

33 WATER QUALITY AND SEDIMENT QUALITY

33.1 INTRODUCTION

33.1.1 This chapter addresses the issue of water and sediment quality and details the assessment of the impacts on water and sediment quality which are specific to the Compensation Site. The water and sediment quality baseline of the wider Humber Estuary is covered in *Chapter 9*. This chapter also includes an assessment of impacts in relation to the Water Framework Directive (WFD) Assessment.

33.2 LEGISLATION, POLICY AND GUIDANCE

33.2.1 Legislation, policy and guidance on water and sediment quality are common to both the AMEP and the Compensation Site and are covered in *Chapter 9*. There are no specific policies relating to water and sediment quality in the ERYC Local Plan.

33.3 ASSESSMENT METHODOLOGY AND CRITERIA

Overview

33.3.1 The methodology for assessing impacts on water and sediment quality as a result of the Compensation Site are consistent with that used in the assessment of the AMEP site, which are described in *Chapter 9* of the Environmental Statement.

33.4 CONSULTATION

33.4.1 Consultation comments received that relate to water and sediment quality at Cherry Cobb Sands are detailed in *Annex 2.2* together with a description of how the comments have been addressed within the Environmental Statement.

33.5 BASELINE

Overview

33.5.1 This Section identifies the existing water quality characteristics of the surface water and groundwater within and adjacent to Cherry Cobb Sands and Old Little Humber Farm. Water quality is assessed as part of the Environment Agency's monitoring programme. As the competent

authority in England and Wales, the Environment Agency is responsible for delivering the Water Framework Directive (WFD) through the Water Environment (WFD) (England and Wales) Regulations 2003. Rivers, estuaries and coastal waters are designated as 'water bodies' under the WFD and the impacts on these are assessed in relation to the objectives of the WFD, which is to achieve 'good' status of surface waters and groundwater.

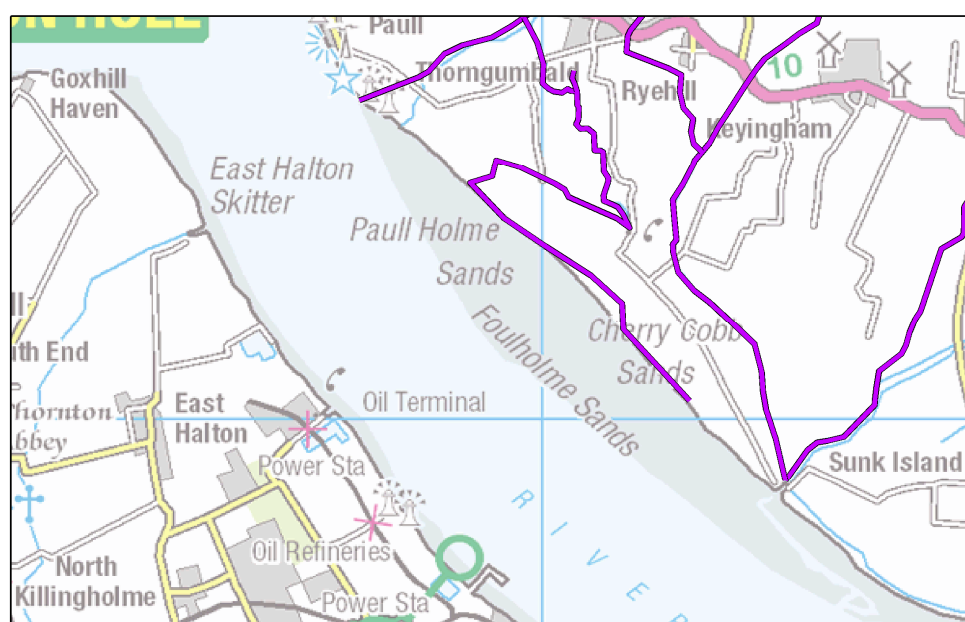
33.5.2 This Section also sets out the sediment quality of intertidal and subtidal areas adjacent to Cherry Cobb Sands. Although no discrete samples have been collected, the likely baseline has been derived using relevant studies, including one from the nearby Paull Holme Strays managed realignment site.

