19. Ornithology

19.1 Introduction

19.1.1 This chapter presents a preliminary assessment of the likely significant effects on ornithological interests within the study area associated with the Moorside Project.

19.1.2 Of particular relevance to this chapter is the assessment of effects on terrestrial and marine habitats and marine and coastal physical processes that may affect birds, with particular regard to habitat and food resource, which are described in preceding chapters of the PEIR, notably:

- Noise and Vibration (**Chapter 5**);
- Marine Water and Sediment Quality (**Chapter 16**);
- Marine Ecology (**Chapter 17**); and
- Freshwater and Terrestrial Ecology (**Chapter 18**).

19.2 Limitations of the PEIR

General

19.2.1 The scale and complexity of the Moorside Project means that it is continuing to evolve at this preliminary stage, which presents limitations in terms of programme and phasing. In addition, work has yet to be undertaken, or fully completed, for certain survey elements. These limitations have meant that this PEIR chapter has focussed on the Moorside Site and the Accommodation Sites with regard to baseline description and assessment as there is greater information available to use in the preliminary assessment. As such the following sites are not considered in the PEIR assessment, but will be included in the ES for DCO submission:

- Corkickle to Mirehouse Railway Site; and
- St. Bees Railway Site.

19.2.2 The next steps of the assessment will take place as further detail on the design and construction of the proposed Moorside Project emerges. In addition, further survey work is on-going and the initial assessment provided within this chapter will also be updated to take account of the results of this additional work (a summary of this on-going work is provided in **Section 19.4**).

19.2.3 All sites for the Highway Improvements have been scoped out of the ornithological assessment due to the current land use/ habitats on these and the limited magnitude of potential impacts associated with any development activity on them.

19.2.4 Decommissioning has not been specifically assessed within the PEIR, as it remains uncertain at this point which elements would be decommissioned and when. Each of the Accommodation Sites and Additional Sites (including the Railway Sites) may see some element of decommissioning activity undertaken once the construction phase of the Moorside Site itself is complete (demolition or removal of certain features) and the effects of these operations are expected to be no greater than those in the construction phase assessments for these sites. The decommissioning phase of each Moorside Project Site will be assessed in the ES. As discussed at **Chapter 2, Project Description**, decommissioning of the Moorside Power Station itself will also be included within the ES, but at a high level given that these activities will take place around 60 years after operations commence, and they will be covered by a discrete EIA of the activities at that time.

Technical

19.2.5 The marine infrastructure, comprising the MOLF and the CWS, will be located within the red line boundary shown on **Figure 17.1**. This preliminary assessment has therefore been based on this envelope.

19.2.6 The Biodiversity Management Strategy (BMS), which encompasses the Mitigation Plan (MP), Habitat Enhancement Plan (HEP) and Habitat Management Plan (HMP), and elements of the Construction Environmental Management Plan (CEMP), are still being developed and will continue to do so as the Moorside Project evolves (see **Section 19.6**). Principles for the BMS are included in this PEIR at **Chapter 18, Terrestrial Freshwater Ecology, Appendix 18.A**. An outline CEMP is included at **Appendix 2A**.

19.2.7 The assessment for the Moorside Site and Accommodation Sites contained within this chapter is made prior to the completion of all survey work (see paragraph 19.4.6 for details of survey work still to be completed) and in the absence of quantitative supporting analysis; this work is being progressed over the course of 2016.

19.2.8 Therefore the assessment presented herein relies on expert judgment of the potential effects on each receptor from the Moorside Site and Accommodations sites only, and will be revised following more detailed analysis and refinements in engineering design. The final assessment for all sites will be presented within the Environmental Statement to be submitted as part of the application for a DCO for the Moorside Project in 2017.

19.3 Policy and legislative context

19.3.1 The following policy and legislation are relevant to the assessment of the likely significant effects on ornithological interests within the study area associated with the Moorside Project.

National Policy

19.3.2 Matters that are highlighted in National Policy Statements as being of specific relevance to defining the scope of the assessment on biodiversity (including ornithology) are listed below. The following policy will therefore be used to define the assessment:

- Section 5.3 of NPS EN-1 sets out how a biodiversity assessment should be carried out (Reference 6. DECC). It sets out the generic biodiversity impacts of energy NSIPS, which also apply to new nuclear development projects. It reflects the policies set out in the NPPF (see below) and says that the applicant should:
  - "*clearly set out any effects on internationally, nationally and locally designated sites of ecological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity*" (at 5.3.3);
  - *"show how the project has taken account of opportunities to conserve and enhance biodiversity"* (at 5.3.4); and
  - "as a general principle, and subject to the specific policies set out…*aim to avoid significant harm to biodiversity conservation interests, including through mitigation and consideration of reasonable alternatives, and where significant harm cannot be avoided, then appropriate compensation measures should be sought"* (at 5.3.7).
- In relation to designated sites, EN-1 states the following:
  - *"appropriate weight should be attached to designated sites of international, national and local importance, protected species, habitats and other species of principle importance for the conservation of biodiversity and to biodiversity within the wider environment"* (at 5.3.8);
  - *"the most important sites are those identified through international conventions and European directives. The Habitats Regulations provides statutory protection for these sites but do not provide statutory protection for potential Special Protection Areas (pSPA) before they are classified as Special Protection Areas. For the purposes of considering development proposals affecting them, as a matter of policy the Government wishes pSPAs to be considered in the same way as if they had already been classified. Listed Ramsar sites should, also as a matter of policy, receive the same protection"* (at 5.3.9); and
  - those SSSIs (or those features of SSSIs) which are not covered by an international designation should be given a high degree of protection. Development consent should not normally be granted where the proposed development on land within or outside of a SSSI is likely to have an adverse effect on a SSSI (either individually or in combination with other developments). Where an adverse effect, after mitigation, on the SSSI's notified special interest features is likely, an exception should only be made where the benefits (including need) of

development at this SSSI clearly outweigh both the impacts on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs (at 5.3.10).

- In relation to regional and local sites, EN-1 says the following:
  - Sites of regional and local biodiversity, which include local nature reserves and locally designated sites should be given due consideration but should not be used in themselves to refuse development consent (at 5.3.13).
- In relation to biodiversity within developments, EN-1 says the following:
  - Opportunities for building beneficial biodiversity features into the design of developments should be maximised (at 5.3.15).
- In relation to protection of habitats and other species, EN-1 notes that:
  - many individual wildlife species receive statutory protection under a range of legislative provisions. It also notes that other species and habitats have been identified as being of principal importance for the conservation of biodiversity and should be protected from the adverse effects of development by using requirements or development consent obligations. Development consent should be refused where harm to these habitats and species (or the habitats of these species) would result, unless the benefits (including need) of the development outweigh the harm, and that substantial weight should be given to biodiversity features of national or regional importance (at 5.3.17).
- In relation to mitigation, EN-1 says the following:
  - Appropriate mitigation measures should be included as an integral part of the proposed development, and in particular the applicant should demonstrate that:
    - "during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works";
    - "during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements";
    - "habitats will, where practicable, be restored after construction works have finished"; and
    - "opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals" (at 5.3.18).
  - Where the applicant cannot demonstrate that appropriate mitigation measures will be put in place, requirements should be attached to any consent and/ or development consent obligations entered into (at 5.3.19).

- Account will also be taken of "*what mitigation measures may have been agreed between the applicant and Natural England or the Marine Management Organisation (MMO), and whether Natural England (or the Countryside Council for Wales) or the MMO has granted or refused or intends to grant or refuse, any relevant licences, including protected species mitigation licences*" (at 5.3.20).

- Section 3.9 of NPS EN-6 (Reference 7. DECC) sets out the additional policy (over and above that set out in Section 5.3 of EN-1) which is specific to new nuclear power stations makes particular reference to the need to consider effects on biodiversity arising from: changes to the groundwater regime; water discharge, abstraction and quality issues; habitat and species loss; fragmentation/ coastal squeeze; disturbance events (noise, light and visual); and changes in air quality. It notes that possible mitigation options include variations to building layout to avoid ecologically sensitive areas and on-site measures to protect habitats and species and to avoid or minimise pollution and the disturbance of wildlife.

  - Section 3.9.3 of EN-6 confirms that, "in carrying out an assessment in accordance with Section 5.3 of EN-1, applicants should also consider the effects of construction of a new nuclear power station on the groundwater regime and its effects on terrestrial/ coastal habitats"; and

  - *Section 3.9.10 of EN-6 confirms that "at the project level baseline studies on nationally and internationally important habitats and species that may be affected as a result of a development should be undertaken by an applicant to inform the assessment of the cumulative ecological effects*"

  - In relation to mitigation, section 3.9.11 of EN-6 confirms that "*as well as the options for mitigation set out in EN-1"*, other possible mitigation options have been identified as being relevant. *"These include variations to building layout to avoid ecologically sensitive areas and on-site measures to protect habitats and species and to avoid or minimise pollution and the disturbance of wildlife*".

Conventions

19.3.3 The following conventions are relevant to the assessment of effects on ornithology:

- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR convention); and,

- The Convention of the Conservation of European Wildlife and Natural Habitats (the Bern Convention).

European Legislation

19.3.4 The following European legislation is relevant to the assessment effects on ornithology:

- Directive 92/43/EEC - The Habitats Directive; and,
- Directive 2009/147/EC - The Birds Directive.

National Legislation

19.3.5 The following National legislation is relevant to the assessment effects on ornithology:

- The Wildlife and Countryside Act 1981 (as amended);
- The Countryside and Rights of Way (CRoW) Act 2000;
- The Natural Environment and Rural Communities (NERC) Act 2006; and,
- The Conservation of Habitats and Species Regulations 2010.

Local Policy

19.3.6 Policy to be considered at a local level includes the following:

- The Cumbria Biodiversity Action Plan (BAP), which has been prepared by the Cumbria Biodiversity Partnership, includes 39 species and habitat plans, covering over 700 individual actions to conserve and/or enhance Cumbria's biodiversity.
- Copeland Local Plan 2013-2028: Adopted Core Strategy and Development Management Policies (adopted December 2013): Policy ENV3 (biodiversity and geodiversity) combined and proactive approach to protect and enhance designated sites, wildlife corridors and protected species. Policy DM25 supports this policy.

