34 AQUATIC ECOLOGY AND NATURE CONSERVATION

34.1 INTRODUCTION

34.1.1 This chapter addresses the impacts to aquatic ecology and nature conservation which are specific to the Compensation Site. The aquatic ecology and nature conservation baseline of the wider Humber Estuary is covered in *Chapter 10* of the Environmental Statement.

34.1.2 Within the Compensation Site, the only part of the site that may affect the aquatic ecology and nature conservation is the proposed managed realignment at Cherry Cobb Sands. The Old Little Humber Farm site is some distance inland and the construction works will be at least 10 m from local drains. The Old Little Humber Farm site is not protected by any nature conservation designations will have no effect on the aquatic ecology and is not considered further in this chapter.

34.2 LEGISLATION, POLICY AND GUIDANCE

34.2.1 Legislation, policy and guidance on aquatic ecology and nature conservation which are common to both the AMEP and the Compensation Site and are covered in *Chapter 10* of the Environmental Statement. The Local Plan Policy which is specific to the Compensation Site is summarised below.

Local Plan Policy

ERYC Holderness District Wide Local Plan

34.2.2 The local policy relating to nature conservation is set out in the environmental policies within ERYC's Holderness District Wide Local Plan. The relevant policies are outlined below.

34.2.3 Policy Env 5 states that the Council will only approve development proposals in the Holderness coastal zone which are not likely during the life expectancy of the development to:

- *'conflict with nature conservation policies of this plan; or*
- *preclude reasonably practical options to conserve or enhance important coastal habitats by managed retreat or soft engineering techniques.'*

34.2.4 Small scale extensions to existing development will be permitted providing the whole development meets the life expectancy criterion.

34.2.5 Policy Env 11 states that proposals for development in the estuarine coastal area must accord with Env5 and the other nature conservation policies of this plan. The Council will require a comprehensive scheme to accompany significant estuary related proposals, including environmental measures to safeguard environmental features of importance.

34.2.6 Policy Env 12 states that development proposals (either individually or in combination with others) likely to adversely affect an existing or proposed Ramsar site, SPA or SAC will be subject to rigorous examination and will only be permitted if there are overriding reasons in the national interest and there is no alternative. Where sites host a priority habitat or species (as listed in the Habitats Directive), proposals that affect those habitats or species may only be consented for reasons of human health or safety. Before any development is allowed, the Council will require developers to demonstrate that adverse effects are minimised and that commensurate efforts to compensate for unavoidable damage are made.

34.2.7 Policy Env 13 states that development proposals (either individually or in combination with others) likely to adversely affect a notified SSSI will be subject to special scrutiny and will only be permitted if the proposal is in the national interest and there is no alternative. Before any development is allowed, the Council will require developers to demonstrate that adverse effects are minimised and that commensurate efforts to compensate for unavoidable damage are made.

34.2.8 Policy Env 16 states that development proposals (either individually or in combination with others) likely to harm species protected under the Wildlife and Countryside Act 1981 and the Habitat Regulations will only be permitted if the proposal meets an identified need and there is no reasonable alternative. Before any development is allowed, the Council will require developers to demonstrate that adverse effects are minimised (as far as is reasonable). Where appropriate the Council will consider the use of conditions or planning obligations to:

- *'facilitate the survival of individual members of the species;*
- *reduce disturbance to a minimum; and*
- *provide adequate alternative habitats to sustain at least the current levels of population.'*

Others

34.2.9 The UK Biodiversity Action Plan (UK BAP), published in 1994, was the UK Government's response to the Convention on Biological Diversity; this is described in more detail in *Chapter 35*. Local BAPs are developed as a local, partnership response to the Convention on Biological Diversity. A Biodiversity Action Plan Strategy has been published for the East Riding of Yorkshire (East Riding of Yorkshire Council, 2010).

34.2.10 The Humber Management Scheme, the Humber Flood Risk Management Strategy and the Humber Estuary Coastal Habitat Management Plan are also relevant to the proposals at the Cherry Cobb Sands. These are described in *Section 10.2*.

34.3 ASSESSMENT METHODOLOGY AND CRITERIA

Overview

34.3.1 The assessment methodology for aquatic ecology and nature conservation of the impacts of the managed realignment at Cherry Cobb Sands are consistent with that used in the assessment of the AMEP site as detailed in *Chapter 10*.