Water Quality

Surface Water

33.5.3 A WFD surface water body lies within Cherry Cobb Sands and runs adjacent to the east side of Old Little Humber Farm, named the "Little Humber Area". This water body is the soke dyke behind the existing flood defence. Keyingham drain, located 100 m from the Cherry Cobb Sands, is also designated a WFD surface water body known as "Sands/Keyingham/ Roos Drain from Source to Humber". The location of these water bodies are shown in *Figure 33.1*. The details of the classification and attributes of these water bodies are given in *Table 33.1*.

Figure 33.1 WFD water bodies within and adjacent to the compensation site



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Table 33.1 *Surface water bodies ecological and chemical quality*

WFD parameter	Little Humber Area	Sands/Keyingham/Roos Drain from Source to Humber
Water body ID	GB104026066550	GB104026067230
Management catchment	Hull and East Riding	Hull and East Riding
River Basin District	Humber	Humber
Typology description	Low, extra small, calcareous	Low, small, calcareous
Hydromorphological status	Artificial	Artificial
Current ecological quality	Moderate potential	Moderate potential
Current chemical quality	Does not require assessment	Does not require assessment
2015 predicted ecological quality	Moderate potential	Moderate potential
2015 predicted chemical quality	Does not require assessment	Does not require assessment
Overall risk	At risk	At risk
Protected area	Yes	Yes
No. of measures listed (water body level only)	0	0
Overall biological quality	-	Bad
Macroinvertebrates	-	Bad
Overall physico chemical quality	-	Moderate
Ammonia	-	Moderate
Dissolved oxygen	-	Poor
pH	-	High
Phosphate	-	Poor
Overall Hydromorphological quality	Not high	Not high
Hydrology	High	Not high
Overall specific pollutants quality	-	Moderate
Ammonia	-	Moderate
Copper	-	High
Zinc	-	High
Mitigation measure assessment	-	Moderate

Source: Environment Agency (2010)

33.5.4 Both water bodies are classified as Artificial Water Bodies (AWB) as they have been created in a location where no water body existed before. These water bodies are classed as having moderate ecological potential (rather than ecological status which applied only to natural water bodies). Ecological status/potential is recorded on a scale of high, good, moderate, poor or bad. "High" denotes largely undisturbed conditions and the other classes represent increasing deviation from this undisturbed, or reference, condition. The Humber River Basin Management Plan (RBMP) (Environment Agency, 2009) which sets out the requirements of the WFD has determined that the chemical water quality does not require assessment in either of the surface water bodies.

33.5.5 In addition to the designated WFD water bodies there is also an undesignated drain (known as Cherry Cobb Sands Drain) which runs parallel to Cherry Cobb Sands Road from north-west to south-east and discharges into Stone Creek. This drain collects run-off from the road and drainage from the surrounding agricultural land. As it is an undesignated drain there is no water quality data available from the Environment Agency.

Groundwater

33.5.6 There are no source protection zones within 2 km of the proposed Compensation Site and therefore it is considered that no source protection zones will be affected by the works at either Cherry Cobb Sands or Old Little Humber Farm.

33.5.7 There is one WFD groundwater body within the Compensation Site study area, namely “Hull and East Riding Chalk”. The details of the classification and attributes of this water body are given in *Table 33.2*.

Table 33.2 *Groundwater chemical water quality*

WFD parameter	Hull and East Riding Chalk
Water body ID	GB40401G700700
Management catchment	Hull and East Riding
River Basin District	Humber
Current quantitative quality	Poor
Groundwater dependent terrestrial ecosystems (quantitative impacts)	Good
Impact on surface waters	Good
Saline or other intrusions	Poor
Resource balance	Good
Current chemical quality	Poor
Upward chemical trend	Yes
2015 predicted quantitative quality	Poor
2015 predicted chemical quality	Poor
Overall risk	At risk
No. of measures listed (water body level only)	3

Source: Environment Agency (2010)

33.5.8 The Hull and East Riding Chalk water body is a primary chalk aquifer which is overlain by around 20 to 25 m of marine and estuarine alluvium and 1 to 5 m of more recent deposits (see *Chapter 31, Section 31.5*). The primary chalk aquifer is assessed as being not vulnerable as a result of the depth of the aquifer from the surface.

33.5.9 There are two areas which are classed as 'secondary aquifers', one which is located on the saltmarsh north of Cherry Cobb Sands and another located to the east of Stone Creek (see *Chapter 31, Section 31.5*). It is considered unlikely that these areas support groundwater supply (and they are not exploited for this); however there is high potential for leaching into these aquifers as they are relatively close to the surface.