Guidance

19.3.7 Guidance documents that are of specific relevance to the impact assessment of the Moorside Project on Marine Ecology are as follows:

- Institute of Ecology and Environmental Management (2006). Guidelines for Ecological Impact Assessment in the United Kingdom (Reference 2. CIEEM);
- Chartered Institute of Ecology and Environmental Management (2010). Guidelines for Ecological Impact Assessment in Britain and Ireland – Marine and Coastal (Reference 3. CIEEM); and
- Chartered Institute of Ecology and Environmental Management (2016). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Second edition, January 2016 (Reference 4. CIEEM).

19.4 Data gathering methodology

Study Area

19.4.1 The red line site boundaries are presented in **Figure 2.1a** and **Figure 2.1b** in **Chapter 2, Project Description** though the ornithological survey areas extend beyond these red line boundaries as follows:

- The Marine Survey Area extends to 10 km offshore and from St Bees Head in the north to Ravenglass Estuary in the south (**Figure 17.1**);
- Surveys in the intertidal zone associated with the Moorside Search Area (MSA), which broadly equates to the indicative development area identified on **Figure 2.3**, and a 500 m buffer extended from Calder Viaduct in the South to Braystones Waste Water Treatment Plant in the North; and
- Terrestrial ornithological surveys cover the Moorside Site, Corkickle to Mirehouse Railway Site, Corkickle Site, Mirehouse Site, Egremont Site and St Bees Railway Site red line boundaries plus a 250 m buffer.

19.4.2 Further survey work commenced in March 2016 and is scheduled to continue until June 2016.

Desk study

19.4.3 In addition to the data collated as identified in **Chapter 18: Terrestrial and Freshwater Ecology**, baseline data for the Ornithological impact assessment were collated from the following sources:

- Records of legally protected or otherwise notable species were obtained from Cumbria Wildlife Trust;
- GIS datasets of statutory designated sites in the wider Irish Sea area, were obtained from a range of sources including JNCC, Scottish Natural Heritage (SNH), Natural Resource Wales (NRW) and the Department of Environment, Northern Ireland (DOENI);
- The Royal Society for the Protection of Birds (RSPB) was asked to provide records of Schedule 1 birds and Species of Principal Importance (under Section 41 of the Natural Environment and Rural Communities Act 2006) from within c.2 km of the Moorside, Corkickle, Mirehouse, and Egremont Sites;
- Ongoing consultation with the RSPB identified the Calder Viaduct roost area as potentially important for post-breeding aggregations of Sandwich terns;
- British Trust for Ornithology (BTO) Wetlands Birds Surveys (WeBS) core count data relevant to the Moorside Site;
- The BTO Bird Atlas and BirdTrack was checked to determine whether the distributions of any species/populations of high nature conservation

importance fell within 2 km of the Moorside Site, Corkickle Site, Mirehouse Site, and Egremont Site; and

- Additionally, an initial review was carried out of published sources of information such as the Cumbria Bird Club annual report(s) and 'grey' literature available on the internet to identify species which are recorded in the wider area and so may be present within the Moorside Site, Corkickle Site, Mirehouse Site, and Egremont Site.

19.4.4 Additional data collection using relevant sources will be carried out for the remaining Additional Sites with potential ornithological interest not referenced above and extend to a 250 m buffer.

Survey work

19.4.5 Previous surveys of breeding and wintering birds were carried out in 2010-2011 and 2012-14 on the Moorside Site only and the adjacent intertidal and nearshore area.

19.4.6 A further programme of surveys and methodologies were agreed with NE, Marine Management Organisation (MMO), Environment Agency (EA), Copeland Borough Council, Cumbria County Council, RSPB and Cumbria Wildlife Trust (CWT) during consultation and initiated at the start of 2015. The ongoing survey programme, as amended in consultation with, and agreed with, relevant statutory and non-statutory consultees, includes:

- Offshore boat-based surveys, following the methods as detailed within Camphuysen et al. (Reference 1. Camphuysen *et al*) were undertaken to record seabird distribution and activity on a monthly basis from January–December 2015;
- Offshore aerial surveys, to provide complementary seabird monitoring, were undertaken in May and June 2015 with further surveys in February and March 2016;
- Intertidal surveys recording shorebirds and birds using the intertidal zone/ nearshore waters within the Moorside Search Area plus 500 m buffer were undertaken over two surveys per month, on a monthly basis, from March-May 2015, July 2015 – December 2015 and January-February 2016;
- Tern and kittiwake focussed roost count surveys, targeting the spring tide roosts/ aggregations on the foreshore around Sellafield, at Calder Viaduct and Braystones Water Treatment Works outflow, were undertaken twice a month, from July to October 2015, inclusive;
- Additional tern roost monitoring will be undertaken in summer 2016 to further identify tern numbers, age structure and interconnectivity between the roosts and any SPAs;
- Terrestrial territory mapping surveys using a modified version of the Common Bird Census (CBC) method (Reference 9. Gilbert *et al.*) were undertaken over the MSA plus 250 m buffer, with six visits between late March to early June 2015. Further surveys (including a 250 m buffer around

each site) are planned for the Corkickle Site, Corkickle to Mirehouse Railway Site, Mirehouse Site, Egremont Site and St Bees Railway (and any additional non-surveyed areas on the Moorside Site) between March–June 2016. Breeding kingfisher surveys are incorporated in to the CBC in appropriate habitats;

- Breeding barn owl surveys following the Shawyer method (Reference 11. Shawyer), whilst also taking into account guidance in Hardey *et al* (Reference 10. Hardey *et al*.) (and including a 250 m buffer around each site red line boundary), were undertaken on the Moorside Site in 2015 with surveys planned for the Mirehouse Site and Egremont Site, (and any additional non-surveyed areas on the Moorside Site) in 2016; and
- Terrestrial winter bird transect surveys were undertaken, walking a set transect route and stopping at suitable vantage points to scan the surrounding land within the site boundary plus a 250 m buffer on the Moorside Site, Corkickle Site, Mirehouse Site, Egremont Site and the Corkickle to Mirehouse Railway Site. Surveys were completed between November 2015 and February 2016.

19.4.7 Ornithological survey work of the Moorside Site described within this chapter was undertaken based on the original 'Moorside Search Area', which was the area consulted on as part of the Stage One Consultation. The Moorside Search Area broadly equates to the indicative development area identified on **Figure 2.3**. Where necessary, further survey work will be undertaken in 2016 in respect of the Moorside Site to inform the Environmental Statement. Full survey work, which is seasonally constrained (March–June), is yet to be completed on the Corkickle Site, Corkickle to Mirehouse Railway Site, Mirehouse Site, Egremont Site and St Bees Railway Site.

Consultation

19.4.8 Further to the details outlined in **Chapter 3 EIA Methodology** regarding the consultation that has taken place to date, consultation with the following organisations has informed the scope of the assessment.

- Natural England (NE);
- Copeland Borough Council (CBC);
- Cumbria County Council (CCC);
- Lake District National Park (LDNP);
- Environment Agency (EA);
- West Cumbria Rivers Trust (WCRT);
- Cumbria Wildlife Trust (CWT);
- RSPB;
- Allerdale Borough Council (ABC);
- National Trust (NT); and

- Friends of the Lake District (FLD)

19.4.9 It should be noted that, in addition to the consultees listed above, consultation received from NE, RSPB and Consultants acting on behalf of Copeland Borough Council and Cumbria County Council has been used to inform the scope of the assessment.

19.4.10 This consultation has included the responses to the regular meetings and discussions held on the Survey and Monitoring Plan, quarterly update meetings, EIA Scoping Report and the discussion drafts issued for the PEIR.

19.4.11 **Table 19.1** provides details of the issues which have been raised during consultations, and a response on how they have been considered in the EIA process.

Table 19.1 Consultation responses received

Issue raised	Consultees	Response
Feedback from quarterly consultation meetings: Whilst the baseline, receptors and predicted impacts appear appropriate at this stage, the baseline is incomplete, limiting the extent to which the Council can provide meaningful comment. Data for the AD and 'other' sites is lacking at this stage. The Council have provided comment on the proposed assessment methodology, and provided suggestions for further survey effort for further consideration. The Council welcome continued dialogue with NuGen on the emerging assessment, supported by further design definition and baseline data.	CBC	Baseline data collection is continuing throughout 2016 and continues to be communicated to consultees through quarterly meetings. Further survey effort between March and June 2016 has been discussed and agreed with consultees, including NE.
Feedback from quarterly consultation meetings: The numbers of Sandwich terns, which may be birds from nearby SPAs, are higher than expected at the two roosts identified. Impacts to these birds will need careful assessment by the applicant within the application and associated HRA; this was discussed in some detail at the Quarter 4 and HRA core group meeting. Additionally, higher than expected numbers of Manx shearwaters that are likely from SPA populations require careful consideration within the HRA.	CBC	A detailed survey plan for 2016 to address Sandwich tern distribution and disturbance has been discussed and agreed with consultees, including NE. Manx shearwater are now identified as a receptor within the assessment process and considered within the HRA.
Raised during quarterly consultation meetings and Scoping Report response:	CBC/NE/EA	A relevant threshold for temperature impacts to fish (avian prey) was discussed during Quarter 3 and 4 2015 meetings and 2^0C was suggested and

Issue raised	Consultees	Response
Impacts of bird prey species need to be appropriately assessed, especially in terms of effects of the thermal plume.		agreed with consultees. A full assessment will be undertaken on birds prey species in **Chapter 17 Marine Ecology.**
Raised during quarterly consultation meetings: Engagement on overall avian mitigation strategy, including habitat creation and improvement; this should include offsetting methods to be used and how mitigation will be secured – land purchase, S106 etc.	CBC	The Biodiversity Management Strategy (BMS) is being progressed and an outline BS is presented in this PEIR. Additionally, a CEMP will set out how environmental effects will be minimised through effective mitigation measures embedded in activities associated with site clearance and construction plans. An outline CEMP is presented in this PEIR.
Raised during quarterly consultation meetings and Scoping Report response: NE required clarifications relating to survey method details and survey buffer zones.	NE	Full details provided to NE via the Survey and Monitoring Plan and quarterly consultation meetings. Survey timetables and associated buffers are detailed within the PEIR.
Raised during quarterly consultation meetings and Scoping Report response: Requirement for a second year of survey work.	NE	A second year of survey work was agreed with NE and other key consultees (CBC, RSPB, EA, CWT, CCC) to focus on sandwich tern distribution and behaviour rather than repeat the suite of surveys undertaken in 2015.
Raised during quarterly meetings and Scoping Report response: The need for interdisciplinary working in terms of possible impacts on bird species form construction boat traffic and potential oil spill risk.	CBC/EA/NE	There is integration with marine transport aspects via the marine and transport teams in terms of impacts of additional boat traffic on birds and effects of the development on bird prey species of fish.
Raised during quarterly consultation meetings:	NE	The pSPA is included as a receptor in the PEIR assessment and HRA.