Sensitive Receptors

34.3.2 For the purposes of the assessment of Cherry Cobb Sands, the following are considered to be sensitive aquatic receptors that occur within the vicinity of the site:

- habitats:
- intertidal mudflats and sandflats;
- saltmarshes.

- rare or nationally important benthic invertebrates associated with the estuary;

- diadromous fish (e.g. river and sea lamprey, eel, smelt, Atlantic salmon, sea trout and shad); and

- other fish fauna of conservation and/or commercial interest.

Significance Criteria

34.3.3 The significance criteria for Cherry Cobb Sands are determined in the same manner as for the AMEP site (see *Section 10.3*).

34.4 CONSULTATION

34.4.1 Consultation comments received that relate to aquatic ecology and nature conservation at Cherry Cobb Sands are detailed in *Annex 2.2* together with the response detailing now the comments have been addressed within the Environmental Statement.

34.5 BASELINE

Data sources

34.5.1 This section has been informed by a literature review of currently available information, including the following:

- English Nature (2003). The Humber Estuary European Marine Site, English Nature's Regulation 33 Interim Advice, April 2003;
- Hemingway, K.L., Cutts, N.D., Allen, J.H. & S. Thomson (2008). Habitat Status of the Humber Estuary, UK. Institute of Estuarine & Coastal Studies (IECS), University of Hull, UK. Report produced as part of the European Interreg IIIB HARBASINS project;
- Allen, J., Boyes, S., Burdon, D., Cutts, N., Hawthorne, E., Hemingway, K., Jarvis, S., Jennings, K., Mander, L., Murby, P., Proctor, N., Thomson, S., & Waters, R. (2003). English Nature Research Report No 547: The Humber Estuary: A comprehensive review of its nature conservation interest;
- Manning, C.J. (2006). The Humber Management Scheme;
- Black & Veatch (2010). Saltmarsh Survey (*Annex 34.1*); and
- Allen, J.H. (2006). An assessment of temporal variation of benthic invertebrate communities in the Humber Estuary. Institute of Estuarine & Coastal Studies (IECS), University of Hull, UK. Report to the Environment Agency. Report No YBB091.

Protected Sites

34.5.2 The intertidal habitats along the Cherry Cobb Sands frontage are covered by the Humber Estuary SAC and SSSI and the Humber Estuary SPA and Ramsar site designations (a full description of these sites is provided in *Chapter 11*). The designated interest features present within the vicinity that may be affected by the proposed compensation site include the following:

- Birds listed under Annex I and Annex II of the Birds Directive (see *Chapter 11*);
- Salicornia and other annuals colonising mud and sand;
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);
- Mudflats and sandflats not covered by seawater at low tide (intertidal mudflats and sandflats);
- An assemblage of threatened coastal and wetland invertebrates (Ramsar citation).

Intertidal Habitats

Saltmarsh

34.5.3 Coastal saltmarsh is a BAP priority habitat. In order to determine the extent and quality of saltmarsh at Cherry Cobb Sands, a saltmarsh survey of the intertidal frontage adjacent to the Cherry Cobb Sands site was undertaken in November 2010 (*Annex 34.1*). Whilst it is recognised that this was not the optimum time to undertake the survey, it was still possible to map the locations of three saltmarsh zones (lower, mid and upper saltmarsh) and record the general quality of the saltmarsh plant habitat along the frontage of the site.

34.5.4 The extent of saltmarsh in 2010 was compared to LiDAR data collected in 2007. This indicated that the mid and upper saltmarsh zones are relatively stable with little change in their extent since 2007 (as detailed in *Annex 34.1*). The upper saltmarsh varies in width from five metres at Stone Creek in the south of the site, up to 330 m at the Outstray in the north of the site. The width of the mid saltmarsh zone also varies in a similar manner from 60 m in the south to around 300 m in the north of the site.

34.5.5 There is dense saltmarsh vegetation cover in the upper and mid saltmarsh zones, with little or no signs of erosion, which indicates that the habitat quality is good. These zones are dominated by sea couch grass *Elytrigia atherica (Elymus pycnanthus)* with other species of note including sea plantain *Plantago maritima*, red fescue *Festuca rubra* and *Orache atriplex sp*. A network of saltmarsh creeks runs through these zones, allowing water to drain off following high tide as well as allowing freshwater from the land to discharge into the estuary.