Abstractions and Discharges

33.5.10 There are no licensed abstractions within 2 km of either Cherry Cobb Sands or Old Little Humber Farm (Environment Agency, *pers.comm.*, 7 Jan & 7 Dec 2011). The closest discharge consents are held by Yorkshire Water Services Ltd. although these are over 4 km from the site at Keyingham Waste Water Treatment Works and Ottringham Drain.

Protected Areas

33.5.11 The WFD considers water quality in relation to protected areas. Protected areas include areas designated for:

- the abstraction of water intended for human consumption (see *Paragraph 33.5.8*);
- the protection of economically significant aquatic species (see *Paragraph 33.5.13*);
- recreational waters, including areas designated as bathing waters under Directive 76/160/EEC (see *Paragraph 33.5.14*);
- nutrient sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC (see *Paragraph 33.5.10*);
- the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites (see *Paragraph 33.5.11*)

33.5.12 Commercial shellfish operations at Cleethorpes and Grimsby are currently closed but may be brought back into operation. These areas are not likely to be affected by the managed realignment at Cherry Cobb Sands due to the sites being over 13 km south-east.

- 33.5.13 The closest area designated under the Bathing waters Directive is Cleethorpes Beach which lies approximately 13 km south-east of the Cherry Cobb Sands, which given this distance is not likely to be affected by the scheme.
- 33.5.14 There are no nitrate sensitive areas within the Humber Estuary or surrounding area to the Compensation Site and therefore it is considered that no nitrate sensitive areas will be affected by the Compensation Site.
- 33.5.15 The Humber Estuary SPA, SAC and Ramsar Site lie adjacent to the Cherry Cobb Sands as detailed in *Chapter 35*.
- 33.5.16 A contaminated Land risk assessment was undertaken in August 2011, which included the results of an investigation of 14 trial pits, 12 cone penetrometer tests and a cable percussion borehole (*Annex 31.4*). The results of the chemical analysis of samples taken did not reveal elevated levels of any contaminants, apart from elevated levels of copper, lead, zinc and total petroleum hydrocarbons (likely diesel and / or acetone) at two locations (TP11 and TP12). These two sampling locations include the area of historic landfill in the north western fields, which are just outside of the proposed compensation site. Whilst all of the samples taken within the proposed compensation site are classed as uncontaminated based on recent soil guideline values issued by the Environment Agency, the total absence of any contamination within the site cannot be guaranteed since the sites were limited to a certain degree because of the restricted access to the land during the survey.
- 33.5.17 The contaminated land risk assessment (*Annex 31.4*) considered the risk that previously unknown areas of contamination might be present within Cherry Cobb Sands. This risk was highlighted in the consultation response from Hickling Gray Associates (*Annex 2.2*). A geophysical survey (*Annex 40.3*) identified magnetic anomalies within the Cherry Cobb Sands site in areas where aerial photographs and old mapping showed creeks used to exist. The contaminated land Risk Assessment (*Annex 31.4*) notes that some of these channels appear to have been backfilled with highly magnetic material.
- 33.5.18 The proposed risk management strategy (*Annex 31.4*) is to carry out a secondary ground investigation prior to commencement of the works, if consented. If no contamination is found, machine operators will still be instructed to stop immediately if they subsequently encounter evidence of contamination during construction works.

33.5.19 If evidence of contamination is identified either through site investigation or during excavation, the material will be removed and subject to bio-remediation. Depending on the type of contamination and the outcome of the bioremediation the material will either be reused on site but buried so it will not be exposed to controlled waters or removed and disposed of in a licensed facility.

Sediment Quality

33.5.20 The intertidal and subtidal zones along the south-west facing shore of the Cherry Cobb Sands are characterised by mudflats that consist of estuarine silts, sands, and gravels. *Chapter 32* presents information on the dynamics of the sediments adjacent to Cherry Cobb Sands, whilst this section is concerned with the chemical quality of the estuarine sediments.

33.5.21 This assessment has been informed by a study undertaken at the nearby Paull Holme Strays managed realignment site which lies 4 km north of the Cherry Cobb Sands. The sediments at Paull Holme Strays were sampled in 2009 as part of a discrete sampling programme (Bone, 2010). The characteristics of sediments at this site are likely to be very similar to sediments adjacent to Cherry Cobb Sands due to the close proximity of sites on the north bank of the Humber and the similar orientation and surrounding agricultural land use that are likely to influence these sites.