Issue raised	Consultees	Response
The consultation on Morecambe Bay and Duddon Estuary pSPA commenced on 21 January 2016. Consequently, its features of interest are now fully protected in accordance with the Birds Directive.		
Raised during quarterly consultation meetings: The use of boat based surveys may not adequately record key species, red-throated diver and common scoter and aerial surveys may be required	NE	A limited aerial survey programme was undertaken to provide additional survey data. NE, CBC, EA and RSPB all agreed that the numbers of divers and scoters were low in the Marine Search Area and as such the use of aerial surveys was a precautionary measure to collaborate the boat based surreys and a full year of aerial surveys was not required.

19.5 Scope of the assessment

Potential receptors

19.5.1 Following initial screening of the key receptors presented in the Scoping Report and the Habitat Regulations Assessment Evidence Plan (HRA EP), a single SSSI, St Bees Head SSSI (6 km from the Moorside Site) and 19 SPA/ Ramsar sites have been identified as potential receptors based on possible connectivity between their offshore ornithological qualifying features and the Moorside Site. These statutory sites are shown on **Table 19.2** and **Figures 17.1 and 17.2**.

19.5.2 No statutory designated sites where there is possible connectivity between their terrestrial ornithological qualifying features and the Accommodation Sites have been identified.

19.5.3 Therefore, only offshore statutory sites with possible connectivity with the Moorside Site are considered in this assessment. Note that there is no potential connectivity between the offshore statutory sites and any Accommodation Site.

Table 19.2 Potential Receptors: Designated Sites with possible connectivity with the Moorside Site

Potential ornithological receptors: designated sites	Distance to Moorside Site	Qualifying species that could potentially use the offshore area affected by the Moorside Site
St Bees Head SSSI	6 km	Breeding seabird assemblage. Including over 2,000 pairs of guillemots, along with lesser numbers of fulmar, kittiwake, razorbill, cormorant, puffin, shag and herring gull. In addition, the cliffs are the only breeding site in England for black guillemots.
Morecambe Bay and Duddon Estuary pSPA[1]	10 km	Sandwich tern, little tern.
Solway Firth marine dSPA	18 km	Red-throated diver, common scoter.
Duddon Estuary SPA and Ramsar	24 km	Sandwich tern.
Morecambe Bay SPA and Ramsar	36 km	Sandwich tern, herring gull, lesser black-backed gull.
Liverpool bay SPA	56 km	Red-throated diver, common scoter.

[1] The Morecambe Bay and Duddon Estuary pSPA amalgamates the existing Morecambe Bay and Duddon Estuary SPAs and adds marine areas identified for foraging terns breeding in these SPAs. Amalgamation of the existing SPAs is proposed because of evidence of terns moving between nesting colonies in these SPAs, and the overlap in marine foraging areas of terns breeding in these colonies. Consultation on the proposal ends on 21st April 2016.

Potential ornithological receptors: designated sites	Distance to Moorside Site	Qualifying species that could potentially use the offshore area affected by the Moorside Site
Ribble and Alt Estuaries SPA and Ramsar	77 km	Lesser-black backed gull.
Copeland Islands SPA	131 km	Manx shearwater.
Ailsa Craig SPA	133 km	Gannet, lesser black-backed gull.
Skerries Island SPA	180 km	Fulmar.
Rathlin Island SPA	180 km	Lesser black-backed gull.
Howth head coast SPA	190 km	Fulmar.
Irelands Eye SPA	190 km	Fulmar, gannet.
Lambay Islands SPA	192 km	Fulmar, Manx shearwater.
Aberdaron Coast and Bardsey Island SPA	193 km	Manx shearwater.
Skokholm and Skomer SPA	310 km	Storm petrel, Manx shearwater.
Saltee Islands SPA	320 km	Fulmar.
Rum SPA	321 km	Manx shearwater.
Grassholm SPA	326 km	Gannet.
Mingulay and Bernaray SPA	370 km	Fulmar

19.5.4 Additionally, individual bird species or species groups have been identified as potential receptors, having the potential to be subject to likely significant effects from the Moorside Site, and these are presented in **Table 19.3**[2].

Table 19.3 Potential Receptors: Species

Criteria	Species
Schedule I of the Wildlife and Countryside Act 1981	Kingfisher, barn owl.
Annex I of the Birds Directive	Whooper swan, red-throated diver, great northern diver, Balearic shearwater, storm petrel, little egret, merlin, peregrine, golden plover, bar-tailed godwit, dunlin, Sandwich tern, common/ arctic tern, little gull, Mediterranean gull, short-eared owl and kingfisher.

[2] A number of species noted in **Table 19.2** (Potential Receptors: Designated Sites with possible connectivity with the Moorside Site) as potentially using the offshore area affected by the Moorside Site are not included within **Table 19.3**. Such species are considered in the context of being qualifying interest features for designated sites/assemblage groups to avoid reassessing species as multiple receptors.

Criteria	Species
Species of Principal Importance NERC Act 2006	Linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge, curlew, lapwing, grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch.
Species occurring in regionally or nationally important numbers	Linnet, Sandwich tern, guillemot, razorbill, curlew, lapwing, Manx shearwater, cormorant.

Spatial and temporal scope

19.5.5 Ornithological Zones of Influence (ZoI) were initially identified within the Scoping Report and agreed and ratified NE, MMO, EA, Copeland Borough Council, Cumbria County Council, RSPB and CWT.

19.5.6 For seabirds in the marine environment, the ZoI extended to cover statutory designated sites with mobile seabird interest in the wider Irish Sea up to 200 km away and those sites further afield where there qualifying interest species had potential max mean foraging ranges that overlapped with the marine survey area.

19.5.7 Preliminary modelling indicated that effects will be captured within the ZoI identified for Marine water and Sediment Quality (See **Chapter 16, Marine Water and Sediment Quality**) which identified a maximum tidal excursion of 7 km. The extent of the offshore ZoI was further informed by the predicted extents of the thermal and chemical plumes that would be generated by operations on the Moorside Site and an area encompassing concentrations of marine construction traffic. The survey area extends to 10 km offshore and 25 km along the coast from St Bees Head in the north to Ravenglass Estuary in the south.

19.5.8 The ornithological intertidal ZoI extends in the intertidal zone (associated with the MSA and a 500 m buffer) extending from Calder Viaduct in the South to Braystones Waste Water Treatment Plant in the North.

19.5.9 For terrestrial habitats and species (including terrestrial birds), and based on professional judgement and agreed with Natural England, it is considered that a 250 m wide zone extending around the site boundaries for the Moorside Site, Corkickle Site, Corkickle to Mirehouse Railway Site, Mirehouse Site, Egremont Site and St Bees Railway Site encompasses the ZoI for direct effects.

19.5.10 At this stage of the Moorside Project, the temporal scope of the assessment covers the construction and operational phases of the development at each Moorside Project site.

Potentially significant effects

19.5.11 As identified within the Scoping Report, potential effects of the Moorside Project that could be likely to be significant, and which will therefore be subject to further assessment with respect to birds, are summarised below.

- Terrestrial and intertidal birds. Direct and indirect effects of change in land cover, and displacement/ disturbance effects of construction and operation of the Moorside Project, including noise, vibration and light. This will include the construction and operation of the Marine Offloading Facility (MOLF), beach landing, breakwater and Circulating Water System (CWS).
- Marine/ offshore birds. Effects of displacement/ disturbance of foraging seabirds from effects of construction and operation of the MOLF, breakwater and cooling water system, including noise, vibration and light; increases in marine traffic associated with construction material transport including noise; and effects of aggregation, displacement or disturbance of foraging seabirds due to changes in the thermal and chemical composition of the marine environment consequent upon operation of the CWS.

19.6 Environmental measures incorporated into the proposed development

19.6.1 Details of environmental measures that have been incorporated into the overall design of the Moorside Project are set out in **Chapter 2, Project Description**. Specific measures relating to this environmental topic and how these have been targeted to specific ornithological receptors at each of the Moorside Project Sites are set out in **Table 19.4**. Where environmental measures are currently unknown, or uncertain, they are not included within **Table 19.4**. Further measures will be included in the EIA as they are designed and confirmed.

19.6.2 Effects on all aspects of ornithology will be minimised by the implementation of a detailed Biodiversity Management Strategy (BMS). An outline BMS is contained in this PEIR at **Appendix 18.A**. As part of the BMS, a Mitigation Plan will be implemented, which will set out the planned work that is required specifically to mitigate effects on protected and priority species and to create habitats to offset habitat loss. Furthermore, the BMS will also contain a Habitat Enhancement Plan (HEP) and Habitat Management Plan (HMP). The HEP will detail the work planned to deliver a positive effect on biodiversity by enhancing the nature conservation value of habitats and their associated species. The HMP will detail the planned management of retained, created and enhanced habitats, during and post-construction.

19.6.3 Furthermore, a CEMP (an outline of which is included at **Appendix 2.A)** will set out how environmental effects will be minimised and effective mitigation measures embedded in activities associated with construction.

