Immingham Green Energy Terminal

TR030008

Volume 6

6.2 Environmental Statement

Chapter 17: Marine Water and Sediment Quality

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.2 Environmental Statement

Chapter 17: Marine Water and Sediment Quality

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Author	Associated British Ports Air Products BR

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Table of contents

Tables

17 Marine Water and Sediment Quality

17.1 Introduction

17.1.1 This chapter presents the findings of the assessment of the likely significant effects of the Project on Marine Water and Sediment Quality. It focuses specifically on changes in marine water and sediment quality as a result of piling, capital and maintenance dredging and disposal, as well construction-related accidental spillages.

17.1.2 The interrelationships related to the potential effects on Marine Water and Sediment Quality are addressed in the following chapters **[TR030008/APP/6.2]**:

a. **Chapter 9: Nature Conservation (Marine Ecology)**

b. **Chapter 16: Physical Processes**

c. **Chapter 22: Major Accidents and Disasters**

17.1.3 This chapter is also supported by the following figures **[TR030008/APP/6.3]**):

a. **Figure 17.1**: Water Framework Directive ("WFD") water bodies

b. **Figure 17.2**: WFD protected areas

c. **Figure 17.3**: Water sampling location

17.1.4 Relevant aspects of the Marine Water and Sediment Quality assessment presented in this chapter will inform the WFD Compliance Assessment which will be prepared and included in the Environmental Statement ("ES") (**Appendix 17.A [TR030008/APP/6.4]**), and also the **Habitats Regulations Assessment** ("HRA") **[TR030008/APP/7.6]**.

17.2 Consultation and Engagement

17.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the Marine Water and Sediment Quality assessment, and the approach and methods to be followed. The Scoping Report (**Appendix 1.A [TR030008/APP/6.4]**) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on Marine Water and Sediment Quality. A Scoping Opinion was adopted by the Secretary of State on 10 October 2022 **[TR030008/APP/6.4]**.

17.2.2 The first Statutory Consultation took place between 9 January and 20 February 2023 in accordance with the Planning Act 2008 ("The Act"). The Applicant prepared a Preliminary Environmental Information Report ("PEI Report"), which formed part of the consultation.

17.2.3 Through consideration of the responses to the first Statutory Consultation, the developing environmental assessments and through ongoing design-development and assessment, a series of changes within the Project were identified. A second Statutory Consultation took place between 24 May and 20 July 2023 in accordance with the 2008 Act and a PEI Report Addendum formed part of the consultation.

17.2.4 The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised via the formal scoping opinion (**Appendix 1.A [TR030008/APP/6.4]**) and in response to the formal consultation and other pre-application engagement is summarised in **Table 17-1** . The full responses to consultation comments are included within the Summary of Consultation Responses document **[TR030008/APP/5.1]**.

Table 17-1 Stakeholder consultation on marine water and sediment quality

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
Scoping Opinion, 10 October 2022	Planning Inspectorate	The Scoping Report seeks to scope changes to levels of contaminants in water (construction and operation) out of the assessment on the grounds that the Proposed Development would not directly introduce contaminants to the marine environment and good practice measures would be used to minimise and mitigate the potential for accidental spillages during dredging and disposal. The Scoping Report does not specify what these measures would be although reference is made to 'Guidance for Pollution Prevention: Works and maintenance in or near water'). However, no other detail on the likely measures has been provided. Furthermore, the Scoping Report refers to accidental spillages during dredging and disposal but makes no mention of the potential for accidental spillages during operational activities (e.g. water discharges to the Humber, accidental spillages of fuel and cargo of liquid bulk vessels). In the absence of information such as evidence demonstrating clear agreement with relevant statutory bodies, the Inspectorate is not in a	An assessment of the risk of accidental spillages and associated potential impacts on water quality is provided in **Section 17.8**. Further information on mitigation measures that would be applied to minimise the risk of accidental spillages during construction and operational phases has been provided in **Section 17.7**. This also details the measures that would be in place were a spill to occur. Further information on the impact on water quality resulting from potential major accidents and disasters is also provided in **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**.