33.5.22 Total metal concentrations of sediments at Paull Holme Strays are given in *Table 33.3*. As the UK does not have sediment quality guidelines, the results from this study are compared with Cefas guideline action levels for the disposal of dredged material and also the Canadian Sediment Quality Guidelines as detailed in *Table 9.9* of *Volume 1*.

Table 33.3 Total metal concentrations in sediments collected from mudflats at Paull Holme Strays (Bone, 2010).

Metal	Total concentration (mg per kg)	UK Cefas Action level 1 guidelines	Canadian Guidelines
Chromium	8.21	40	52.3
Copper	7.14	40	18.7
Lead	11.27	50	30.2
Nickel	6.71	20	15.9
Zinc	36.52	130	124

33.5.23 The Humber Estuary has been subject to contamination from a number of industrial and urban sources (see *Section 9.5*). This means that sediments within the estuary typically contain trace metals, polychlorinated biphenyls (PCBs), hydrocarbons, and tributyltin (TBT).

As described in *Paragraph 9.5.26*, sediments are transient within the system as a result of tides, currents, bioturbation, and maintenance dredging and this may contribute to the dispersal of contaminants within the estuarine system. Despite the history of contamination in the Humber Estuary, sediment quality data from Paull Holme Strays suggest that sediments local to Cherry Cobb Sands will have contaminant concentrations below Cefas and Canadian guideline action levels.

33.6 *IMPACTS*

Water Quality

Construction Phase

33.6.1 The impacts on water quality during the construction stage of the Cherry Cobb Sands and Old Little Humber Farm comprise:

- Disturbance of sediments (associated with the marine environment) and soils (associated with the terrestrial environment) leading to increased turbidity of estuarine waters and watercourses and mobilisation of contaminants present within the sediment and soils;
- Potential leaks or spills of oil or fuel from construction vehicles leading to contamination of estuarine waters and watercourses;
- Water quality impacts from realignment of existing soke dyke; and
- Potential impacts on groundwater quality.

Surface Water

33.6.2 It is possible that contaminated material may be encountered during the works to re-profile Cherry Cobb Sands during construction of the new flood embankments, or the wet grassland at Old Little Humber Farm. Soils within the site may be considered to be contaminated as it is likely that pesticides or fertilisers will have been used on agricultural land, although the chemical results from the recent trial pits at Cherry Cobb Sands do not indicate any degree of contamination within the site.

33.6.3 Mobilisation of contaminated soils from Cherry Cobb Sands could lead to pollution of estuarine or riverine waters. Typically, during the first few floods of a new managed realignment scheme there is a flush of contaminants into the estuarine environment. The more water soluble compounds will be washed from the soil into the tidal water and

diluted in the estuary relatively rapidly, whereas the more hydrophobic compounds will be associated with the organic fraction within the soils and will be more persistent. Subsequent erosion of the soils within the site will cause a proportion of these contaminants to become mobilised, associated with the suspended sediment fraction in the water and these contaminants may accumulate in areas of deposition. The sensitivity of the receiving estuarine waters to contaminants is considered to be medium as there are no designated shellfish waters or other sensitive waters that would be affected by a short term increase in contaminants. The magnitude of effect is assessed as being medium taking into consideration the quantity and type of pollutants which are likely to be flushed into estuarine waters. This results in a moderate negative significant effect.

33.6.4 Following the initial breach a small amount of agricultural soils washed from inside the managed realignment site, will enter the estuarine waters in the vicinity of the site. Soils will be relatively mobile as a result of reprofiling of the site and construction of new flood embankments and will wash into the estuary causing a localised temporary increase in suspended sediment concentration. Increased suspended sediment concentrations can affect light penetration and can depress dissolved oxygen levels as well as potentially impacting suspension feeding invertebrates and fish (these impacts are assessed in *Chapter 34*). The Humber Estuary is assessed as having low sensitivity to increases in suspended sediment concentration given that it is a large macro-tidal water body with existing very high concentrations of suspended sediment (see *Chapter 9, Paragraph 9.5.13*). The magnitude of the impact is assessed as being low given the relatively small size of Cherry Cobb Sands and the likely area that would be affected compared with the size of the estuary, therefore resulting in a negligible effect.