Table 19.4 Rationale for incorporation of environmental measures

Potential receptor	Predicted changes and potential effects	Incorporated measure
Common to all developments		

Potential receptor	Predicted changes and potential effects	Incorporated measure
Annex 1 Species (little egret, merlin, peregrine, golden plover, short-eared owl and kingfisher). **Species of Principal Importance NERC Act 2006** (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch). **Species occurring in regionally or nationally important numbers (**linnet, curlew, lapwing**)**	Construction disturbance in terrestrial areas	Effects on these receptors will be minimised by integrated implementation of a detailed Biodiversity Management Strategy (BMS), and particularly the Construction Environmental Management Plan (CEMP) which will set out how environmental effects will be minimised and effective mitigation measures embedded in activities associated with the site clearance and construction phase.
Annex 1 Species (little egret, merlin, peregrine, golden plover, short-eared owl and kingfisher). **Species of Principal Importance NERC Act 2006** (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) Farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch). **Species occurring in regionally or nationally important numbers** (linnet, curlew, lapwing)	Habitat loss	As part of the BMS, a Mitigation Plan will be implemented which will set out the planned work that is required specifically to mitigate effects on protected and priority species and to create habitats to offset habitat loss. Habitat creation proposals would be drafted based on the Defra biodiversity off-setting scheme guidance. Furthermore, the BMS will also contain a Habitat Enhancement Plan (HEP) and Habitat Management Plan (HMP). The HEP will detail the work planned to deliver a positive effect on biodiversity by enhancing the nature conservation value of habitats and their associated species. The HMP will detail the planned management of retained, created and enhanced habitats, during and post-construction.
Schedule 1 of the Wildlife and Countryside Act: kingfisher & barn owl.	Construction disturbance in terrestrial areas	Adherence to the CEMP will ensure that disturbance to these receptors during the breeding season is avoided.
Schedule 1 of the Wildlife and Countryside Act: Barn owl.	Terrestrial construction disturbance	The CEMP will ensure that disturbance to this receptor during the breeding season is avoided.
Moorside Development only		

Potential receptor	Predicted changes and potential effects	Incorporated measure
Annex 1 Species (red-throated diver, great northern diver, Balearic shearwater, Sandwich tern, common/ Arctic Tern, little gull, Mediterranean gull, golden plover, bar-tailed godwit, dunlin)	Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	The CEMP will set out how environmental effects will be minimised for this receptor and effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.
Morecambe Bay and Duddon Estuary pSPA: Sandwich tern.	Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	The CEMP which will set out how environmental effects will be minimised for this receptor and effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.
Duddon Estuary SPA and Ramsar: Sandwich tern.	Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	The CEMP which will set out how environmental effects will be minimised for this receptor and effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.
Morecambe Bay SPA and Ramsar: Sandwich tern, herring gull and lesser black-backed gull.	Construction disturbance in the intertidal and nearshore areas. Increase in disturbance and displacement associated with marine vessel traffic during construction.	The CEMP will set out how environmental effects will be minimised for this receptor and effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.
Copeland Islands SPA: Manx shearwater.	Increase in disturbance and displacement associated with marine vessel traffic during construction.	The CEMP which will set out how environmental effects will be minimised for this receptor and effective embedded mitigation measures, including pollution prevention measures.
St Bees Head SSSI: Guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, herring gull and black guillemot.	Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	The CEMP will set out how environmental effects will be minimised for this receptor and effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.
Species occurring in regionally or nationally important numbers (sandwich tern,	Construction disturbance in the intertidal and nearshore areas and	The CEMP will set out how environmental effects will be minimised for this receptor and

Potential receptor	Predicted changes and potential effects	Incorporated measure
guillemot, razorbill, Manx shearwater, cormorant)	associated increase in disturbance and displacement associated with marine vessel traffic.	effective mitigation measures embedded in activities associated with construction in the nearshore and intertidal areas, including pollution prevention measures.

19.7 Assessment methodology

Methodology for prediction of effects

19.7.1 The EIA Regulations indicate what is to be considered when determining the impacts of proposed developments on environmental receptors. As required by the EIA Regulations, only impacts that are likely to have significant effects require detailed assessment and such effects of the Moorside Project on the environment will therefore be identified, described and assessed. The overarching approach for the assessment of significance is set out in **Chapter 3, EIA Methodology**. Topic specific criteria for receptor value/significance and magnitude of change are described in this section.

19.7.2 In combination with guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal 2016 & CIEEM Guidelines for Ecological Impact Assessment in Britain and Ireland – Marine and Coastal 2010, the EIA Regulations provide a framework for the methodology adopted in this PEIR to assess the potential effects on biodiversity receptors.

19.7.3 The CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal 2006 has been revised with the new edition published in January 2016. As the new guidance was published part way through the drafting of this PEIR, CIEEM guidance 2006 has been considered; any changes made to the 2016 guidance will be considered and incorporated into the Environmental Statement (ES) as necessary.

19.7.4 Due to the complexity of ecological system processes and the uncertainty of some impacts and efficacy of some mitigation measures, experienced professional judgement also plays a key role in the evaluation of features and in determining significance of effects.

19.7.5 This preliminary assessment of potential effects has been undertaken based on the expectation that mitigation, off-setting and enhancement measures to be set out in the BMS will be adopted as an embedded part of the Moorside Project.

Significance evaluation methodology

19.7.6 The methodology for assessing the significance of effects is outlined in **Chapter 3, EIA Methodology Section 3** and combines judgments of receptor

conservation value/ sensitivity with an assessment of the magnitude of change (**Table 3.1**). Topic specific criteria for receptor value/ sensitivity and magnitude of change are described in this section (**Tables 19.5** & **19.6** below). Industry guidance, including the CIEEM Guidance (CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal 2006, Guidelines for Ecological Impact Assessment in Britain and Ireland – Marine and Coastal 2010 & Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal 2016), has also influenced the methodology in this chapter with regard to the specific methods and criteria used (as explained below).

19.7.7 The significance of the potential effects is guided by considering the sensitivity of biodiversity receptors and the degree to which they may be affected (magnitude of change) by the Moorside Project (see **Tables 19.5 and 19.6**). This is presented as a matrix (see **Table 3.1** in **Chapter 3, EIA Methodology, Section 3.3**), though it should be noted that this is for guidance only as in practice the assessment involves professional judgement based on the nature of the potential impact and detailed understanding of the sensitivity of the receptor affected.

Sensitivity

19.7.8 Determining the sensitivity (or value) of biodiversity receptors within a study area uses criteria that guide the determination of conservation value; in the assessment of conservation value, the importance of a site for those receptors present (judged on the basis of the habitats present and the level of use by the species under consideration) is taken into account. The approach of this assessment, therefore, is to consider the value of a site for the receptor under consideration and the number of individuals of that species using it rather than only considering the nature conservation importance of a receptor itself[3].

[3] A species could for example be considered to be of international importance by virtue of being listed on Annex 1 of the Birds Directive; though a site used sporadically by an individual Annex 1 species while foraging would clearly not be considered to be of international importance.

Table 19.5 Nature conservation value and associated sensitivity

Sensitivity	Conservation Value	Examples
Very High	International	A feature (e.g. habitat or population) that forms part of an internationally designated site (SPA, SAC, Ramsar, etc.). Habitats Directive Annex I habitats and Annex II species (92/43/EEC). Birds Directive Annex 1 species (2009/147/EC) A feature that represents more than 1% of the international resource.
High	National	A feature that forms part of the cited interest of nationally designated site (SSSI, NNR, MCZ). Features listed in Schedule 1, 5 and 8 of the Wildlife and Countryside Act 1981. A feature that represents more than 1% of the national resource. Section 41 Species/Habitats of Principal Importance (NERC Act 2006).
Medium	Regional	A feature that represents more than 1% of the regional resource. Bird species listed on the BoCC Red List (Reference 8. Eaton *et al.*). LBAP species.
Low	Local	A feature that is of nature conservation value in a local context only, with insufficient value to merit a formal nature conservation designation. Species of international, national or regional importance, but which are only present very infrequently or in very low numbers within the study area.
Very low	Negligible	A feature that is common and widespread. Loss of such a feature would not be seen as detrimental to the biodiversity interests of the area.

Magnitude of Change

19.7.9 The impact magnitude is determined by the interaction between the scale of the change in time, area, intensity and the sensitiveness of the affected receptor. It is important to note that a change resulting from a proposed development can be positive or negative and this is reflected in **Table 19.6** which sets out the criteria used to determine the magnitude of change.

Table 19.6 Criteria used to determine the Magnitude of change

Magnitude	Description
Very high	The change permanently (or over the long-term) beneficially/ adversely affects the conservation status of a habitat/ species, increasing/reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/ species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is strengthened/compromised. There may be an increase/decrease in the level of biodiversity conservation value of the receptor.
High	The change permanently (or over the long-term) beneficially/ adversely affects the conservation status of a habitat/ species increasing/ reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/ species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be an increase/ decrease in the level of biodiversity conservation value of the receptor.
Medium	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small scale increase/ reduction. These changes are likely to be within the range of natural variability and there is not expected to be any permanent change in the conservation status of the species/ habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its biodiversity conservation value.
Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations would experience little or no increase/ reduction. Any changes are likely to be within the range of natural variability and there would be no short-term or long-term change to the conservation status of habitat/ species receptors or the integrity of designated sites.
Very low	A change the level of which is so low, it is not discernible on designated sites or habitats or the sizes of species' populations, or changes that balance each other out over the lifespan of a project.

19.7.10 The criteria in **Table 19.6** refer to the terms 'integrity' and 'conservation status'. For habitat areas and species, a negative effect is assessed as being significant if the favourable conservation status of a receptor would be changed by the Moorside Project. Conservation status is defined by the CIEEM (2006 & 2010) guidelines as follows:

- "*for habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area; and*
- *for species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area*".

19.7.11 The decision as to whether the conservation status of each specified biodiversity receptor has been changed has been made using professional judgement, drawing upon the results of the initial assessment of how each receptor is likely to be affected by the Moorside Project.

19.7.12 A similar procedure has been used for designated sites that are likely to be affected by the Moorside Project, except that the focus is on the effects on the integrity of each site, defined by the CIEEM (2006) guidelines as "*the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*". The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, professional judgement is used to identify the interest features.

19.7.13 It is important to recognise that effects can be beneficial rather than adverse. Positive effects can be measured along the same scales of magnitude. A positive effect is assessed as being significant if development activities are predicted to cause:

- an improvement in the condition of a habitat/ species population from unfavourable to unfavourable recovering or favourable (noting that condition data are only available for SSSIs but that professional judgement has been used to apply the same principle to habitats/ species elsewhere); or
- partial or total restoration of a site's favourable condition.