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		position to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effect. This should cross reference to Chapter 21 Major Accidents and Disasters.	
Scoping Opinion, 10 October 2022		In addition to the data sources listed in paragraph 16.2.1, the Applicant is directed to water quality data available on the Open WIMS database at https://environment.data.gov.uk/water-quality/view/landing	Environment Agency water quality monitoring data has been used to characterise the marine water quality baseline in **Section 17.6**.
Scoping Opinion, 10 October 2022		The ES should assess the potential for chemical contamination to accumulate at the dredge disposal sites.	**Section 17.6** compares sediment quality data from site-specific marine sediment sampling with the Centre for Environment, Fisheries and Aquaculture Science ("Cefas") Guideline Action Levels to determine the suitability of sediments for disposal at sea and to understand the impacts from redistribution of sediment-bound contaminants.
Scoping Opinion, 10 October 2022		The methodology does not describe how the significance of effects would be determined, or how the general methodology described in Chapter 4 of the Scoping Report would be applied to this aspect specifically. The	The assessment of impacts (i.e., how the significance of effects is determined) in this chapter follows the approach detailed in **Chapter 5: EIA Approach [TR030008/APP/6.2]**. This follows the Institute of Environmental Management and Assessment and the Chartered Institute of Ecology and Environmental Management guidelines. The impacts have been identified based on ABPmer's

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		ES should clearly explain how likely significant marine water and sediment quality effects have been identified.	previous (extensive) experience of port developments as well as consultation with stakeholders.
Scoping Opinion, 10 October 2022		Paragraph 16.6.3 indicates that contaminant concentrations in sediments would be compared to Cefas Guideline Action Levels for the Disposal of Dredged Material. These don't exist for all of the contaminants which could potentially be observed. The Applicant should consider if there is any potential to explore alternative guidance levels (e.g. those used by other agencies/countries) for contaminants not covered by the Cefas Guidelines.	Where Cefas Action Levels are not defined for certain contaminants, reference is made to other relevant thresholds/guidance as appropriate - this is noted in **Section 17.6**.
Scoping Opinion, 10 October 2022	Environment Agency	In addition to the data sources listed in paragraph 16.2.1, we would direct the Applicant to water quality data, which is available on the Open WIMS database at https://environment.data.gov.uk/water-quality/view/landing. The Report does not specifically discuss water discharges to the Humber. Paragraph 16.4.8 states that "Changes to levels of contaminants in	Environment Agency water quality monitoring data has been used to characterise the marine water quality baseline in **Section 17.6**. Discharges into the Humber Estuary are discussed in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage [TR030008/APP/6.2]**. Any changes to, or potential impacts, on discharges will also be considered within the WFD Compliance Assessment (**Appendix 17.A [TR030008/APP/6.4]**). An assessment of the risk of accidental spillages and associated potential impacts on water quality is provided in **Section 17.8**. Further information on the impact on water quality resulting from potential major accidents and disasters is also provided in **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**. Noted.

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		water (including accidental spillages) during operation" is scoped out. Under the COMAH regulations, the site will be required to complete an unmitigated assessment of the environmental impact in the event of incidents. As such, undertaking this assessment of potential impact now may provide an early indication if the project will be required to go beyond best practice. If the project intends to discharge directly to the Humber it will need to follow this guidance Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk) in support of its permit application. Paragraph 16.6.3 indicates that contaminant concentrations in sediments would be compared to Cefas Guideline Action Levels. These don't exist for all of the contaminants which could potentially be observed. The Applicant should consider if there is any potential to explore alternative guidance levels (e.g. those used by other agencies/countries).	Where Cefas Action Levels are not defined for certain contaminants, reference is made to other relevant thresholds/guidance as appropriate - this is noted in **Section 17.6**.

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
Statutory Consultation (PEIR) December 2022 – February 2023	Marine Management Organisation	The report states that Cefas Action Levels are not in place for various contaminants, and in their absence, other comparable tools such as the Canadian Sediment Quality Guidelines (CSQGs) or the OSPAR Action Levels of other signatory countries will be used to contextualise the contaminant concentrations. The MMO agree that this approach can be appropriate in some circumstances, though this will be dependent on the contaminants which will be tested for, i.e. it may be more appropriate to use the proposed Action Levels for PAHs (Ref 17-33) rather than the CSQG probable/threshold effect levels.	It is important to note that proposed updates to Cefas Action Levels are still subject to review and are not yet implemented. However, proposed Cefas Action Levels have been considered where existing Cefas Action Levels are not defined for certain contaminants in **Section 17.6** and compared with site-specific sediment quality data.
Statutory Consultation (PEIR) December 2022 – February 2023	Natural England	Chapters 16 and 17: Physical Processes and Marine Water and Sediment Quality Based on our current understanding, Natural England broadly agrees with the scope of the assessment set out in Chapters 16 and 17 of the PEIR, however, we note that the sediment sampling and physical process modelling is currently incomplete and therefore we may provide additional comments. We note that the Humber	Sediment sampling has been undertaken and the results are presented in **Section 17.6**. This data has informed the assessment in **Section 17.8**.

