilities (includes existing)	<p>The SPA is subject to a wide range of pressures such as land-claim for agriculture, overgrazing, dredging, overfishing, industrial uses and unspecified pollution. However, overall the site is relatively</p>

Morecambe Bay SPA	
<p>pressures and trends)</p> <p><i>Details at Appendix 1</i></p> <p>Predicted Impacts</p> <p><i>What are the issues arising from the plan and how might the site be affected?</i></p>	<p>robust and many of those pressures have only slight to local effects and are being addressed through Management Plans. The breeding tern interest is very vulnerable and the colony has recently moved to the adjacent Duddon Estuary.</p> <p>Water Resources and Quality</p> <ul style="list-style-type: none"> • Increased/ altered drainage from earthworks and excavation • Potential for toxic contamination from accidental leakage • Radioactive discharges (accidental and routine) • Alteration of flow from abstraction • Changes to water temperature from controlled discharge • Sedimentation and changes in organic and nutrient loading arising from construction during the construction and decommissioning phases <p>Air Quality</p> <ul style="list-style-type: none"> • Local level impacts (reduced air quality arising from increased emissions from road/ transport/ generation sources) arising from construction decommissioning activities. • Potential impacts from planned aerial release of argon-41, krypton-85 and tritium, carbon dioxide, sulphur dioxide, nitrogen oxide, sulphur dioxides, volatile organic compounds and accidental radioactive emissions. <p>Habitat Loss and Fragmentation</p> <ul style="list-style-type: none"> • Construction activities (during construction, operation and decommissioning) have the potential to result in indirect loss and fragmentation of SPA supporting habitats for example inter-tidal habitats within <p>Coastal Squeeze</p> <ul style="list-style-type: none"> • Any development encroaching on the coastal fringe may lead to habitats being 'squeezed' between an eroding seaward edge and fixed flood defence walls and lead to indirect loss of supporting

Morecambe Bay SPA	
	<p>habitats.</p> <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> Local level impacts relating primarily to construction and decommissioning activities.
<p>Potential In-combination effects (screening)</p> <p><i>What other plans and programmes could lead to in-combinations effects?</i></p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> Nominations for nuclear power stations at Braystones, Sellafield and Heysham Operation and decommissioning of existing nuclear power stations at Sellafield and Heysham as well as conventional power stations (Roosecote Power Station). Shoreline Management Plan Barrow Port Area Action Plan Copeland Borough Adopted Local Plan Shoreline Management Plan Duddon Estuary and Morecambe Bay Regional Park Proposals Gas Storage Facility, Gateway Storage Company Ltd West of Duddon Sands and Walney Offshore Windfarms <p>Air Quality</p> <ul style="list-style-type: none"> Nominations for nuclear power stations at Braystones, Sellafield and Heysham Shoreline Management Plan Barrow Port Area Action Plan Shoreline Management Plan Lancashire Minerals and Waste Local Plan Cumbria Local Transport Plan (LTP2) Cumbria Minerals and Waste Development Framework Gas Storage Facility, Gateway Storage Company Ltd West of Duddon Sands and Walney Offshore Windfarms

Morecambe Bay SPA	
	<p>Habitat Loss and Fragmentation / Coastal Squeeze</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Shoreline Management Plan • Barrow Port Area Action Plan • Gas Storage Facility, Gateway Storage Company Ltd • Duddon Estuary and Morecambe Bay Regional Park Proposals • West of Duddon Sands and Walney Offshore Windfarms <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> • Nominations for nuclear power stations at Braystones, Sellafield and Heysham • Duddon Estuary and Morecambe Bay Regional Park Proposals • Barrow Port Area Action Plan • Cumbria Local Transport Plan (LTP2) • Gas Storage Facility, Gateway Storage Company Ltd • West of Duddon Sands and Walney Offshore Windfarms
<p>Appropriate Assessment</p> <p>Likelihood of adverse effect on integrity:</p>	<p>Water Resources and Quality</p> <ul style="list-style-type: none"> • No direct impacts on the SPA as a result of the predicted localised effects on water resources and quality are anticipated given that the nominated site lies over 10km to the north east from the closest point of the SPA. Instead the following assessment deals only with indirect effects on qualifying interests which may utilise habitats outside of Morecambe Bay SPA which fall within Duddon Estuary SPA and surrounding land and hence may be subject to the effects of water quality impacts arising as a result of the proposed development. Interchange between the two designated sites has been assumed due to the fact that the following supporting habitats are present within both designated sites: intertidal mudflat and sandflat communities, intertidal and subtidal boulder and cobble skear communities and saltmarsh communities. Movement of qualifying birds between Morecambe Bay