19.7.14 If a species' population, habitat or site is already in favourable condition, it is still possible for there to be a significant positive effect. There is, however, no simple formula for determining when such effects are significant and decisions about significance therefore have to be made on a case by case basis using professional judgement.

19.8 Preliminary assessment of residual effects

19.8.1 The assessment of effects to date is based upon the baseline conditions that have been established from desk study and surveys carried out to date, which are set out below. Further surveys are taking place in relation to the Additional Sites and will be incorporated fully into the ES to be submitted as part of the application for a DCO for the Moorside Project in 2017. In undertaking a preliminary assessment of effects, it should be noted that assumptions have been made in respect of certain aspects of the proposed development where further details will become available as on-going work progresses (for example final scheme description, final BMS and the results of on-going assessment work for other technical disciplines).

Baseline conditions

19.8.2 **Tables 19.7 and 19.8** provide a summary of the ornithological receptors that have been scoped in for assessment based on the data recorded on species presence and abundance identified from the species assemblage recorded within the Moorside Site Search Area, Marine Survey Area (as shown in **Figure 17.1**) and associated buffers to date. Further survey work and assessment

work is due to be carried out between March – June 2016 for the following sites:

- Corkickle Site;
- Corkickle to Mirehouse Railway Site;
- Egremont Site;
- Mirehouse Site:
- St Bees Railway site.

19.8.3 All Scottish statutory sites with ornithological qualifying features were scoped out with Scottish Natural Heritage (SNH) during the HRA consultation (A draft HRA Evidence Plan is provided in **Appendix 19.A**).

19.8.4 A single SSSI, St Bees Head SSSI (6 km from the Moorside Site) and 19 SPA/ Ramsar sites have been identified as potential receptors based on possible connectivity between their offshore ornithological qualifying features and the Moorside Site (**Table 19.7**)

19.8.5 No statutory designated sites where there is possible connectivity between their terrestrial ornithological qualifying features and the Accommodation Sites have been identified.

19.8.6 Therefore, only offshore statutory sites with possible connectivity with the Moorside Site are considered in this assessment. Note that there is no potential connectivity between the offshore statutory sites and any Accommodation Site.

19.8.7 Where more than one SPA has the same breeding seabird species qualifying feature, the SPA within closest foraging range for each species is initially included. If effects are assessed as significant for the initial SPA and qualifying interest species then all SPAs with potential connectivity would be assessed for significant effects associated with probable connectivity of their qualifying features.

Table 19.7 Statutory designated sites scoped in for further assessment in relation to the Moorside Site (only the nearest SPAs with probable connectivity with their associated qualifying features have been listed).

	Baseline description of relevant qualifying features
St Bees Head SSSI	All nine qualifying species (namely guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, black guillemot and herring gull) were recorded in either the offshore boat-based surveys, aerial surveys and/ or intertidal surveys in the Marine Survey Area. Highest monthly totals ranged from 1 black guillemot to 2,149 guillemot. Numbers of kittiwake at the Calder Viaduct roost peaked at 54, whilst the highest monthly total from boat based surveys was 196.
Morecambe Bay and Duddon Estuary pSPA	Sandwich tern: peak counts of 132 (intertidal surveys) and 216 (tern roost surveys) roosting birds were recorded in the intertidal Marine Survey Area. No little tern were recorded from any surveys.

	Baseline description of relevant qualifying features
Duddon Estuary SPA and Ramsar	Sandwich tern: see Morecambe Bay and Duddon Estuary pSPA.
Morecambe Bay SPA and Ramsar	Sandwich tern: see Morecambe Bay and Duddon Estuary pSPA Herring gull: regularly recorded throughout the Marine Survey Area, with a highest monthly total from boat based surveys of 428. The peak count at the Calder Viaduct roost was 420. Lesser black-backed gull: regularly recorded throughout the Marine Survey Area, with a highest monthly total from boat based surveys of 69. The peak count at the Calder Viaduct roost was 190.
Copeland Islands SPA	This is the nearest SPA for Manx shearwater with a breeding population of 5,000 pairs. During boat based surveys, a total of 356 Manx shearwaters were recorded over the April-June 2015 period, with higher numbers of post-breeding Manx shearwaters recorded between July- September 2015 utilising the areas at the north and south of the Marine Survey Area to forage and roost. A total of 1,267 birds were recorded during August with a peak flock count of 125.

19.8.8 Additionally, individual bird species or species groups have been identified as potential receptors, having the potential to be subject to likely significant effects from the Moorside Site and these are presented in **Table 19.8**.

Table 19.8 Species scoped in for further assessment in relation to the Moorside Site.

Receptor	Baseline description
Schedule 1 species	Kingfisher: Breeding bird surveys in 2015 confirmed a single breeding pair on the Moorside Site. Barn owl: Breeding bird surveys in 2015 confirmed a single breeding pair, four roost sites and three temporary resting sites on the Moorside Site.
Annex 1 Species	Red-throated diver: Recorded during eight offshore boat surveys (total of 65 birds) with a peak flock count of four birds in May 2015. Short-eared owl: Winter walk over surveys in 2015 identified an autumn/ winter roost of a maximum of three birds within the Moorside Site. Sandwich tern and kingfisher as noted respectively in **Table 19.7** and Schedule 1 species above. The following Annex 1 species were screened out for further assessment due to the occasional nature and very low numbers of each species recorded during survey work: whooper swan, great northern diver, Balearic shearwater, little egret, merlin, golden plover, common/ Arctic Tern, little gull, Mediterranean gull and peregrine.
Farmland assemblage	Breeding bird surveys in 2015 confirmed that a total of six NERC listed species were recorded breeding on the Moorside Site. (All of which were also on the Cumbria LBAP and 5 of which are BoCC red-listed): linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge. Potential breeding locations are illustrated in **Figure 19.1**.
Farmland waders	Breeding bird surveys on the Moorside Site in 2015 revealed 10 pairs of lapwing, three pairs of curlew, both of which are NERC species, BoCC red listed and on

Receptor	Baseline description
	the Cumbria LBAP. In addition, two pairs of redshank and a minimum of three pairs of snipe were recorded on the Moorside Site. Neither species is a key receptor, but form an important part of the breeding wader assemblage found within the Moorside Site. Potential breeding locations are illustrated in **Figure 19.2**
Other NERC species	Breeding bird surveys in 2015 on the Moorside Site confirmed that eight NERC listed species were recorded breeding (all of which are also on the Cumbria LBAP and five of which are BoCC red-listed): grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch. Potential breeding locations are illustrated in **Figure 19.3**
Species occurring in regionally or nationally important numbers	Linnet, sandwich tern, guillemot, razorbill, curlew, Manx shearwater and lapwing are already identified and detailed within other receptor groups or designations within this table and **Table 19.7.** Cormorant: potential regionally important numbers of this species were recorded at the Calder Viaduct roost site (peak of 110 birds).

19.8.9 For the Corkickle Site, Mirehouse Site and Egremont Site data from the desk based review, site walkover appraisals in October 2015 and the winter 2015/16 survey visits indicate that receptors are likely to consist of Schedule 1 species (potentially barn owl and kingfisher) and NERC and BoCC red list farmland bird and farmland wader assemblages, similar to those recorded for the Moorside Site. This will be confirmed through surveys taking place between March and June 2016.

19.8.10 For Corkickle to Mirehouse Railway Site and St Bees Railway Site, it is anticipated that the receptors are likely to consist of species and ornithological assemblages similar to those identified above. This will be confirmed through further desk review and surveys during taking place between March and June 2016.

Predicted residual effects and their significance

19.8.11 A summary of the preliminary assessment of the predicted residual effects (i.e. the effects taking into account the incorporated measures) with respect to the types of potential impacts upon each of the key receptors or receptor groups overall and at the Moorside Development and Accommodation Developments is provided in **Tables 19.9 to 19.12**. The evaluation tables generally present a preliminary assessment of the potential adverse effects arising from the Moorside Project unless explicitly stated to be neutral or beneficial in the rationale.

19.8.12 Where insufficient development, and/or baseline information, is available to undertake a prediction of the magnitude of change, and therefore draw preliminary conclusions regarding the significance of effects, the respective column has been populated by an asterisk (*) only.

19.8.13 At this stage, the evaluation tables only deal with the construction and operational phases of the development at each Moorside Project Site (save for those sites identified in paragraph 19.8.10 below). Furthermore, it should be

noted that following their construction, the "Accommodation Sites and Additional Sites" will be operational for a period of time when the Moorside Site is still under construction. With respect to the decommissioning of the Moorside Project, potential effects associated with decommissioning are likely to be no greater than to the effects arising from the construction phase. It is not anticipated that additional receptors would be affected beyond those identified for the construction phase assessment as this assessment has assumed a reasonable worst case. It is anticipated that the decommissioning works would be of shorter duration and would occupy more limited footprints than those currently assumed for construction of the relevant facilities. As such, it is anticipated that the magnitude of change as a result of decommissioning would be less than that as a result of construction. Subject to further design and delivery details, and for the purposes of this PEIR, a worst case scenario assumption has therefore been applied, i.e. it has been assumed that the effects would be the same (rather than less) as those identified for the construction phase. Decommissioning is therefore not considered in addition to construction in the assessment tables below (that address the construction and operational phases).