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		Estuary SSSI should be included in the assessment.	
Pre-application meeting, 20 April 2023.	Marine Management Organisation and Cefas	The meeting provided an update on the Project and focused on discussing comments received from the MMO and Cefas on the PEIR with respect to physical processes and water and sediment quality.	The scope of the environmental assessments has been completed taking on board consultee comments from this meeting which reflect those in the Marine Management Organisation's ("MMO") response to statutory consultation.
Second Statutory Consultation May 2023 – July 2023'	Marine Management Organisation	Very little detailed methodological information has been provided concerning how the change from two piers to one affects the volume and type of dredging and disposal that may be required. At the previous application stage, the PEIR described the dredging required to constitute 100,000 m^3, without specifying the dredge depth. Changes to the anticipated volumes, area, and depth of material to be dredged can significantly change the risk associated with a programme of works. In this respect, the information provided in the addendum is quite limited. However, as this is the PEIR stage, and exact methods required are yet to be finalised, and as bespoke sediment sampling is yet to be	Noted. The capital dredge volume is approximately 4,000m^3 (based on the latest available site-specific geotechnical and geophysical information). The required dredge depth would be approximately 14.5m below Chart Datum. A sediment contamination survey was undertaken in March 2023 to characterise the dredge material and to support the application to dispose of the dredge material at an existing licensed disposal site. This was undertaken in accordance with the MMO sample plan (SAM/2022/00106) which confirmed the suite of contaminants, number of samples, sample locations, replicates and sampling depth required, taking account of available guidelines for the management of dredge material to be disposed at sea.

Reference, Date	Consultee	Summary of Response	How comments have been addressed in this chapter
		undertaken to support the development under OSPAR and the London Convention and Protocol, the MMO is content that this information is not essential at this point.	

17.3 Legislation, Policy and Guidance

17.3.1 **Table 17-2**: presents the legislation, policy and guidance relevant to the Marine Water and Sediment Quality assessment and details how their requirements will be met in the assessment.

Table 17-2: Relevant legislation, policy and guidance regarding Marine Water and Sediment Quality

Legislation/Policy/Guidance	Consideration within the ES
The Planning Act 2008 (Ref 17-2)	
Whilst the Marine and Coastal Access Act ("MCAA") regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a Development Consent Order ("DCO") to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA.	Information relevant to the marine licensing process is provided in the ES including characterisation of the marine water and sediment quality baseline (**Section 17.6**) and an assessment of impacts (**Section 17.8**).
The Marine and Coastal Access Act 2009 ("MCAA") (Ref 17-1)	
The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive, and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment. The MCAA established the MMO as the organisation responsible for marine planning and licensing. The Project will require a Marine Licence for the elements of the works below Mean High Water Springs including dredging, disposal and placing or removing objects on or from the seabed. For Nationally Significant Infrastructure Projects ("NSIPs"), the DCO where granted may include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009. The MMO is responsible for enforcing, post-consent monitoring, varying, suspending, and revoking any deemed marine licence(s) as part of the DCO.	Information relevant to the marine licensing process is provided in the ES including characterization of the marine water and sediment quality baseline (**Section 17.6**) and an assessment of impacts (**Section 17.8**).
The Water Environment (WFD) (England and Wales) Regulations 2017 (Ref 17-3)	
The Water Framework Directive (2000/60/EEC) is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as	**Section 17.6** identifies the relevant WFD water bodies (the Project lies within the Lower Humber water body in the Humber River Basin District) and **Section 17.8** provides an assessment of potential impacts on water bodies.

Legislation/Policy/Guidance	Consideration within the ES
amended, known as the Water Framework Regulations[1]. In terms of water and sediment quality, "Good ecological status/potential" has regard to physico-chemical quality elements, and specific pollutants. The Good ecological status/potential assessment also considers biological and hydromorphological elements. "Good chemical status" has regard to a series of priority substances and priority hazardous substances.	A WFD Compliance Assessment has also been undertaken to determine whether the Project complies with the objectives of the WFD (**Appendix 17.A [TR030008/APP/6.4]**).
WFD (Standards and Classification) Directions (England and Wales) 2015 (Ref 17-4)	
The Direction provides the allowable thresholds (Environmental Quality Standards ("EQS")) for surface and groundwater bodies in England and Wales. This sets annual average ("AA") concentrations and/or maximum allowable concentrations ("MAC") for priority substances and priority hazardous substances that are controlled under the Water Framework Regulations.	Reference is made to AA and MAC for priority substances and priority hazardous substances that are controlled under the Water Framework Regulations in **Section 17.6** and **Section 17.8** where available baseline water and sediment quality data are compared with guideline thresholds.
Bathing Water Regulations 2013 (Ref 17-5)	
The revised Bathing Water Directive (2006/7/EC) is implemented in England and Wales under the Bathing Water Regulations 2013 (as amended).	**Section 17.6** identifies relevant bathing waters (the nearest is located approximately 11.5km south east of the Project).
Nitrate Pollution Prevention Regulations 2015 (Ref 17-6)	
The Nitrate Pollution Prevention Regulations 2015 implement the Nitrates Directive (91/676/EEC) in England and Wales.	**Section 17.6** identifies relevant Nitrate Vulnerable Zones ("NVZ"). As the NVZ is landside this is considered in **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.2]**. NVZs have also been considered in the WFD Compliance Assessment (**Appendix 17.A [TR030008/APP/6.4]**).
Urban Waste Water Treatment (England and Wales) Regulations 1994 (Ref 17-7)	
The Urban Waste Water Treatment Directive (91/271/EEC) is implemented in England and Wales through the Urban Waste Water Treatment (England and Wales) Regulations 1994 (as amended). It aims to protect the environment from the adverse effects of the collection, treatment, and discharge of urban waste water.	**Section 17.6** identifies relevant Sensitive Areas. There are no sensitive areas designated under the Urban Waste Water Treatment Regulations in the vicinity of the Site.