33.6.5 Excavation of an area of saltmarsh in front of the breach location in the existing embankment is likely to lead to a temporary increase in suspended sediment concentration in estuarine waters in the immediate vicinity of the excavation (see *Chapter 34*). The area of saltmarsh to be removed is approximately 2 ha, however this sediment will not all wash out into the estuary and therefore this is assessed as being of a low magnitude. The estuary is considered to have low sensitivity to increases in suspended sediment concentration (*Chapter 33, Paragraph 33.6.3*); the overall impact is assessed as being a temporary moderate negative significant effect.

- 33.6.6 There is potential for leaks or spills from construction vehicles during regular refuelling and maintenance of vehicles which would lead to contamination of soils from within both Cherry Cobb Sands and Old Little Humber Farm leading to subsequent pollution of estuarine waters following the breach at Cherry Cobb Sands. There is also potential for leaks or spills to enter watercourses directly if they are working in proximity to rivers or drains, or in the intertidal area when excavating the saltmarsh in front of the breach. Depending on the extent of pollution this could impact on WFD objectives (e.g. to achieve good ecological potential or status in WFD water bodies). The resulting impacts are likely to be temporary in nature as fuels and oils would be dispersed once they enter estuarine waters. The magnitude of effect is likely to be low in respect of the number of plant on site, however without any mitigation measures the overall impact is assessed as being a temporary minor negative significant effect.
- 33.6.7 Construction of the managed realignment scheme will require the diversion of part of the Little Humber Area WFD water body which is a soke dyke running behind the existing flood embankment. The diversion route is described in *Chapter 28*. The soke dyke will be recreated in as similar manner as possible to the existing soke dyke.
- 33.6.8 The existing Little Humber Area water body is approximately 8.5 km in length. The reach of water body that will be lost and recreated is approximately 1.5 km (around one fifth of the length of the water body). Excavation of a new channel and rerouting of the channel through newly cut earth will contribute to a temporary increase in suspended sediment concentration in the Humber Estuary (see *Paragraph 33.6.2*), but is unlikely to affect the upstream reaches of the Little Humber Area water body due to the direction of flow which is from north-west to south-east.
- 33.6.9 In the reach of water body that will be lost through diversion of the watercourse, chemical and biological parameters will be wholly altered, as it will become part of the intertidal system within the managed realignment. Chemical and biological parameters in the remainder of the water body are unlikely to be affected as they are upstream of the reach that will be lost. The overall hydromorphological quality of the Little Humber Area will be affected as a result of the loss and recreation of around a fifth of the length of the water body. The newly created section of the water body will be an artificial drainage channel, and as the existing water body is classified as an “artificial” water body, it is not considered that this would lead to deterioration in WFD status. The sensitivity of the water body is assessed as being low as it is already an artificial water body and the magnitude of change is assessed as being

low based on the length of the water body that is being diverted, resulting in a minor negative significant effect.

- 33.6.10 The reach of the Little Humber Area water body that passes Old Little Humber Farm is unlikely to be affected by the construction activity as the re-profiling works will be more than 10 m from any of the drains within the site.
- 33.6.11 Under the WFD artificial water bodies often have associated mitigation measures which, once in place, will facilitate the achievement WFD objectives. However, the Little Humber Area water body does not have any mitigation measures however and therefore it is not possible to assess whether these will be impacted by the scheme.
- 33.6.12 The Sands/Keyingham/ Roos Drain from Source to Humber will not be affected by the proposed scheme as it lies 100 m outside Cherry Cobb Sands to the north and has its outfall via a sluice at Stone Creek. This sluice prevents any estuarine water from entering the water body (thereby preventing any impacts from increased suspended sediment concentration in estuarine waters).

Groundwater

- 33.6.13 Given the depth of the Hull and East Riding Chalk water body, this primary aquifer is not vulnerable to contaminants or pollutants leaching through the soil during construction works and therefore there will be no significant effect on the groundwater body or resource.
- 33.6.14 The secondary aquifers are vulnerable to exposure to contaminants or pollutants resulting from construction activities as any water or pollutants can reach the aquifer from spills or leaks at ground level. However the existing flood embankments will act to protect the secondary aquifer from any leakages or spillages and therefore the effect from the Compensation Site is deemed to be not significant.