34.5.6 The lower saltmarsh zone is extensive, stretching up to 800 m from the edge of the mid saltmarsh zone. It is thought that this zone is gradually accreting. The lower saltmarsh is dominated by 'pioneer' species including annual glasswort *Salicornia europea agg*. and common cord grass *Spartina anglica*.

Intertidal Mudflats and Sandflats

34.5.7 There is an extensive area of mudflat and sandflat stretching from the edge of the mid saltmarsh zone. This area is referred to as Foul Holme Sands. In some places saltmarsh vegetation has colonised and it may be classed as lower saltmarsh (comprising saltmarsh vegetation interspersed by mudflat). Vegetation is sparser towards the mean low tide mark where the mudflats/sandflat habitat is dominant.

Intertidal Invertebrates

34.5.8 Intertidal sediment samples were taken by the Environment Agency across the 12 locations shown on the north bank in *Figure 34.1*. Considering the north bank intertidal dataset as a whole, *Heterochaeta costata* was the most abundant species at the majority of sample sites, although not at Cherry Cobb Sands. The lowest species richness recorded was one species/sample at several sites. Species abundance across the dataset ranged between 1 and 760.

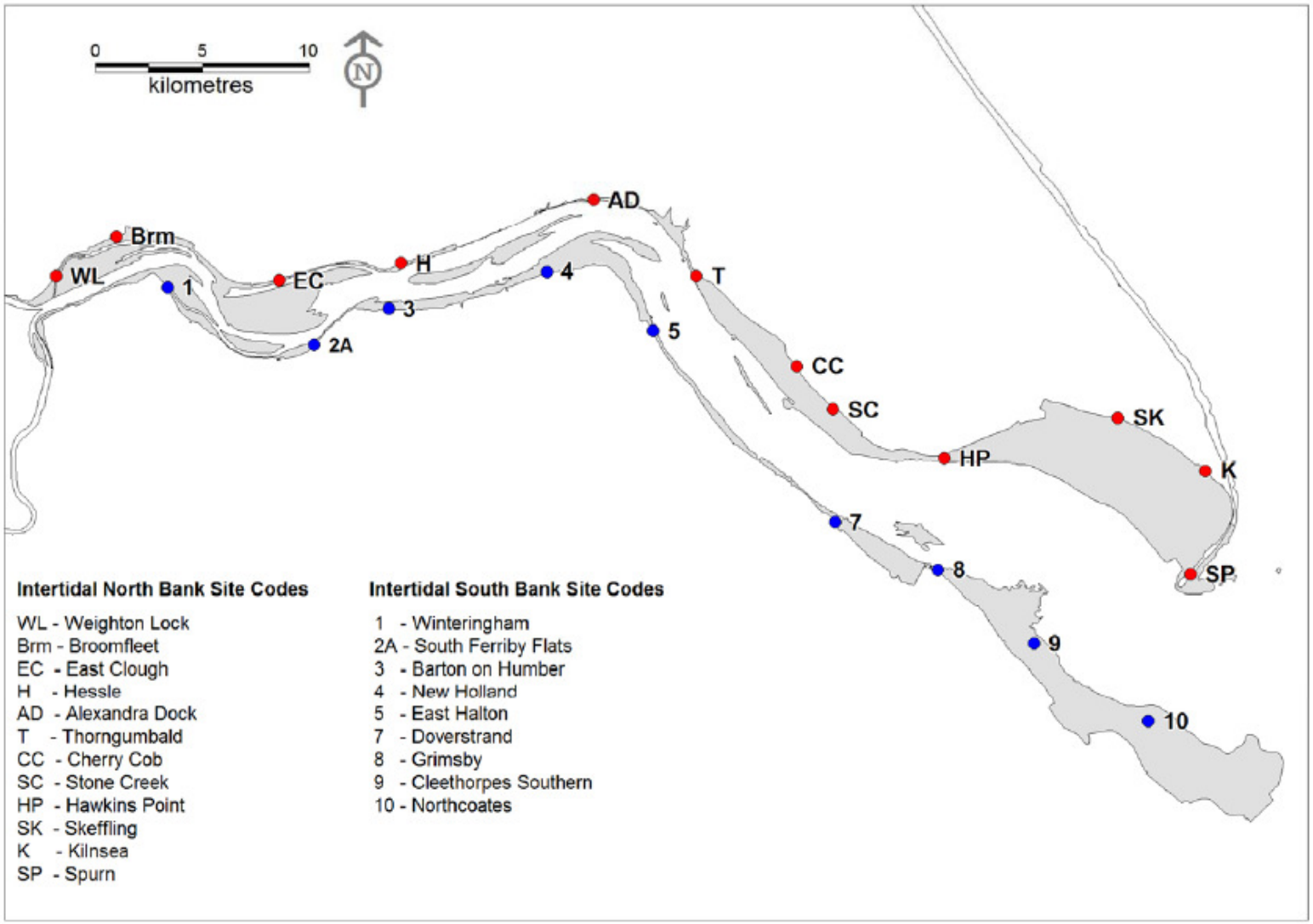
34.5.9 The most commonly occurring species in the intertidal samples of Cherry Cobb Sands site were a type of pot worm *Enchytraeidae*, sludge worms *Tubificoides benedii*, Baltic macoma *Macoma balthica* and roundworms *Nematoda*. All except the latter were found in every sample (five samples were taken each year from 2000 to 2003), as was a type of sandworm *Hediste diversicolor* (though in much smaller numbers). *Nematoda sp*. were recorded as one of the dominant species in 2001 but were not present in the 2000 or 2002 data. This was also the case for the sample sites Thorngumbald and Stone Creek, which are upstream and downstream of Cherry Cobb respectively.