[1] Following the UK leaving the EU, the main provisions of the WFD have been retained in English law through The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019. (Ref 17-31)

Legislation/Policy/Guidance	Consideration within the ES
Shellfish Water Protected Areas Directions 2016 (Ref 17-8)	
The Shellfish Water Protected Areas (England and Wales) Directions 2016 require that the Environment Agency (in England) endeavour to observe a microbial standard in all 'Shellfish Water Protected Areas'. The microbial standard is 300 or fewer colony forming units of *E. coli* per 100 ml of shellfish flesh and intravalvular liquid. The Directions also require the Environment Agency to assess compliance against this standard to monitor microbial pollution (75% of samples taken within any period of 12 months below the microbial standard and sampling/analysis in accordance with the Directions).	There are no Shellfish Water Protected Areas in the vicinity of the Project. **Section 17.6** explains that the nearest is the West Wash Shellfish Water Protected Area, located over 65km south.
The Conservation of Habitats and Species Regulations 2017 (Ref 17-9)	
The Habitats Directive and Birds Directive are transposed into UK law through the Conservation of Habitats and Species Regulations 2017 as amended, known as the "Habitats Regulations"[2]. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species' and the adaptation of planning and other controls for the protection of European Sites. The Regulations also require the compilation and maintenance of a register of European sites, to include Special Areas of Conservation ("SACs") (classified under the Habitats Directive) and Special Protection Areas ("SPAs") (classified under the Birds Directive). These sites form the Natura 2000 network. These regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), candidate SACs ("cSAC"), potential Special Protection Areas ("pSPA"), and proposed and existing European offshore marine sites.	**Section 17.6** characterises the baseline for water and sediment quality. A consideration of impacts on these receptors is described in **Section 17.8** which has informed the assessment of impacts on protected habitats and species presented in **Chapter 9: Nature Conservation (Marine Ecology)** and **Chapter 10: Ornithology [TR030008/APP/6.2]**. A **shadow Habitats Regulations Assessment** report has been produced **[TR030008/APP/7.6].** This report will aid the Competent Authorities[3] in determining whether the Project has the potential for a likely significant effect ("LSE") on the interest features and/or supporting habitat of a European/Ramsar site either alone or in-combination with other plans, projects and activities and, if so, provides information to support the Appropriate Assessment of the implications of the Project on the integrity of the protected site in light of the site's conservation objectives.
National Policy Statement for Ports ("NPSfP") (Ref 17-10)	
The NPSfP provides the policy framework for nationally significant infrastructure projects involving new port development (Ref 17-10). In	This chapter on marine water and sediment quality has been prepared for the ES. A consideration of

[2] Following the UK leaving the EU, the Conservation of Habitats and Species Regulations 2017 (Ref 17-9) have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ref 17-32).

[3] The Secretary of State is the Competent Authority for the HRA for this Project.