	Morecambe Bay SPA
	<p>SPA and adjacent Duddon Estuary is also noted within the Morecambe Bay SPA component South Walney and Peil Channel Flats SSSI citation which notes that until recently, Foulney Island regularly supported a large population of breeding Sandwich Tern as well as occasionally little tern and a small population of common tern but these birds have subsequently moved into and bred within Duddon Estuary.</p> <ul style="list-style-type: none"> • Current Environment Agency data¹⁹ indicates that for the closest watercourse to the nominated site at Kirksanton (the manmade drainage channel known as Haverigg Pool) the ecological status is assessed as being 'moderate' with copper and zinc currently achieving 'less than good' status. No assessment of the chemical status of this watercourse had been made. By 2027 the EA predicts that the ecological status will increase to 'good'. • Current assessments for the coastal water quality, in front of the nominated site at Kirksanton indicate that the ecological and chemical status of the environments here are 'moderate' and 'good' respectively, with the former predicted to improve to 'good' by 2027. The elements that are currently achieving 'less than good' ecological status here are macroalgae and dissolved inorganic nitrogen. • Groundwater quantitative and chemical quality status around the nominated site are assessed by the EA¹ as being 'good' although the groundwater body (West Cumbria Permo-Triassic sandstone aquifers) has an upward trend in pollutant concentrations with risks noted for nitrate, phosphate and hazardous substances as well as artificial flow pressures including abstraction. • At present in the Duddon Estuary, the main source of contamination enters habitats through diffuse agricultural sources and point source discharges from sewage treatment works most notably at the towns of Millom and Askham-in-Furness. Crude sewage also enters the estuary through discharges at Broughton- in-Furness and Barrow-in-Furness. As a result, it is therefore considered that the habitats

¹⁹ Environment Agency River Basin Management Plans: Draft North West River Basin District, 2008. The data used in this assessment is taken from the Draft River Basin Management Plan, which was the most up to date plan available at the time. Draft plans were presented to the Government for approval in September 2009, with final plans published in December 2009
 UKTG – Water Framework Directive Website: <http://www.wfduk.org/>

	Morecambe Bay SPA
	<p>which fall within Duddon Estuary are subject to a current medium level of exposure to nutrient and organic loading.²⁰</p> <ul style="list-style-type: none"> • Exposure levels to synthetic and non-synthetic compounds within the estuary are also considered to be high. There are a number of industrial effluent disposal sites, namely a paper mill and ship building works at Barrow-in-Furness as well as other industry at Askham-in-Furness and Millom. Discharges from these sites are covered by EA consents. The past industrial history of the Duddon Estuary has left a legacy of industrial waste including slag heaps at Barrow, Askham and Millom. The extent, location, contents and stability of other past industrial waste sites is less well known for example waste disposal on North Walney¹⁰ • Radioactive discharges are subject to targets monitored by the EA and of the non-radioactive discharges, nitrate contributions are considered to be the most significant². In particular it is noted that there can be measurable localised impacts on sea nutrient levels in the vicinity of discharges. • The supporting habitats upon which qualifying interests of the Morecambe Bay SPA depend are vulnerable to toxic and non-toxic contamination (Appendix 1, Site Characterisations) and whilst current water quality indicators show that generally ecological and chemical levels within coastal and freshwaters around Kirksanton to be generally 'moderate' or higher, there are some areas for concern, namely regarding nutrient loading from sewage treatment works and past industrial sources of synthetic and non-synthetic compounds. Without further information on discharge levels and quality arising from the development that planned radioactive and non-radioactive discharges will have, together with additional information regarding movement of birds from Morecambe Bay SPA into Duddon Estuary SPA it is not possible at this stage to determine they will not adversely impact upon the SPA. <p>Air Quality</p> <ul style="list-style-type: none"> • No direct impacts on the SPA as a result of the predicted localised effects on air quality are anticipated given that the nominated site lies over 10km to the north east from the closest point of