19.8.14 It should be noted that assessment tables have not been presented for the following sites as collection of baseline characterisation data, and/or design information, is on-going at this stage:

- Corkickle to Mirehouse Railway Site; and
- St. Bees Railway Site

Table 19.9 Moorside Development: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
St Bees Head SSSI: Guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, herring gull and black guillemot.					
Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic	Likely	High	Potentially Low *	Potentially Moderate* (Potentially significant)	All nine qualifying species were present in the Marine Survey Area due to the close proximity of the SSSI. Analysis is ongoing to assess resultant level of effects. Any effects would be minimised during the construction phase by adoption of embedded environmental measures in the CEMP, on which basis significance is anticipated to be Moderate (Potentially Significant).
Morecambe Bay and Duddon Estuary pSPA: Sandwich tern.					
Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	Likely	Very High	Potentially Very Low *	Potentially Moderate* (Potentially significant)	Sandwich tern, a potential qualifying species of the pSPA was recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work and analysis during the Sandwich tern breeding season will assess the species pSPA connectivity and resultant level of likely significant effects. Disturbance effects, if any, to the roost sites would be minimised via the embedded mitigation measures within the CEMP, on which basis significance is anticipated to be Moderate (Potentially Significant).
Duddon Estuary SPA and Ramsar: Sandwich tern.					
Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and	Likely	Very High	Potentially Very Low *	Potentially Moderate* (Potentially significant)	Sandwich tern, a qualifying species of the SPA was recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work and analysis during the Sandwich tern breeding season will assess the species SPA connectivity and resultant level of likely significant effects. Any disturbance effects to the

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
displacement associated with marine vessel traffic.					roost sites would be minimised via the embedded mitigation measures within the CEMP, on which basis significance is anticipated to be Moderate (Potentially Significant).
Morecambe Bay SPA and Ramsar: Sandwich tern, herring gull and lesser black-backed gull.					
Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic.	Likely	Very High	Potentially Very Low *	Potentially Moderate* (Potentially significant)	Sandwich tern, herring gull and lesser black-backed gull, qualifying species for this SPA, were recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work (Sandwich tern only) and analysis is ongoing to assess the species SPA connectivity and resultant level of likely significant effects. Disturbance effects to the foraging and roost sites would be minimised via the embedded mitigation measures within the CEMP. Furthermore impacts on the gull species are anticipated to be minimal due to their tolerance of anthropogenic activities, on which basis significance is anticipated to be Moderate (Potentially Significant).
Copeland Islands SPA: Manx shearwater.					
Increase in offshore disturbance and displacement associated with marine vessel traffic	Unlikely	Very High	Potentially Very Low *	Potentially Moderate* (Potentially significant)	Manx shearwater, a qualifying species for this SPA, was recorded in the summer months of 2015 in the Marine Survey Area. Analysis is ongoing to assess the SPA connectivity and resultant level of likely significant effects for this species. Any adverse effects on this species would be minimised during the construction phase by adoption of embedded environmental measures in the CEMP, on which basis significance is anticipated to be Moderate (Potentially Significant).
Annex 1 species: Red-throated diver					
Construction disturbance in the intertidal and	Likely	Low	Potentially Very Low*	Potentially Negligible*	Red-throated diver is an Annex 1 species although for this assessment it is only considered to be of low sensitivity due to

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic				(Not Significant)	the low numbers of birds recorded in the Marine Survey Area. Analysis is ongoing to assess and resultant level of effects for this species. Any adverse effects on this species would be minimised during the construction phase by adoption of embedded environmental measures in the CEMP, on which basis significance is anticipated to be Negligible (Not Significant)
Annex 1 species: Short-eared owl					
Terrestrial construction disturbance and habitat loss.	Likely	Low	Medium	Minor (Not Significant)	Assessment is ongoing for this species. Although an Annex 1 species, short-eared owl is only considered to be of low sensitivity due to the low numbers of birds recorded, with a maximum of three birds using a transient late autumn roost on the Moorside Site. Effects on this species would be minimised by the Mitigation Plan (as part of the BMS), and, implementation of the CEMP, which would minimise disturbance to these species during the autumn and winter seasons when the roost site was active.
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch).					
Terrestrial construction disturbance and habitat loss.	Likely	High	Low	Moderate (Potentially significant)	Sixteen NERC listed species of principal importance were recorded breeding on the Moorside Site. Survey work and assessment is ongoing between March and June 2016 for the Accommodation sites. However, any effects on these species would be minimised by the Mitigation Plan (as part of the BMS), including habitat enhancement and supplementary winter feeding in unaffected areas of, or close to, the Moorside Site and, in addition, implementation of the CEMP, which would minimise disturbance to these species during the breeding and non-breeding season.

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher					
Terrestrial construction disturbance.	Likely	High	Very Low	Minor (Not Significant)	Effects on this receptor would be minimised through implementation of the CEMP, which would ensure no disturbance occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					
Terrestrial construction disturbance.	Likely	High	Very Low	Minor (Not Significant)	Assessment and survey (Accommodation sites March – June 2016) is ongoing for this receptor. However, any anticipated potential significant effects on this species would be minimised by the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction. Implementation of the CEMP would ensure no disturbance occurs during the breeding season and therefore there would be no contravention of the WCA.
Species occurring in regionally or nationally important numbers: Cormorant					
Construction disturbance in the intertidal and nearshore areas and associated increase in disturbance and displacement associated with marine vessel traffic	Likely	Medium	Potentially Low *	Potentially Minor*(Not Significant)	Potential regionally important numbers of this species were recorded at the Calder Viaduct roost site with the species also record within the nearshore areas. Analysis is ongoing to assess and resultant level of effects for this species. Any adverse effects on this species would be minimised during the construction phase by adoption of embedded environmental measures in the CEMP, on which basis significance is anticipated to be Minor (Not Significant)

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Operation					
St Bees Head SSSI: Guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, herring gull and black guillemot.					
Effects of thermal plume, entrainment and entrapment within the CWS of bird prey species leading to reduced food resource	Likely	High	Low	Moderate (Potentially Significant)	All nine qualifying species were present in the Moorside Site offshore area due to the close proximity of the SSSI. Analysis is ongoing to assess the resultant level of effects. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a relatively small proportion of the overall foraging area available to this species. Once the design of the marine infrastructure and its potential effects on bird prey species (fish) is finalised then the final level of effect on birds will be addressed.
Morecambe Bay and Duddon Estuary pSPA: Sandwich tern					
Effects of thermal plume, entrainment and entrapment within the circulating water system on bird prey species leading to reduced food resource	Likely	Very High	Very Low	Moderate (Potentially Significant)	Sandwich tern, a potential qualifying species of the pSPA, was recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work and analysis during the Sandwich tern breeding season will assess the species pSPA connectivity and resultant level of effect. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a negligible proportion of the overall foraging area available to this species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed.

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Duddon Estuary SPA and Ramsar: Sandwich tern					
Effects of thermal plume, entrainment and entrapment within the cooling system of bird prey species	Likely	Very High	Very Low	Moderate (Potentially Significant)	Sandwich tern, a potential qualifying species of the SPA, was recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work and analysis during the Sandwich tern breeding season will assess the species SPA connectivity and resultant level of effect. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a negligible proportion of the overall foraging area available to this species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed.
Morecambe Bay SPA and Ramsar: Sandwich tern, herring gull and lesser black-backed gull					
Effects of thermal plume, entrainment and entrapment within the CWS of bird prey species leading to reduced food resource	Likely	Very High	Very Low	Moderate (Potentially Significant)	Sandwich tern, herring gull and lesser black-backed gull, qualifying species for this SPA, were recorded in high numbers roosting along the shoreline of the Moorside Site. Survey work (Sandwich tern only) and analysis is ongoing and will assess the species SPA connectivity and the resultant level of effect. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a negligible proportion of the overall foraging area available to these species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed. In advance of that, impacts on the gull species would be anticipated to be minimal due to their tolerance of anthropogenic activities.
Copeland Islands SPA and Ramsar: Manx shearwater					

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Effects of thermal plume, entrainment and entrapment within the CWS of bird prey species leading to reduced food resource	likely	Very High	Very Low	Moderate (Potentially Significant)	Manx shearwater, a qualifying species for this SPA, was recorded in the summer months of 2015 in the Marine Survey Area. Analysis is ongoing to assess the SPA connectivity and the resultant level of effects for this species. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a negligible proportion of the overall foraging area available to this wide ranging species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed.
Annex 1 species: Red-throated diver					
Effects of thermal plume, entrainment and entrapment within the CWS of bird prey species leading to reduced food resource	Unlikely	Low	Very Low	Negligible (Not Significant)	Red-throated diver is an Annex 1 species although for this assessment it is only considered to be of low sensitivity due to the low numbers of birds recorded in the Marine Survey Area. Analysis is ongoing to assess the resultant level of effects. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a negligible proportion of the overall foraging area available to this wide ranging species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed.
Annex 1 species: Short-eared owl					
Roost disturbance and habitat loss	Likely	Very High	Very Low	Negligible (Not Significant)	Assessment is ongoing for this species. Although an Annex 1 species, for this assessment, short-eared owl is only considered to be of low sensitivity due to the low numbers of birds recorded, with a maximum of three birds using a transient late autumn roost on the Moorside Site. Operational effects on this

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
					species would already be minimised through the implementation of the Mitigation Plan with long term habitat enhancement and habitat management (via the HEP and HMP).
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Sixteen NERC listed species of principal importance were recorded breeding on the Moorside Site, and winter survey data indicates that a similar suite of species is likely to be present on the Accommodation Sites. Survey work (Accommodation Sites: March-June 2016) and assessment is ongoing. Operational effects on these species would be minimised through the implementation of the Mitigation Plan with long term habitat enhancement and habitat management (via the HEP and HMP).
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher					
Breeding season disturbance and habitat loss	Unlikely	High	Very Low	Minor Not Significant	Indicative breeding for this receptor was recorded on site although assessment is still ongoing. Operational effects on this species would already be minimised through the implementation of the Mitigation Plan with long term habitat enhancement and habitat management (via the HEP and HMP) providing overall biodiversity gain for this species. Proactive working practices outlined within the overall BMS would ensure no disturbance to kingfisher occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Breeding season disturbance and habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Indicative breeding for this receptor was recorded on site although assessment is still ongoing. Operational effects on this species would already be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction with long term habitat enhancement and habitat management (via the HEP and HMP) providing overall biodiversity gain for this species. Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Proactive working practices outlined within the overall BMS would ensure no disturbance to barn owl occurs during the breeding season and therefore there would be no contravention of the WCA.
Species occurring in regionally or nationally important numbers: Cormorant					
Effects of thermal plume, entrainment and entrapment within the CWS of bird prey species leading to reduced food resource	Unlikely	Medium	Very Low	Negligible (Not Significant)	Potential regionally important numbers of this species were recorded at the Calder Viaduct roost site with the species also record within the nearshore areas. Analysis is ongoing to assess the resultant level of effects. Operational effects would be limited to a maximum tidal excursion of 7 km around the outfall pipes, concentrated on the prey species resource which may only affect a small proportion of the overall foraging area available to this species. Once the design of the marine infrastructure and its potential effects on bird prey species is finalised then the final level of effect on birds will be addressed.