Protected Areas

- 33.6.15 The condition of the SSSI units which comprise the Humber Estuary SPA, SAC and Ramsar site are used to assess the current water quality of the parts of the international sites which are in proximity to the Compensation Site. The relevant Humber Estuary SSSI unit is classed as 'Unfavourable recovering' due to a sag in dissolved oxygen levels within the Lower Humber Unit, which covers the mudflats and sandflats adjacent to Cherry Cobb Sands. The impacts relating to increases in suspended sediment concentration are covered in *Paragraph 33.6.2*. It is considered that the increase in suspended sediment could

potentially result in a small decrease in dissolved oxygen concentration due to reduced light levels suppressing primary production, which could impact fish and invertebrates (impacts associated to these are covered in *Chapter 34*).

Operational Phase

- 33.6.16 A potential impact on water quality during the operation of the managed realignment is from disturbance of sediments leading to increased turbidity of estuarine waters. As the site evolves localised erosion which may lead to an increased level of suspended sediment, particularly in the first year following the breach, although this impact will reduce over time as the site moves towards equilibrium and sediments settle out of suspension and accrete within the site. The impacts of increased suspended sediment are the same as detailed for construction impacts in *Paragraph 33.6.2* although impacts will be of a slightly longer duration.
- 33.6.17 The possibility exists for the water quality in the Cherry Cobb Sands Drain to be affected once the managed realignment is operational due to saline seepage into the existing freshwater ditch. However this will be minimised through careful design of the embankment and diversion of the existing soke dyke which will collect any saline seepage coming through the new flood embankment.
- 33.6.18 The water quality of the reach of the Little Humber Area water body adjacent to Old Little Humber Farm is unlikely to be affected by the presence of the wet grassland.

Sediment Quality

Construction Phase

- 33.6.19 During the earthworks for the new embankment and re-profiling of the Cherry Cobb Sands and the creation of wet grassland at Old Little Humber Farm there is potential for leaks or spills from construction vehicles during regular refuelling and maintenance of vehicles. This would lead to the contamination of soils within the Compensation Site and subsequent pollution of estuarine waters and sediment following the breach. Impacts relating to this are covered in *Paragraph 33.6.4*.

Operational Phase

- 33.6.20 Once sediment begins to accrete within the managed realignment site, the site may act as a sink for sediments (some of which may be

contaminated). This could potentially have a positive benefit for removal of metals and other contaminants from the water column. Historically, reclamation of wetland areas for agriculture has reduced the number of natural sediment sinks within the Humber Estuary. Re-creating this opportunity is of low magnitude (given the size of the site) and the Humber Estuary has low sensitivity to contaminants as it is a large macro-tidal estuary; however the effect is still assessed as being of minor positive significance.

- 33.6.21 Total metal concentrations at Paull Holme Strays derived from Bone (2010) are all well below guideline levels (Cefas guideline action levels for the disposal of dredged material and the Canadian Sediment Quality Guidelines). Over many years, storage of contaminated sediments could lead to an increase in contaminant concentrations within Cherry Cobb Sands above guideline levels however given the existing metal concentration of sediments this effect is considered to be of negligible significance and would only become a problem if the newly created mudflats or saltmarsh were to be eroded and the contaminants remobilised.
- 33.6.22 Sediments within the Little Humber Area water body adjacent to Old Little Humber Farm are unlikely to be affected by the presence of the wet grassland.

33.7 *CUMULATIVE IMPACTS*

Water Quality

Construction Phase

- 33.7.1 Several proposed developments are located adjacent to the south bank of the Humber Estuary, approximately 4 km away. It is likely that a few of the schemes on the south bank will have localised impacts upon water quality during construction through potential spillages and increased suspended sediment concentration. Given the distance of the Compensation Site from the proposed schemes on the south bank, and the existing high sediment load in the Humber Estuary, it is unlikely that there will be cumulative impacts upon water quality from construction of these schemes.
- 33.7.2 The construction of the Humber Gateway cable trench through the Old Little Humber Farm site should not affect water quality, assuming it will be carefully managed. In combination effects are therefore unlikely to have any extra effects on the Little Humber Area water body above

those associated with the individual projects, even if carried out at a similar time.