²⁰ English Nature (2001) Duddon Estuary European Marine Site: English Nature's advice under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

	Morecambe Bay SPA
	<p>the SPA. Instead the following assessment deals only with indirect effects on qualifying interests which may utilise habitats outside of Morecambe Bay SPA which fall within Duddon Estuary SPA and surrounding land and hence may be subject to the effects of air quality impacts arising as a result of the proposed development. Interchange between the two designated sites has been assumed due to the fact that the following supporting habitats are present within both designated sites: intertidal mudflat and sandflat communities, intertidal and subtidal boulder and cobble skear communities and saltmarsh communities. Movement of qualifying birds between Morecambe Bay SPA and adjacent Duddon Estuary is also noted within the Morecambe Bay SPA component South Walney and Peil Channel Flats SSSI citation which notes that until recently, Foulney Island regularly supported a large population of breeding Sandwich Tern as well as occasionally little tern and a small population of common tern but these birds have subsequently moved into and bred within Duddon Estuary.</p> <ul style="list-style-type: none"> • The Environment Agency assesses that, non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared with other regulated industries and the Agency does not consider them to be an environmental priority. The Agency's most recent available assessment of radioactive aerial emissions indicates that all fall within authorised limits². • Changes in air quality can impact upon sensitive supporting habitats including saltmarsh and shingle communities which are of particular relevance to many of the qualifying interests of Morecambe Bay SPA. Information provided by the UK Air Pollution Information System²¹ indicates that air quality within the area (centred on the nominated site, up to a resolution of 5km) is generally good with pollution levels for all key pollutants (sulphur dioxide, particulates, nitrogen dioxide etc.) typically low. However, sensitivities and critical loads have been identified and have revealed that for some pollutants, current deposition levels are close to or within exceedance level ranges. For saltmarsh, sand dunes and shingle habitats, current acid deposition levels when compared to critical loads for

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	Morecambe Bay SPA
	<p>these habitats are in exceedance by 0.62kg eq/ha/yr.</p> <ul style="list-style-type: none"> • Air quality data provided by the UK Air pollution Information System²² from within Morecambe Bay SPA itself (close to Heysham) reveal that here nitrogen deposition for dune systems and perennial vegetation of stony banks are at, or are in exceedance of critical loads. • Air quality issues around the nominated site are considered to potentially be most significant during construction and decommissioning phases (transport etc). The potential for cumulative effects from other plans and programmes also arises as a result of policies within the Barrow Area Action Plan which sets out policies for major redevelopment of Barrow including developments within and adjacent to the SPA. As such, likely significant effects as a result of air quality impacts cannot be ruled out at this stage. <p>Habitat Loss and Fragmentation/Coastal Squeeze</p> <ul style="list-style-type: none"> • No direct impacts on the SPA as a result of habitat loss / fragmentation and coastal squeeze are anticipated given that the nominated site lies over 10km to the north east from the closest point of the SPA. Instead the following assessment deals only with indirect effects on qualifying interests which may utilise habitats outside of Morecambe Bay SPA which fall within Duddon Estuary SPA and surrounding land and hence may be subject to the effects of habitat loss / fragmentation and coastal squeeze impacts arising as a result of the proposed development. Interchange between the two designated sites has been assumed due to the fact that the following supporting habitats are present within both designated sites: intertidal mudflat and sandflat communities, intertidal and subtidal boulder and cobble skewer communities and saltmarsh communities. Movement of qualifying birds between Morecambe Bay SPA and adjacent Duddon Estuary is also noted within the Morecambe Bay SPA component South Walney and Peil Channel Flats SSSI citation which notes that until recently, Foulney Island regularly supported a large population of breeding Sandwich Tern as well as occasionally little tern and a small population of common tern but these birds have subsequently moved into and bred within Duddon Estuary.