Note: * Denotes where the assessment is incomplete and ongoing at this time and therefore the significance of the effects cannot be accurately predicted.

Table 19.10 Corkickle Development: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial construction disturbance and habitat loss	Likely	High	Low	Moderate (Potentially Significant)	Survey work and assessment is ongoing between March and June 2016 for this site. However, any anticipated effects on these species would be minimised by the Mitigation Plan (as part of the BMS), including habitat enhancement and supplementary winter feeding in unaffected areas of, or close to, the Corkickle Site and, in addition, implementation of the CEMP, which would minimise disturbance to these species during the breeding and non-breeding season.
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher					
Terrestrial construction disturbance	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (between March and June 2016) and assessment is ongoing for ornithological receptors on this site. However, it is anticipated that effects on kingfisher would be minimised through the implementation of the CEMP, which would ensure no disturbance occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					
Terrestrial construction disturbance	Likely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for this receptor. However, any effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction. Magnitude of change and

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Implementation of the CEMP would ensure no disturbance to this species occurs during the breeding season and therefore there would be no contravention of the WCA.
Operation					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for this site. Any operational effects on these species groups would be minimised through the implementation of the Mitigation Plan with long term habitat enhancement and habitat management (via the HEP and HMP) providing overall biodiversity gain for these species.
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher					
Breeding season disturbance and habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for this site. Any operational effects on kingfisher would be minimised by adoption of proactive working practices outlined within the overall BMS, which would ensure no disturbance to kingfisher occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Breeding season disturbance and habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for this receptor. However, any operational effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction with long term habitat enhancement and habitat management (via the HEP and HMP). Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Proactive working practices outlined within the overall BMS would ensure no disturbance to barn owl occurs during the breeding season and therefore there would be no contravention of the WCA.

Note: * Denotes where the assessment is incomplete and ongoing and this time and therefore the significance of the effects cannot be accurately predicted.

Table 19.11 Mirehouse Development: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial construction disturbance and habitat loss	Likely	High	Low	Moderate (Potentially Significant)	Survey work (March-June 2016) and assessment is ongoing. Any effects on these species groups would be minimised through the implementation of the Mitigation Plan, including habitat enhancement and supplementary winter feeding in unaffected areas of, or close to, the site and implementation of the CEMP which would minimise disturbance to these species during the breeding and non-breeding season.
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher					
Terrestrial construction disturbance	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for ornithological receptors on this site. However, it is anticipated that effects on kingfisher would be minimised by implementation of the CEMP, which would ensure no disturbance occurs during the breeding season and therefore there would be no contravention of the WCA.

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					
Terrestrial construction disturbance	Likely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for this receptor. However, any effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction. Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Implementation of the CEMP would ensure no disturbance to this species occurs during the breeding season and therefore there would be no contravention of the WCA.
Operation					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing. Any operational effects on these species groups would be minimised through the implementation of the Mitigation Plan with long-term habitat enhancement and habitat management (via the HEP and HMP).

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					
Breeding season disturbance and habitat loss	Unlikely	High	Very Low	Minor (Not Significant)	Assessment and survey work (March-June 2016) is ongoing for this receptor. However, any operational effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction with long term habitat enhancement and habitat management (via the HEP and HMP). Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Proactive working practices outlined within the overall BMS would ensure no disturbance to barn owl occurs during the breeding season and therefore there would be no contravention of the WCA.

Note: * Denotes where the assessment is incomplete and ongoing and this time and therefore the significance of the effects cannot be accurately predicted.

Table 19.12 Egremont Development: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial construction disturbance and habitat loss.	Likely	High	Low	*Moderate (Potentially Significant)	Survey work (March-June 2016) and assessment is ongoing. Any effects on these species groups would be minimised through the implementation of the Mitigation Plan, including habitat enhancement and supplementary winter feeding in unaffected areas of, or close to, the site and implementation of the CEMP which would minimise disturbance to these species during the breeding and non-breeding season.
Schedule 1 of Wildlife and Countryside Act 2006species: Kingfisher					
Terrestrial construction disturbance.	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing for ornithological receptors on this site. However, it is anticipated that effects on kingfisher would be minimised by implementation of the CEMP, which would ensure no disturbance occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006species: Barn owl					
Terrestrial construction disturbance.	Likely	High	Very Low	Minor (Not Significant)	Assessment and survey work (March-June 2016) is ongoing for this receptor. However, any effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction. Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Implementation of the CEMP would ensure no disturbance to this species occurs during the breeding

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
					season and therefore there would be no contravention of the WCA.
Operation					
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch)					
Terrestrial habitat loss.	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing. Any operational effects on these species groups would be minimised through the implementation of the Mitigation Plan with long-term habitat enhancement and habitat management (via the HEP and HMP).
Schedule 1 of Wildlife and Countryside Act 2006species: Kingfisher					
Breeding season disturbance and habitat loss.	Unlikely	High	Very Low	Minor (Not Significant)	Survey work (March-June 2016) and assessment is ongoing. Any operational effects on kingfisher would be minimised by adoption of proactive working practices outlined within the overall BMS, which would ensure no disturbance to kingfisher occurs during the breeding season and therefore there would be no contravention of the WCA.
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl					
Breeding season disturbance and habitat loss.	Unlikely	High	Very Low	Minor (Not Significant)	Assessment and survey work (March-June 2016) is ongoing for this receptor. However, any operational effects on this species would be minimised through the implementation of the Mitigation Plan for barn owl, including placement of new nest boxes to minimise loss of nest sites during construction with long term habitat enhancement and habitat management (via the HEP and HMP). Magnitude of change and significance of effect are dependent on the form of the Mitigation Plan, which is on-going work. Proactive working practices outlined within the overall BMS would ensure no

Receptor and summary of predicted effects	Probability	Sensitivity/ value of receptor	Magnitude of change	Significance of effect	Rationale
					disturbance to barn owl occurs during the breeding season and therefore there would be no contravention of the WCA.

Note: * Denotes where the assessment is incomplete and ongoing and this time and therefore the significance of the effects cannot be accurately predicted.

19.9 Preliminary assessment of the Moorside Project as a whole

19.9.1 An assessment of the Moorside Project as a whole will be included in the ES. For the purposes of this PEIR, a preliminary assessment of the Moorside Site and the Accommodation Sites has been undertaken in the context of their respective ZoIs. The assessment has looked at whether there would be any additional, "accumulated effects" on specific environmental receptors. The ES will consider all of the Additional Sites in this assessment once the data becomes available.

19.9.2 In terms of the spatial scope of the assessment of accumulated effects, the principles have been set out in **Chapter 3, EIA Methodology, Section 3.4** and summarised in **Table 3.8**. With respect to ornithology, the ZoI around each Moorside Project site vary. For seabirds in the marine environment, the ZoI extended to cover statutory designated sites with mobile seabird interest in the wider Irish Sea up to 200 km away and those sites further afield where their qualifying interest species had potential max mean foraging ranges that overlapped with the marine survey area. The marine survey area extends to 10 km offshore and 25 km along the coast from St Bees Head in the north to Ravenglass Estuary in the south. The ornithological intertidal ZoI (associated with the MSA and a 500 m buffer) extends from Calder Viaduct in the South to Braystones Waste Water Treatment Plant in the North. For terrestrial habitats and species (including terrestrial birds), and based on professional judgement and agreed with Natural England, it is considered that a 250 m wide zone extending around the site boundaries for the Moorside Site, Corkickle Site, Corkickle to Mirehouse Railway Site, Mirehouse Site, Egremont Site and St Bees Railway Site encompasses the ZoI for direct effects.

19.9.3 The following paragraphs contain a preliminary high-level accumulated effects assessment of the ornithological effects arising from the whole Moorside Project, taking into account the preliminary residual effects assessments for the individual project elements contained in **Tables 19.9** to **19.12** above. Whilst the potential for whole project effects to arise has been identified at this preliminary stage, it has not been possible to determine the magnitude of change and therefore to rule out the potential for these effects to be significance. Consequently such effects are described as being 'potentially significant', although the use of the term 'potentially significant' should not be taken to imply that significant effects are considered likely to occur. The rationale for these conclusions is provided in the following paragraphs and a summary of this analysis is set out in **Table 19.13** below. Full detailed assessments will be carried out subsequently and reported in the ES that is due to be submitted in 2017. However, it should be noted that it is not possible at this stage to determine the magnitude of change and therefore the significance of whole Moorside Project ornithology effects because of the absence of the required detailed design information. Full detailed assessments will be carried out subsequently and reported in the ES that is due to be submitted in 2017.

19.9.4 Accumulated whole Moorside Project effects will occur during the construction phase applying to one receptor group - Species of Principal Importance NERC Act 2006. All other receptors have no in-combination accumulated effects.

Table 19.13 Summary of predicted residual ornithological effects – whole project construction and operational phases

Receptors	Whole Project accumulated effects /Significance of effects*						
	Moorside Development	Corkickle Development	Mirehouse Development	Egremont Development	Corkickle to Mirehouse Railway Development	St Bees Railway Development	Whole Moorside Project
St Bees Head SSSI: Guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, herring gull and black guillemot.	Potentially significant	No effects	No effects	No effects	No effects	No effects	Potentially Significant
Morecambe Bay and Duddon Estuary pSPA: Sandwich tern	Potentially significant	No effects	No effects	No effects	No effects	No effects	Potentially Significant
Duddon Estuary SPA and Ramsar: Sandwich tern.	Potentially significant	No effects	No effects	No effects	No effects	No effects	Potentially Significant
Morecambe Bay SPA and Ramsar: Sandwich tern, herring gull and lesser black-backed gull.	Potentially significant	No effects	No effects	No effects	No effects	No effects	Potentially Significant
Copeland Islands SPA: Manx shearwater.	Potentially significant	No effects	No effects	No effects	No effects	No effects	Potentially Significant
Annex 1 species: Red-throated diver	Not significant	No effects	No effects	No effects	No effects	No effects	Not significant
Annex 1 species: Short-eared owl	Not significant	No Effects	No Effects	No Effects	No effects	No effects	Not significant
Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii)	Potentially significant	Potentially significant	Potentially significant	Potentially significant	Not yet assessed	Not yet assessed	Potentially significant

Receptors	Whole Project accumulated effects /Significance of effects*						
	Moorside Development	Corkickle Development	Mirehouse Development	Egremont Development	Corkickle to Mirehouse Railway Development	St Bees Railway Development	Whole Moorside Project
farmland waders (lapwing, curlew, redshank and snipe); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch).							
Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher.	Not significant	Not significant	Not significant	Not significant	Not yet assessed*	Not yet assessed*	Not significant
Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl.	Not significant	Not significant	Not significant	Not significant	Not yet assessed*	Not yet assessed*	Not significant
Species occurring in regionally or nationally important numbers: Cormorant	Not significant	Not significant	Not significant	Not significant	No effects	No effects	Not significant

Note: * Whilst these sites have not yet been assessed their limited supporting habitats mean that they will have a significance of effects equal to or lower than the already assessed sites.