Legislation/Policy/Guidance	Consideration within the ES
order to meet the requirements of the Government's policies on sustainable development, the NPSfP requires that new port infrastructure should also, amongst other things, assess the impact on the water environment, including transitional and coastal waters. Section 5.6 of the NPSfP advises that applicants should assess the existing status and impacts of the Project on water quality, water resources and physical characteristics of the water environment as part of the ES. The ES should describe: • The existing quality of waters affected by the Project and the impacts of the Project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges; • Existing water resources affected by the Project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates; • Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the Project and any impact of physical modifications to these characteristics; • Any impacts of the Project on water bodies or protected areas under the WFD and source protection zones ("SPZs") around potable groundwater abstractions; and • Any cumulative effects.	impacts to marine water and sediment quality are presented in **Section 17.8**. The mitigation measures that are proposed to be implemented as standard good practice to manage water quality impacts are presented in **Section 17.7**. An **Outline Construction Environmental Management Plan** ("CEMP") **[TR030008/APP/6.5]** has been prepared and provided with the Development Consent Order ("DCO") application which sets out the mitigation measures considered necessary to manage environmental effects. A consideration of surface water discharges is presented in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage [TR030008/APP/6.2]**. A consideration of groundwater and surface water abstractions is presented in **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.2]**. A consideration of the physical characteristics of the water environment is presented in **Chapter 16: Physical Processes [TR030008/APP/6.2]**. A consideration of impacts on WFD water bodies is provided in **Section 17.8**. This has also been assessed in the WFD Compliance Assessment submitted with the DCO application (**Appendix 17.A [TR030008/APP/6.4]**). An assessment of any cumulative water and sediment quality effects that could arise from the Project alone, as well as through other plans, projects and ongoing activities within the study area is considered in **Chapter 25: Cumulative and In-Combination Effects [TR030008/APP/6.2]**.
UK Marine Policy Statement ("MPS") (Ref 17-11)	
The MPS (Ref 17-11) is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social, and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and consenting development in the UK marine areas. Section 2.6.4 of the MPS is relevant to the Marine Water and Sediment Quality assessment. In	This chapter on marine water and sediment quality has been prepared for the ES. A consideration of impacts to marine water and sediment quality is presented in **Section 17.8**. A WFD Compliance Assessment has been undertaken to determine whether the Project complies with the objectives of the WFD (**Appendix 17.A [TR030008/APP/6.4]**).

Legislation/Policy/Guidance	Consideration within the ES
particular, paragraph 2.6.4.3 states, amongst other things, that - "*The marine plan authority should satisfy itself where relevant that any development will not cause a deterioration in status of any water to which the WFD applies... Decision makers should also take into account impacts on the quality of designated bathing waters and shellfish waters from any proposed development.*"	
UK Marine Strategy (Ref 17-12)	
The aim of the UK Marine Strategy is to protect the UK's marine environment. The Strategy sets out a comprehensive framework for assessing, monitoring, and taking action to achieve the UK's shared vision for clean, healthy, safe, productive, and biologically diverse seas (Ref 17-13). It aims to achieve good environmental status of marine waters by 2020 (followed by a six-year review) and then to protect the resource base upon which marine-related economic and social activities depend. The Strategy constitutes a vital environmental component of future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment. The UK Marine Strategy applies to the landward boundary of coastal waters as defined under the WFD (i.e., from mean high water springs to the outer limit of the UK Exclusive Economic Zone ("EEZ"), as well as the area of UK continental shelf beyond the EEZ. Government reporting against the Strategy is a cyclical process, and the most recent assessments and Marine Strategy documents were updated in 2019.	The Project is not located within a UK Marine Strategy region (it lies within the Lower Humber WFD transitional (estuarine) water body). The anticipated pressures exerted on the marine environment by the Project are considered to be of small magnitude in the context of UK Marine Regions such that they are unlikely to be a significant issue. The Strategy is, therefore, not considered further in this ES with regards to the Marine Water and Sediment Quality assessment.
East Inshore and East Offshore Marine Plans (Ref 17-14)	
The first Marine Plans include the East Inshore and East Offshore Marine Plans, which are collectively referred to as 'the East Marine Plans'. These were formally adopted on 2 April 2014 (Ref 17-14). There is one policy within the East Marine Plans specifically related to water and sediment quality: Policy ECO2 - "*The risk of release of hazardous substances as a secondary effect due to any increased collision risk should be taken account of in proposals that require an authorisation":*	The potential risk of vessel collisions as a result of the Project are considered in **Chapter 12: Marine Transport and Navigation [TR030008/APP/6.2]**. The risks, consequences and mitigation measures relating to potential accidental release of hazardous substances is presented in **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**. The impacts of the Project on Marine Water and Sediment Quality are assessed in **Section 17.8** of this chapter. **Chapter 9: Nature Conservation (Marine Ecology) [TR030008/APP/6.2]** also provides an assessment of the impacts to marine