²² <http://www.apis.ac.uk/>

	Morecambe Bay SPA
	<ul style="list-style-type: none"> • The Shoreline Management Plan (Management Unit No. 8: Skeller Point to Haverigg) describes the coastal geomorphology and main pressures affecting the coastal habitats found immediately in front of the nominated site and which form part of the qualifying interest for Morecambe Bay SAC. • The blown sand which makes up the coast from Kirkstanton Haws through to Haverigg originates from the Duddon estuary sand bars. • The coastline will continue to erode at a similar rate to that observed at present, estimated to be between 0.2 - 0.5/m year with a small area of accretion at Haverigg Point of around 0.3m/year. The erosion and consequent behaviour of the coast will change in approximately 100 years when the sand and gravel deposits are estimated to be exhausted and the more extensive boulder clay deposits that back them become exposed. The continued erosion of the outer Duddon sand bars would maintain the supply of material in the short term to the south length of the Unit between Haverigg and Kirkstanton Haws, but would eventually cause the coast to become more exposed and the coastline to start to recede. • The extent of loss / modification to marine and terrestrial habitats from the construction of cooling water culverts, sea defences and a marine off-loading facility is currently unknown, and its significance in the context of wider habitat changes cannot be assessed. It is possible that these changes may act cumulatively or accelerate changes anticipated in the longer term for this stretch of coastline in relation the primary designation features. At this strategic stage where detailed development plans are unknown, it is not possible to conclude that there will not be indirect significant effects on the qualifying interests of the SPA through loss and fragmentation of off-site supporting habitats. <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> • No published studies on disturbance of qualifying bird interests within the SPA were found. However

Morecambe Bay SPA	
	<p>published studies on disturbance impacts more generally highlight vulnerabilities for qualifying interests of the SPA, including for species such as Little Tern²³ although most studies relate to recreational disturbance and highlight the significance of disturbance from dog walkers and close proximity to humans.</p> <ul style="list-style-type: none"> Information on waterbird trends at this site and their regional (sub-national) and national contexts contained within Wetland Bird Survey (WeBS) Reports were consulted and revealed that of a total of 23 species evaluated, alerts have been triggered for 12 species²⁴. The following six species were listed as being on ‘high alert’ for this site: Pintail, Eider, Ringed Plover, Grey Plover, Bar-tailed Godwit and Turnstone. The remaining species were all considered to be on ‘medium alert’: Shelduck, Mallard, Eider, Goldeneye, Red-breasted Merganser, Ringed Plover, Grey Plover, Dunlin, Bar-tailed Godwit, Curlew, Turnstone. Reasons given for the decline in these species were varied but in the main could be attributed to large scale factors rather than site specific issues. However, for certain species, site-level effects were cited as possibly contributing factors including cockling and bait-digging. Without knowing the full extent and nature of the development proposals, it is not possible to determine how the nature or timing of the development may affect interest feature birds or indeed to conclude that there will be no significant effect as a result of disturbance effects
<p>Possible Avoidance and Mitigation Measures – <i>includes recommendations for policy/proposals</i></p>	<p>Water Resource and Quality</p> <ul style="list-style-type: none"> Adverse impacts upon surface, ground and estuarine waters should be avoided through the implementation of appropriate safety measures and water quality monitoring. This is primarily the responsibility of the Water Companies (resource planning) and the Environment Agency (abstraction licensing and discharge regulation). However, the Draft Nuclear NPS can require that control and regulation measures relating to supply and discharge are in place prior to the implementation of the nominated site proposals.

²³ Little Terns at Great Yarmouth: Disturbance to birds and implications for strategic planning, Footprint Ecology,

²⁴ The Wetland Bird Survey WeBS Alerts: Morecambe Bay (data evaluated – winters 2004/5 inclusive)

	Morecambe Bay SPA
	<ul style="list-style-type: none"> • Primary data collection and subsequent laboratory analyses of samples for a full suite of parameters (including radioactive elements) should be undertaken to determine current exposure levels within the ecosystems <p>Air Quality</p> <ul style="list-style-type: none"> • The Draft Nuclear NPS should take into account the potential for air quality impacts to arise, particularly at a local level. The implementation of public transport infrastructure and/or non-road transport means, phasing of development, and the implementation of robust monitoring at sites to track changes in air quality over time should be implemented. In addition, the potential for cumulative impacts to arise from other plans and programmes implemented which overlap with the nuclear development in future (for example, during the decommissioning phase of the development) should be considered. <p>Habitat Loss and Fragmentation/ Coastal Squeeze</p> <ul style="list-style-type: none"> • Where proposals for design and build remain under development, the Draft Nuclear NPS should seek to prioritise the prevention of any direct adverse impacts upon sensitive habitats which could lead to their loss or fragmentation. Preventative measures implemented should allow for the avoidance of key habitats during construction works, and ensure that adequate measures are implemented within construction environmental management plans to minimise direct and indirect impacts upon habitats of factors such as pollution. The interest features on the designated sites should guide the identification of potential mitigation and compensation measures. • Habitat creation to replace habitats removed as a result of the development and to maintain connectivity of wildlife corridors around the development site should be undertaken as early as possible prior to the development works. • Any direct impacts that may not be mitigated for successfully should be addressed through appropriate compensation measures agreed with Statutory Bodies and implemented prior to the commencement of development proposals. • Avoidance of impacts through the safe operation and decommissioning of the development and of