19.10 Preliminary assessment of cumulative effects

Scope of the assessment

19.10.1 As outlined in **Chapter 3, EIA Methodology, Section 3.4**, an exercise has been undertaken to determine which other (non Moorside) developments should be considered in the context of their ability to result in cumulative adverse environmental effects with the Moorside Project.

19.10.2 In terms of the spatial scope of the assessment of cumulative effects, the cumulative ZoI differs from the ZoI used to determine ornithological receptors primarily due to mobile nature of these species, some of which travel large distances for foraging and migration. Whilst this mobile behaviour may bring some species within an effect ZoI it is for some receptors (primarily designated sites) considered more appropriate to use a ZoI for cumulative assessment centred around the key breeding areas/colonies encompassing their qualifying species core foraging ranges, rather than a cumulative ZoI centred around the Moorside Project Sites. For terrestrial species a cumulative ZoI of 10 km has been used to allow assessment of cumulative effects on the potentially connected local area population.

19.10.3 The cumulative ZoIs for each ornithological receptor are as follows;

- St Bees Head SSSI: Guillemot, fulmar, kittiwake, razorbill, cormorant, puffin, shag, herring gull and black guillemot – the cumulative ZoI encompasses the core foraging range for each qualifying species (up to 35 km offshore from St Bees Head)(**Figure 19.4a**);
- Morecambe Bay and Duddon Estuary pSPA: Sandwich tern - the cumulative ZoI for breeding birds encompasses the boundary detailed for the pSPA and the cumulative ZoI for post breeding roost birds extends to a radius of 10 km from the Moorside Site (**Figure 19.4b**);
- Duddon Estuary SPA and Ramsar: Sandwich tern. - the cumulative ZoI encompasses the boundary detailed for the Morecambe Bay and Duddon Estuary pSPA and the cumulative ZoI for post breeding terns extends to a radius of 10 km longshore and offshore from the Moorside Site (**Figure 19.4b**);
- Morecambe Bay SPA and Ramsar: Sandwich tern, herring gull and lesser black-backed gull – the cumulative ZoI encompasses the boundary detailed for the Morecambe Bay and Duddon Estuary pSPA and the cumulative ZoI for post breeding terns extends to a radius of 10 km longshore and offshore from the Moorside Site (**Figure 19.4b**);
- Copeland Islands SPA: Manx shearwater - the cumulative ZoI extends from the SPA to encompass a 200 km radius in the wider Irish Sea and for post breeding birds extends to a radius of 50 km offshore from the Moorside Site (**Figure 19.4c**);
- Annex 1 species: Red-throated diver - the cumulative ZoI extends to an offshore radius of 10 km from the Moorside Site allowing assessment of

cumulative effects on the potentially connected local area population (**Figure 19.4d**);

- Annex 1 species: Short-eared owl - the cumulative ZoI extends to a land based radius of 10 km from the Moorside Site allowing assessment of cumulative effects on the potentially connected local area population (**Figure 19.4d**);
- Species of Principal Importance NERC Act 2006: (i) Farmland assemblage (linnet, skylark, tree sparrow, yellowhammer, reed bunting, grey partridge); (ii) farmland waders (lapwing, curlew); and (iii) other NERC Species of Principal Importance (grasshopper warbler, song thrush, house sparrow, dunnock, willow tit, spotted flycatcher, starling and bullfinch) - the cumulative ZoI extends to a land based radius of 10 km from the Moorside Site, Corkickle Site, Mirehouse Site and Egremont Site allowing assessment of cumulative effects on the potentially connected local area population (**Figure 19.4e**);
- Schedule 1 of Wildlife and Countryside Act 2006 species: Kingfisher - the cumulative ZoI extends to a land based radius of 10 km from the Moorside Site, Corkickle Site, Mirehouse Site and Egremont Site allowing assessment of cumulative effects on the potentially connected local area population (**Figure 19.4e**);
- Schedule 1 of Wildlife and Countryside Act 2006 species: Barn owl - the cumulative ZoI extends to a land based radius of 10 km from the Moorside Site, Corkickle Site, Mirehouse Site and Egremont Site allowing assessment of cumulative effects on the potentially connected local area population (**Figure 19.4e**); and
- Species occurring in regionally or nationally important numbers: Cormorant - the cumulative ZoI extends to the Cumbrian coast within 50 km of the Moorside Site, allowing assessment of cumulative effects on the regional population (**Figure 19.4f**).

19.10.4 Of the other developments described in **Chapter 3 EIA Methodology, Section 3.4,** listed in **Table 3.4** and considered in the context of **Table 3.9** in terms of ornithological effects, it is considered appropriate at this stage not to consider the following projects on the basis that they do not fall within the ornithological cumulative ZoIs, or have connectivity with the or support habits likely to support ornithological receptors identified for the Moorside Project Sites:

- 7. Barrow-in-Furness Site (BAE Systems);
- 8. Ulverston Biopharmaceutical Manufacturing Facility (GSK);
- 9. Heysham New Nuclear Power Station (EDF Energy); and
- 10. Tidal Lagoon West Cumbria (Tidal Lagoon Power).

19.10.5 Of the remaining other developments considered in **Table 3.9**, these are briefly discussed in the context of their likely interaction with respect to birds in the sub-sections below.

1. Sellafield Site Decommissioning (Sellafield Ltd/Nuclear Decommissioning Authority)

19.10.6 The Sellafield Site Decommissioning project has the potential to interact with the Moorside Project Sites with respect to a suite of terrestrial receptor cumulative ZoI for Species of Principal Importance (NERC Act 2006), Annex 1 species (short-eared owl) and Schedule 1 species (barn owl and Kingfisher). This would notably occur during the construction phase of the Moorside Project Sites, when cumulative effects could occur with respect to construction and decommissioning disturbance effects.

2. North West Coast Connections (NWCC), West Cumbria (National Grid)

19.10.7 The North West Coast Connections project is intimately related to the Moorside Project, since it would provide the connection to the UK national electricity grid for the power generated and therefore the local works would partially take place within the boundary of the Moorside Site.

19.10.8 Four 400kv transmission circuits or two double circuits would be constructed to connect Moorside Power Station to the national grid system which entails construction within Morecambe Bay.

19.10.9 It is therefore anticipated that there would be potential cumulative effects during the construction phase of the Moorside Project in relation to Species of Principal Importance (NERC Act 2006), Annex 1 species (short-eared owl) and Schedule 1 species (barn owl and Kingfisher).

19.10.10 Furthermore, with NWCC construction occurring within the intertidal coastal areas near Morecambe Bay there may be potential for cumulative effects on Morecambe Bay and Duddon Estuary pSPA, Duddon Estuary SPA and Ramsar and Morecambe Bay SPA and Ramsar (qualifying species Sandwich tern, herring gull and lesser black-backed gull).

3. Whitehaven Coking Coal Project (West Cumbria Mining)

19.10.11 This project consists of the development of a drift mine and the construction of a new railhead facility in the Pow Beck Valley Area. Although only limited information is currently available from West Cumbria Mining, it is envisaged that the operational period of the mine and railhead would overlap with the construction and operational phases of the Moorside Project and effects could include disturbance and habitat loss. This could potentially lead to cumulative effects with respect to a suite of terrestrial receptor cumulative ZoI for Species of Principal Importance (NERC Act 2006), Annex 1 species (short-eared owl) and Schedule 1 species (barn owl and Kingfisher).

4. Low Level Waste Repository, Drigg (LLWR Ltd)

19.10.12 The extensions to the low level waste repository at Drigg would also have the potential to generate disturbance and habitat loss at the same time as the Moorside Project is under construction and during at least half of its operational years which could be potentially significant with respect to

cumulative effects on Species of Principal Importance (NERC Act 2006), Annex 1 species (short-eared owl) and Schedule 1 species (barn owl and kingfisher).

5. West Cumbria Water Supply Pipeline (United Utilities);

19.10.13 Indicative timescales for this new large water pipe, new water treatment works, smaller water distribution pipes and service reservoir anticipate construction to commence in March 2017, with the project becoming operational in 2022. Whilst there are currently no planning or environmental documents associated with the project in the public domain, there is potential for the project to have cumulative effects in terms of habitat loss and disturbance for Species of Principal Importance (NERC Act 2006), Annex 1 species (short-eared owl) and Schedule 1 species (barn owl and kingfisher).

6. Walney Extension Wind Farm (Dong Energy);

19.10.14 The scheme comprises the construction of an onshore substation, cabling from this substation to the national grid and construction of a further 105 offshore wind turbines. Offshore construction is anticipated to commence in April 2016 and to be completed in December 2019.

19.10.15 Potential cumulative effects could during the construction and operational phases of the Moorside Project in the context of seabirds associated with the cumulative ZoI for Copeland Islands SPA (qualifying species, Manx shearwater) Morecambe Bay and Duddon Estuary pSPA, Duddon Estuary SPA and Morecambe Bay SPA and Ramsar (qualifying species Sandwich tern, herring gull and lesser black-backed gull) and potentially species occurring in regionally important numbers (cormorant).

19.11 Consideration of additional mitigation

19.11.1 At this stage, all of the mitigation measures, which are anticipated will be required, are incorporated into the development proposals and are considered in the assessment of effects outlined in **Section 19.8**. However, if it emerges during the preparation of the Environmental Statement that additional, non-incorporated measures, need to be considered, the relevant details will be presented in the ES.

19.12 References

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