Legislation/Policy/Guidance	Consideration within the ES
There are also several references to the importance of water quality in supporting a healthy ecosystem and the potential for pollutants to affect the environment as well as people (from marine as well as riverine and terrestrial sources).	habitats and species due to changes in water and sediment quality. A consideration of surface water discharges is presented in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage [TR030008/APP/6.2]**.
North East Lincolnshire Local Plan 2013 to 2032 (Ref 17-15)	
The North East Lincolnshire Local Plan was adopted in 2018 and covers the period 2013 to 2032. Within its Spatial Portrait, the Local Plan highlights the importance of the 'Estuary Zone' of the local authority area, which includes the 'nationally important port' of Immingham. When considering the detail of how the economy of the area will be developed, the Plan specifically identifies at the outset that there are good expectations of growth within the ports and logistics sector. On the policies map which accompanies the Local Plan, the Site is shown as being located within an area identified as 'Employment – Operational Port'. In addition, Policy 34 of the plan makes clear that: *"Water management* *1. Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the Humber River Basin Management Plan."* The Humber River Basin Management Plan provides a framework for protecting and enhancing the benefits provided by the water environment within the Humber River Basin District and informs decisions on land-use planning. The Humber River Basin District covers an area of 26,100 km² and extends from the West Midlands in the south, northwards to North Yorkshire and from Staffordshire in the west to part of Lincolnshire and the Humber Estuary in the east	The Project is located largely within the administrative area of North East Lincolnshire, although elements of the marine infrastructure fall beyond the local Council's administrative boundary. A consideration of impacts on WFD water bodies is provided in **Section 17.8**. This has also been assessed in the WFD Compliance Assessment submitted with the DCO application which considers WFD objectives as outlined in the Humber River Basin Management Plan (**Appendix 17.A [TR030008/APP/6.4]**).
Clearing the Waters for All (Ref 17-16)	
In 2016, the Environment Agency published guidance, referred to as "Clearing the Waters for All", regarding how to assess the impact of activities in WFD transitional and coastal water bodies (Ref 17-16). The guidance sets out the	The WFD Compliance Assessment for the Project (**Appendix 17.A [TR030008/APP/6.4]**) follows the format specified in this guidance.

Legislation/Policy/Guidance	Consideration within the ES
following three discrete stages for WFD compliance assessments to follow: Screening: excludes any activities that do not need to go through the scoping or impact assessment stages; Scoping: identifies the receptors and quality elements that are potentially at risk from an activity and need further detailed assessment; and Assessment: considers the potential impacts of an activity, identifies ways to avoid/minimise impacts, and indicates if it may cause deterioration or jeopardise the water body achieving good status.	
Planning Inspectorate Advice Note Eighteen: The Water Framework Directive (Ref 17-17)	
Advice Note Eighteen (Ref 17-17) explains the information that the Inspectorate considers an applicant must provide with their NSIP application in order to clearly demonstrate that the WFD and the Water Environment (WFD) (England and Wales) Regulations 2017 have been appropriately considered. The Advice Note also refers to Environment Agency guidance (as described above) in terms of the WFD process and the information required. Furthermore, the guidance describes the relevant bodies to be consulted in the pre-application process, and the presentation of information.	The WFD Compliance Assessment for the Project (**Appendix 17.A [TR030008/APP/6.4]**) contains the information specified in this guidance as appropriate.

17.4 Assessment Methodology

17.4.1 The overall assessment approach is described in detail in **Chapter 5: EIA Approach [TR030008/APP/6.2]** including definitions of sensitivity/importance of receptors and magnitude of change. This method has been followed for this chapter.

Data and Information Sources

17.4.2 Current baseline conditions have been determined by a desk-based review of available information. A project-specific sediment contamination survey has also been undertaken.

17.4.3 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the Project include:

a. ‘Catchment Data Explorer’ website (Ref 17-18).

b. Water body summary table within the Environment Agency (Ref 17-16) ‘Clearing the Waters for All’ guidance.

c. Multi-Agency Geographic Information for the Countryside ("MAGIC") website (Ref 17-34).

d. 'Find a bathing water' website (Ref 17-19).

e. List of Shellfish Water Protected Areas in England (Ref 17-20).

f. 'Check for Drinking Water Safeguard Zones and NVZs' website (Ref 17-21).

g. 'Water Quality Archive' website (Ref 17-23).

h. Historic marine surface sediment samples (2001) collected in the area of Immingham Outer Harbour for Particle Size Analysis ("PSA") and chemical contamination analysis.

17.4.4 A sediment contamination survey was undertaken in March 2023 to characterise the dredge material and to support the application to dispose of the dredge material at an existing licensed disposal site. This was undertaken in accordance with the Marine Management Organisation ("MMO") sample plan (SAM/2022/00106) which confirmed the suite of contaminants, number of samples, sample locations, replicates and sampling depth required, taking account of available guidelines for the management of dredge material to be disposed at sea (Ref 17-35).