Morecambe Bay SPA	
	<p>interim waste storage management should be sought.</p> <ul style="list-style-type: none"> • Further studies are necessary to determine the significance of the potential impacts associated with the proposed development upon the ecological integrity of the SPA with regard to habitat loss/fragmentation and coastal squeeze and this should include studies to understand the movement of bird populations between Morecambe Bay SPA and Duddon Estuary. <p>Disturbance (noise, light and visual)</p> <ul style="list-style-type: none"> • Noise, light and visual impacts may be managed at a site level through phasing and timing that takes account of breeding and feeding cycles and should be supported by information on flight lines and migration routes as well as feeding and roosting areas. These measures would be included within a construction environmental management plan, which would help to minimise disturbance. The precise detail and the nature of the measures required would need to be agreed with the Statutory Body prior to the commencement of development but could include for example the use of visual screens. These measures would form part of the wider site management plan that developers would be required to agree and implement prior to commencement.
Conclude no adverse effect on integrity?	<p>It is not possible at this stage of the development of the draft Draft Nuclear NPS to say that proposals at Kirksanton will not have significant adverse effects on Morecambe Bay SPA as a result of impacts to water quality, air quality, disturbance and habitat loss and fragmentation, including coastal squeeze.</p>

Duddon Estuary

- **Latitude:** 02 57 21 W/54 07 19 N
- **Size (ha):** 37404.6
- **Designation:** Ramsar

	Duddon Estuary Ramsar
<p>Qualifying Features</p>	<p>Ramsar criterion 2:</p> <ul style="list-style-type: none"> • Supports nationally important numbers of the rare Natterjack Toad (<i>Bufo calamita</i>), near the north western edge of its range (an estimated 18-24% of the British population). Supports a rich assemblage of wetland plants and invertebrates – at least one nationally scarce plant and at least two British Red Data Book invertebrates. <p>Ramsar criterion 4:</p> <ul style="list-style-type: none"> • The site supports nationally important numbers of waterfowl during spring and autumn passage. <p>Ramsar criterion 5:</p> <ul style="list-style-type: none"> • Assemblages of international importance: • Species with peak counts in winter: 26326 waterfowl (5 year peak mean 1998/99-2002/2003) <p>Ramsar Criterion 6 – species/populations occurring at levels of international importance:</p> <ul style="list-style-type: none"> • Qualifying species /populations (as identified at designation): <p>Species with peak counts in winter</p> <ul style="list-style-type: none"> • Northern Pintail <i>Anas acuta</i> (687 individuals representing an average of 1.1% of the population (5

Duddon Estuary Ramsar	
	<p>year peak mean 1998/9 – 2002/3))</p> <ul style="list-style-type: none"> • Red Knot <i>Calidris canutus islandica</i> (749 individuals representing an average of 0.2% of the GB population (5 year peak mean 1998/9 – 2002/3)) • Common Redshank (wintering) <i>Tringa totanus totanus</i> (2197 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9 – 2002/3))
Conservation Objectives	See Duddon Estuary SPA.
Key Environmental Conditions (factors that maintain site integrity)	See Duddon Estuary SPA
Vulnerabilities (includes existing pressures and trends)	See Duddon Estuary SPA
<i>Details at Appendix 1</i>	
Predicted Impacts	See Duddon Estuary SPA
<i>What are the issues arising from the plan and how might the site be affected?</i>	
Potential In-	