34.5.10 Stone Creek had similar dominant species to those recorded at Cherry Cobb Sands but the overall abundance varied considerably with *Enchytraeidae*, *Macoma balthica* and *Nematoda* all more abundant at Cherry Cobb Sands and *Tubificoides benedii* of a considerably lower abundance at this location. Thorngumbald also had *Enchytraeidae* and *Nematoda* as dominant species but the abundance was approximately 30% of that recorded at Cherry Cobb Sands.

34.5.11 Intertidal communities of the north bank of the Humber show trends typical to estuarine communities. There is variation in species richness and abundance which is likely to be due to natural variability. Species richness of intertidal samples in proximity to Cherry Cobb Sands are typical of the middle region of the Humber Estuary. Average abundance from 2000 to 2003 may be lower than the general trend for this location, as analysis of data from 1989 to 2003 by Allen (2006), suggest higher average abundances. Samples from Thorngumbald, Cherry Cobb and Stone Creek show particular variability ranging from an average of 500 to 1757 individuals/ sample from 1989 to 2003, however it is noted that these sites show marked variability throughout the sampling programme (Allen, 2006).

Figure 34-1 Intertidal Benthic Sampling Stations on the North Bank (2000-2003)

Note Cherry Cobb Sands is shown by 'CC'. Source: Allen (2006).



Subtidal Invertebrates

34.5.12 Data on subtidal invertebrates were provided by the Environment Agency, which has collected data from the mudflats adjacent to Cherry Cobb Sands. The data are from 2008 and 2009 and cover a number of sites on the north bank from Hessle to Spurn. This analysis concentrates on two sites which are in proximity to Cherry Cobb Sands, namely Holme Ridge (521980E, 418552N) which is located on Foul Holme sands opposite Cherry Cobb Sands and Sunk Island Measured Mile (525495E, 416122N) which is located 3 km south-east of Cherry Cobb Sands. Each site was sampled three times.

34.5.13 Total average abundance at Holme Ridge and Sunk Island Measured Mile were 13 and 12 individuals per sample respectively. The most abundant species recorded at Holme Ridge were catworm *Nephtys spp*. and *Macoma balthica*. At Sunk Island Measured Mile there was also a relatively high abundance of *Nephtys spp*. as well as sand hopper *Bathyporeia elegans* and speckled sea louse *Eurydice pulchra*. The sample with the highest abundance (34 individuals/sample) was recorded at Sunk Island Measured Mile in 2009 where large numbers of *Bathyporeia elegans* and *Eurydice pulchra* were recorded. These species are typical of fine and muddy sandy shores and are widely distributed around the coasts of Britain.

34.5.14 Species richness (number of species recorded) at the two sites ranged from 3-8 species/sample with the highest species richness being recorded at Holme Ridge in 2009.

34.5.15 Species richness in intertidal and subtidal samples are typical of the middle region of the Humber Estuary and show similar trends to samples collected at the AMEP site where species richness ranged from two to nine species per sample (see *Section 10.5*).

Fish fauna

34.5.16 Fish fauna is described in *Chapter 10*. The extensive mudflat and saltmarsh habitats adjacent to Cherry Cobb Sands are likely to act as a nursery ground for juvenile fish species.