17.4.5 Contaminant concentrations in sediment samples have been compared to Cefas Guideline Action Levels ("ALs") to determine their suitability for disposal at sea. Where these do not exist for a contaminant, consideration has also been given to other comparable tools such as the Canadian Sediment Quality Guidelines ("CSQGs") or proposed Cefas ALs (Ref 17-33) (it should be noted, however, that proposed updates to Cefas ALs are still subject to review and are not yet implemented). Contaminant concentrations in sediments have informed the assessment of potential changes to dissolved concentrations in the water column and predicted potential redistribution of contaminants as a result of the Project.

Limitations and Assumptions

17.4.6 The information presented in this assessment reflects the proposed parameters and design for the Project as described in **Chapter 2: The Project [TR030008/APP/6.2]**.

17.4.7 This assessment has been undertaken based on the following assumptions:

a. Capital dredging is undertaken by backhoe dredger (e.g., Mannu Pekka or similar) with disposal at the Clay Huts disposal site (HU060) or the Holme Channel (HU056) disposal site. Maintenance dredging (if required at all) is undertaken by Trailing Suction Hopper Dredger with disposal at the Clay Huts disposal site (HU060).

b. Assessment of sediment release rates are based on modelling outputs presented in **Chapter 16: Physical Processes [TR030008/APP/6.2]**.

c. The SeDiChem tool outputs based on a number of simple assumptions, namely general site parameters (e.g., net flow rate of 20,736,000m³/day based on an average for the Humber of 240m³/second (Ref 17-36)), maximum incremental Suspended Sediment Concentration ("SSC") (800mg/l), worst case (or precautionary) partition coefficients from suggested literature and sediment quality from samples collected within the proposed dredge area.

17.4.8 The assessment within this chapter has been undertaken considering the anticipated worst-case scenario in respect of water and sediment quality receptors at the dredge, piling and disposal locations.

17.5 Study Area

17.5.1 The study area for this assessment is the area over which potential direct and indirect effects of the Project are predicted to occur during the construction and operational periods. The direct effects on water and sediment quality are those that may arise due to accidental releases during construction or disturbance of sediments into the water column and increases in turbidity. Indirect effects are those that may arise due to sediment that is disturbed and released into the water column during the marine works resulting in changes in water quality through changes in the levels of dissolved oxygen or the release of sediment-bound contaminants.

17.5.2 The study area for the water and sediment quality topic is considered to be the Site and the adjacent Immingham coastline, the existing jetties across the near-field and the central part of the Humber Estuary, generally between Sunk Chanel and Halton Middle. Within the far-field region, the study area includes the wider Humber Estuary from the mouth up to estuary of the Hull Bend. This reflects the same study area for **Chapter 16: Physical Processes [TR030008/APP/6.2]**.

17.6 Baseline Conditions

Current Baseline

Water quality

Water Framework Directive

17.6.1 Water quality standards and objectives are implemented through a range of legislation including the Water Framework Regulations, the Bathing Water Regulations, and the UK Marine Strategy (see **Table 17-2**). The standards and objectives were established through the WFD which provided for holistic management of all water bodies including rivers, estuaries, groundwater, lakes, and coastal waters to 1nm offshore. Domestic legislation derived from the WFD integrates and requires protection of designated shellfish waters, through The Water Framework Regulations; bathing waters, through the Bathing Water Regulations; nature conservation sites, through the Habitats Regulations; and eutrophication, through the Nitrate Pollution Prevention Regulations.

17.6.2 The Environment Agency published River Basin Management Plans ("RBMPs"), which set out measures through which compliance with WFD objectives will be achieved. The Humber River Basin District RBMP identifies the Humber Lower water body (ID: GB530402609201) within and surrounding the Project (including Humber Estuary disposal sites) (Ref 17-18) (**Figure 17.1 [TR030008/APP/6.3]**). It is recorded as a heavily modified water body due to coastal protection use, flood protection use, and navigation use. This means 'ecological potential' is applied rather than 'ecological status'. The current (2022) status of this waterbody is an ecological potential of 'moderate'. The chemical status in 2022 was noted as 'does not require assessment', however, in 2019 the water body had a chemical status of 'fail'. The reason for the 'fail' chemical status (in 2019) was based on priority substances cypermethrin and dichlorvos, and priority hazardous substances polybrominated diphenyl ethers ("PBDE"), perfluorooctane sulphonate ("PFOS"), benzo(a)pyrene, benzo(b)fluoranthene, benzo(g-h-i)perylene, mercury and its compounds, and tributyltin compounds. The source of contaminants is not known but may relate to historical industrial and maritime activities on the Humber. Surface water bodies overlapping the landside works are detailed in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** and **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.2]**.