Duddon Estuary Ramsar	
<p>combination effects (screening)</p> <p><i>What other plans and programmes could lead to in-combinations effects?</i></p>	<p>See Duddon Estuary SPA</p>
<p>Appropriate Assessment</p> <p>Likelihood of adverse effect on integrity:</p>	<p>See Duddon Estuary SPA. In addition, information on Natterjack Toads in relation to potential impacts associated with habitat (and species) loss is provided separately below:</p> <p>Habitat Loss and Fragmentation/Coastal Squeeze</p> <ul style="list-style-type: none"> The Natterjack Toad is a nationally rare species in Britain and over 95% of the population is associated with 5 estuaries, the Alt, Ribble, Duddon, Esk and Solway. The UK range conclusion is reported as being ‘unfavourable – inadequate’, but improving to reflect post-2001 trends (attributed to conservation action). However, if intensive conservation efforts were to be withdrawn, species specialists are not confident that the range would be sufficiently comprehensive to support viable populations in the long-term.²⁵ The Duddon Estuary itself is therefore one of the most important areas in Britain for this species and contains between 18-25% of the U.K. population, which in turn is equivalent to 50% of the Cumbrian Natterjack Toad population. Particular concentrations occur at Millom Ironworks, Sandscale Haws and the stretch of coast between Sandside and Dunnerholme, but the species is evenly distributed over the whole estuary²⁶.

²⁵ Joint Nature Conservation Committee. 2007. Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006. Peterborough: JNCC.

²⁶ Duddon Estuary SSSI citation

Duddon Estuary Ramsar	
	<ul style="list-style-type: none"> The Duddon Estuary population is considered stable, based on the last reporting round for Cumbria Biodiversity Action Plan²⁷
Possible Avoidance and Mitigation Measures – includes recommendations for policy/proposals	See Duddon Estuary SPA
Conclude no adverse effect on integrity?	It is not possible at this stage of the development of the Draft Nuclear NPS to say that proposals at Kirksanton will not have significant adverse effects on Duddon Estuary Ramsar as a result of impacts to water quality, air quality, disturbance as well as habitat loss and fragmentation, including coastal squeeze.

²⁷ <http://www.ukbap-reporting.org.uk/>

Morecambe Bay

Latitude: 540719N/025721W

Size (ha): 37404.6

Designation: Ramsar

	Morecambe Bay Ramsar
<p>Qualifying Features</p>	<p>Ramsar criterion 4</p> <ul style="list-style-type: none"> • The site is a staging area for migratory waterfowl including internationally important numbers of passage Ringed Plover <i>Charadrius hiaticula</i>. <p>Ramsar criterion 5</p> <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> • Waterfowl <p>Ramsar criterion 6</p> <p>Species regularly supported during the breeding season:</p> <ul style="list-style-type: none"> • Lesser Black-backed Gull • Herring Gull • Sandwich Tern <p>Species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> • Great Cormorant • Common Shelduck • Northern Pintail • Common Eider • Eurasian Oystercatcher • Ringed Plover • Grey Plover

Morecambe Bay Ramsar	
	<ul style="list-style-type: none"> • Sanderling • Eurasian Curlew • Common Redshank • Ruddy Turnstone • Lesser Black-backed Gull <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> • Great Crested Grebe • Pink-footed Goose • Eurasian Wigeon • Common Goldeneye • Red-breasted Merganser • European Golden Plover • Northern Lapwing • Red Knot • Dunlin • Bar-tailed Godwit
Conservation Objectives	See Morecambe Bay SPA.
Key Environmental Conditions (factors that maintain site integrity)	See Morecambe Bay SPA
Vulnerabilities (includes existing pressures and trends)	See Morecambe Bay SPA

	Morecambe Bay Ramsar
<i>Details at Appendix 1</i>	
Predicted Impacts <i>What are the issues arising from the plan and how might the site be affected?</i>	See Morecambe Bay SPA
Potential In-combination effects (screening) <i>What other plans and programmes could lead to in-combinations effects?</i>	See Morecambe Bay SPA
Appropriate Assessment Likelihood of adverse effect on integrity:	See Morecambe Bay SPA
Possible Avoidance and Mitigation Measures – includes recommendations for policy/proposals	See Morecambe Bay SPA
Conclude no adverse	It is not possible at this stage of the development of the Draft Nuclear NPS to say that proposals at

	Morecambe Bay Ramsar
effect on integrity?	Kirksanton will not have significant adverse effects on Morecambe Bay Ramsar as a result of impacts to water quality, air quality, disturbance as well as habitat loss and fragmentation, including coastal squeeze.

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