34.6 IMPACTS

Construction Phase

Intertidal Habitats

34.6.1 Construction of the breach requires excavation of saltmarsh habitat immediately in front of the defences that will be removed which will allow water to enter the site. The area of saltmarsh habitat that will be excavated is approximately 250 m wide. The width of saltmarsh at the breach location is approximately 70 m, resulting in the loss of approximately 2 ha of saltmarsh including the potential for a small additional loss of saltmarsh as a result of scour around the newly created breach. Saltmarsh is a BAP habitat and the area of saltmarsh forms part of the designated SAC, SPA and Ramsar site and therefore has high sensitivity. The area that will be lost is small in comparison to the 627 ha saltmarsh in the Humber Estuary (Environment Agency, 2005) and only comprises approximately 0.1% of the total. The loss of this saltmarsh will be compensated for within the Cherry Cobb Sands site once new saltmarsh habitat forms within the site following the breach The magnitude of effect of loss of saltmarsh is deemed to be low which results in a moderate negative significant effect.

34.6.2 Damage of saltmarsh in the immediate area around the excavated channel will be minimal as the channel will be excavated moving backwards from the seaward edge to the landward edge. By restricting movement of construction plant to the area of saltmarsh which is to be removed, damage to the saltmarsh which will remain *in situ* will be avoided and the effect on this is considered to be of negligible significance.

Benthic Invertebrates

34.6.3 Excavation of saltmarsh in front of the breach will result in the permanent loss of benthic invertebrates associated with saltmarshes within the excavated footprint. The baseline surveys did not indicate the presence of rare invertebrates and the species recorded are common to the estuarine environment and typical of the benthic community within the Humber Estuary. Benthic invertebrates are considered to have low sensitivity as they are not directly included as part of the international or national designations and although bird species rely on them as a food resource the communities are able to recover relatively quickly. The number of benthic communities that will be lost is very small in relation to the number of benthic communities in the Humber Estuary. The loss of benthic invertebrates is therefore assessed as being of low magnitude and the resulting effect is a minor negative significant effect.

Fish fauna

34.6.4 Following the initial breach there will be a localised temporary increase in suspended sediment concentration in the waters adjacent to Cherry Cobb Sands (see *Chapter 33, Section 33.6*). The Humber Estuary has an existing high concentration of suspended sediment and therefore the magnitude of effect is assessed as being low. Juvenile fish are assessed as having a medium sensitivity as although they are likely to be sensitive to change; they are mobile and are able to move away from unfavourable conditions, particularly given that there are large areas of intertidal habitat on the north bank of the Humber. The impact upon fish fauna is therefore assessed as being a minor negative significant effect.

Operational Phase

Intertidal Habitats

34.6.5 Following the initial tidal inundation of Cherry Cobb Sands, any remaining terrestrial habitats will be quickly lost (see *Chapter 35*). Based on evidence from other managed realignment sites on the Humber Estuary and elsewhere in the UK, new subtidal and intertidal habitat will become established relatively quickly following tidal inundation, with fine marine sediments being imported into the site which provide the ideal environment for flora and fauna. Subtidal and intertidal mudflat will remain in areas with higher tidal velocities, whilst in areas where velocities are low, accretion will occur and saltmarsh will begin to form as has been experienced at other managed realignment sites in the Humber (ABPmer, 2010).

34.6.6 Modelling (*Chapter 32*) predicts that by the fifth year after breaching of the site, more than 50 ha of mudflat will have developed with the remainder either developing as saltmarsh or accreting to levels at which saltmarsh is likely to start forming. Detailed design will seek to maximise the development of mudflat at the expense of saltmarsh as that is the habitat that the Compensation Site is predominantly required to deliver.

34.6.7 Creeks will drain fresh water from the land behind Cherry Cobb Sands and these may contain a higher proportion of fresh water compared to the surrounding intertidal habitats which is likely to be beneficial to a range of species including birds and invertebrates utilising the foreshore. Impacts upon waders and wildfowl are covered in *Chapter 35*.

34.6.8 Following the initial breach of the managed realignment site, there will be a temporary increase in suspended sediment as soils from agricultural land enter the estuarine waters in the vicinity of the site. This may lead to increased levels of deposition on mudflat and saltmarsh habitats, resulting in

an increased rate of accretion. There is also potential of smothering of saltmarsh plants leading to die off. Considering the very high concentration of suspended sediment in the Humber Estuary the magnitude of this effect is considered to be very low and the sensitivity of intertidal habitats is considered to be low, resulting in an impact of negligible significance.