Operation Phase

- 33.7.3 Localised increases in turbidity and suspended sediment during operation of the Compensation Site, particularly during the first year following the breach at Cherry Cobb Sands, are not likely to act in combination with the effects of other development proposals to cause cumulative impacts, given the distance of the Compensation Site from the proposed schemes on the south bank, and the existing high sediment load in the Humber Estuary, as noted above.

Sediment Quality

Construction Phase

- 33.7.4 As discussed above for water quality, given the distance of the Compensation Site from the proposed schemes on the south bank (approximately 4 km), and the existing high sediment load in the Humber Estuary there are no likely cumulative impacts relating to sediment quality during construction.
- 33.7.5 As discussed above for water quality, in combination sediment effects associated with the crossing of the Old Little Humber Farm site by the Humber Gateway trench are unlikely to be increased by the presence of the two projects.

33.8 *MITIGATION*

Water Quality

Construction Phase

- 33.8.1 As with any construction site, the potential exists for deterioration in surface and ground water quality as a result of accidental spillage of fuels and oils from construction plant. During the construction phase, the Pollution Prevention Guidelines, as published by the Environment Agency and the guidance provided by CIRIA (2010) will be adhered to.
- 33.8.2 Specific mitigation measures include:
- Oils and fuels must be stored in sealed containers in a safe bunded area of the site away from any water;

- Site staff must be briefed to highlight the need for very tight control of potentially polluting chemicals; and
- Clean-up procedures must be in place and ensure that there is provision of soak-up materials and containment booms in the event of accidental spillages of oils and fuels.
- When working in the intertidal area work must only be undertaken at low water and all machinery moved to a designated 'dry' area each tide.

33.8.3 With mitigation measures in place, the potential for pollution of surface and groundwater from leaks or spills is minimised and the impact is considered to be negligible.

33.8.4 Information on the potential contaminants that may be present in the soil at Cherry Cobb Sands has been gained from an initial Site Investigation (*Annex 31.3*). The conclusion of the Site Investigation was that the majority of the soils at the site do not contain visual or olfactory evidence of contamination and do not contain contaminants in elevated concentrations (*Annex 31.3*). However this Site Investigation did not analyse the presence of pesticides and fertilisers. Prior to construction there will be an additional Site Investigation which will further inform the understanding of the chemicals which may be washed into the Humber during the first few tidal floods of the site.

33.8.5 A further Site Investigation will determine the presence and type of contaminated material prior to onset of works so that as far as possible any earthworks in this area can be avoided. This will minimise the risk of encountering contaminated materials during the works and thus the risk of pollution of estuarine or riverine waters and therefore the magnitude of effect is determined to be low and the resulting significance is reduced to a minor negative effect.

33.8.6 Removal of saltmarsh in front of the breach and excavation of the breach will be completed during periods of low tide to allow loose soils and sediment to be removed from the site before the area of excavation is inundated. This will minimise the suspension of sediment and soils from the excavations. The final stage of works to create the breach will be undertaken on a neap tide in order to reduce the area over which surface waters are likely to experience an increase in suspended sediment concentrations. This will allow material to settle out of suspension faster than on a spring tide, where the tidal range would be larger.

33.8.7 Consultation with the Environment Agency during the detailed design stage will inform the design of the new soke dyke to ensure it has similar or improved conditions compared with the existing soke dyke and to gain advice on measures to maintain or improve WFD status of the Little Humber Area water body.

Sediment Quality

Construction Phase

33.8.8 To mitigate for the potential contamination of soils through accidental spillage of fuels and oils from construction plant the Pollution Prevention Guidelines, as published by the Environment Agency and the guidance provided by CIRIA (2010) will be adhered to. With mitigation measures in place as described in *Paragraph 33.8.2*, the potential for pollution of surface and groundwater from leaks or spills is minimised and the impact is considered to be negligible.

33.9 RESIDUAL IMPACTS

Water Quality

Construction Phase

33.9.1 The temporary increase in suspended sediment concentrations as detailed in *Paragraphs 33.6.2 and 33.6.3* cannot be mitigated for and is assessed as being a temporary minor negative significant effect.

33.9.2 The increase in suspended sediment concentrations will persist for some years during the operation of the Compensation Site as detailed in *Paragraph 33.6.14*, however given the high suspended sediment environment of the Humber Estuary this is assessed as having a negligible effect.