Benthic Invertebrates

34.6.9 Following inundation of the site, intertidal habitats will become established. Concurrently benthic invertebrates will colonise these habitats and this will provide additional opportunities for benthic invertebrate communities to colonise. With suitable source communities close by in the existing estuarine mudflats, this is likely to happen fairly quickly. Experience at Paull Holme Strays has shown that after five years species richness is comparable to that outside the managed realignment site (20 species recorded inside the site and 21 species recorded outside the site in 2008) which is typical of that of a middle estuary community (Environment Agency, 2009). It is noted that there are still differences within the communities and that the mean values of species richness, abundance and diversity were found to be slightly lower inside the site compared to outside. The biomass of communities however is more or less equal as bigger species are found inside the site compared to outside (Environment Agency, 2009). This is partly due to the difference in sediments within the site, which as former agricultural soil will be nutrient rich and will therefore be colonised by different invertebrate species as it will have different physical and chemical properties compared to the sediments outside the managed realignment site. The 2008 survey at Paull Holme Strays suggests that the communities inside are not yet fully developed, although the rate of change inside the site has slowed since 2006.

34.6.10 Development of benthic communities is related to elevation, tidal inundation and, to a lesser extent, accretion. Colonisation was found to be greatest in areas of moderate accretion but is limited in areas of excessively high accretion. The site is expected to evolve to retain subtidal and intertidal mudflat in areas where tidal velocities are high which will allow benthic communities to develop comparable diversity to that outside the site, as has been recorded at Paull Holme Strays.

34.6.11 The effect of creating new opportunities for benthic invertebrate communities to colonise is localised and of low magnitude and therefore the effect is assessed as being a minor positive significant effect.

Fish fauna

34.6.12 Changes in sediment dynamics during the operational phase of Cherry Cobb Sands are not anticipated to affect fish feeding or breeding which may be associated with the mudflat and saltmarsh habitats adjacent to the site (also

refer to *Chapter 12*). This impact is therefore assessed as being of negligible significance.

34.7 CUMULATIVE IMPACTS

Construction Phase

34.7.1 As noted for water and sediment quality in *Chapter 33*, given the distance of Cherry Cobb Sands from proposed development schemes on the south bank of the Humber Estuary, and the existing high sediment load in the estuary there are no likely cumulative impacts relating to water and sediment quality during construction. As a result, there are no likely cumulative impacts upon aquatic habitats and species resulting from cumulative water and sediment quality impacts during construction.

Operation Phase

34.7.2 The creation of intertidal and subtidal habitat at Cherry Cobb Sands will balance out the losses of intertidal and subtidal habitat (and associated species) caused by construction of AMEP. It is likely therefore that the combined effects of the AMEP and Cherry Cobb Sands upon aquatic ecology will be to neutralise the negative impacts of AMEP, resulting in minimal cumulative effects.

34.8 MITIGATION MEASURES

34.8.1 Following the creation of the managed realignment at Cherry Cobb Sands the key nature conservation interests remaining within the vicinity of the site are likely to be water birds utilising the site. In order to assess the effective implementation of the site, monitoring of the site for bird species, invertebrates and other nature conservation features will be undertaken in accordance with a strategy and programme to be developed in consultation with the Regulators.

34.8.2 Monitoring surveys for invertebrates, wetland bird species and habitats would be broadly similar to those undertaken for the Humber managed realignment sites of Chowder Ness and Welwick (ABPmer, 2010) although further tailoring of effort closer to the time would be required.

34.8.3 Able will develop and implement a management plan for the future management and maintenance of Cherry Cobb Sands. The management plan will be developed in consultation with the regulators.

34.9 RESIDUAL IMPACTS

Construction Phase

34.9.1 The removal of a small amount of saltmarsh is unavoidable during construction, therefore there remains a temporary minor negative significant impact on the existing saltmarsh habitats from excavation of a channel.

Operational Phase

34.9.2 The creation of intertidal habitats, including saltmarsh, and provision of new opportunities for benthic invertebrate communities to colonise are considered to be localised effects of low magnitude, resulting in a minor positive significant effect as far as aquatic ecology is concerned.