Bathing Waters

17.6.3 Cleethorpes designated bathing waters is located approximately 11.5km south east of the Project, and Humberston Fitties is located approximately 15km south east (**Figure 17.2 [TR030008/APP/6.3]**). Cleethorpes was assessed as having 'good' bathing water quality in 2022 (Ref 17-19), declining from an 'excellent' classification in 2019. Humberston Fitties was assessed as having 'good' bathing water quality in 2022 (Ref 17-19), remaining consistent with a 'good' classification in 2019.

Shellfish Water Protected Areas

17.6.4 There are no Shellfish Water Protected Areas in the vicinity of the Project (Ref 17-20). The nearest is the West Wash Shellfish Water Protected Area, located over 65km south.

Nitrate Vulnerable Zones ("NVZ")

17.6.5 As the NVZ is landside this is considered in **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.2]**. NVZs have also been considered in the WFD Compliance Assessment (**Appendix 17.A [TR030008/APP/6.4]**).

Sensitive Areas

17.6.6 There are no sensitive areas designated under the Urban Waste Water Treatment Regulations in the vicinity of the Site (Ref 17-22).

17.6.7 The main watercourses in the vicinity of the Site (within 5km) are South Killingholme Haven which drains to the north-west corner of the Port of Immingham (but is defined as part of the Humber Estuary water body), North Killingholme main drain, Habrough Marsh drain and the Humber Estuary itself.

Water quality monitoring

17.6.8 The Environment Agency's 'Water Quality Archive' (Ref 17-23) provides data on water quality measurements taken at sampling points around England. These can be from coastal or estuarine waters, rivers, lakes, ponds, canals or groundwaters. They are taken for a number of purposes including compliance assessment against discharge permits, investigation of pollution incidents or environmental monitoring.

17.6.9 The nearest saline water sampling point to the Project (with adequate temporal coverage and a reasonable amount of determinands measured) is Clean Site - Ti02 Monitoring Point, 1985 (sampling ID: AN-CLNMON1). This is shown on **Figure 17.3 [TR030008/APP/6.3]**. Contaminant concentrations measured in the water at this location are shown in **Table 17-3**:. These are compared against Environmental Quality Standards ("EQS") as described under the WFD (Standards and Classification) Directions (England and Wales) 2015, specifically annual average AA concentrations and/or MAC to provide an indication of the water quality measured at the sampling point.

17.6.10 As indicated below in **Table 17-3**:, metal concentrations reported between 2015 and 2023 were typically below respective EQSs. There were some exceedances related to the AA EQS for tributyl tin ("TBT") and the Humber Estuary transitional water body was failing chemical status due to excessive concentrations of TBT in 2019. Benzo(a)pyrene and benzo(g,h,i)perylene were failing their respective MAC EQSs between 2015 and 2023 (with the exception of 2022 for benzo(a)pyrene). Benzo(b)fluoranthene and benzo(k)fluoranthene were also failing their MAC EQSs in 2015 to 2023 (with the exception 2019). The Humber Lower transitional water body was failing chemical status due to benzo(a)pyrene, benzo(b)fluoranthene and benzo(g-h-i)perylene in 2019.

Table 17-3: Concentration range, mean and number of water samples collected between 2015 and 2023 by the Environment Agency for contaminants measured near the Project

Parameter	Unit	EQS	Results	2015	2016	2017	2018	2019	2020	2021	2022	2023
Arsenic	µg/l	25 (AA)	Range	1.9 - 2.39	2.32 - 2.32	-	1.94 - 2.59	1.95 - 1.95	-	-	-	2.2 - 2.2
			Average	2.10	2.32		2.28	1.95				2.20
			n	3	1		3	1				1
Cadmium	µg/l	0.2 (AA)	Range	0.044 - 0.101	0.041 - 0.066	0.062 - 0.063	0.0461 - 0.144	0.0408 - 0.0706	-	0.058 - 0.12	0.051 - 0.08	0.045 - 0.081
			Average	0.08	0.05	0.06	0.09	0.06		0.08	0.07	0.06
			n	9	4	2	9	3		8	12	4
Chromium (VI)	µg/l	0.6 (AA); 32 (MAC)	Range	<0.3	<0.3	-	<0.3	<0.3	-	-	-	-
			Average	0.3	0.3		0.3	0.3				
			n	1	1		3	1				
Copper	µg/l	3.76 (AA)	Range	1.7 - 2.62	2.5 - 3.2	2.35 - 2.96	1.99 - 2.52	1.59 - 1.59	-	1.7 - 3.2	1.7 - 3.7	1.8 - 4.2
			Average	2.01	2.85	2.66	2.20	1.59		2.19	2.28	2.93
			n	3	2	2	3	1		8	12	4
Lead	µg/l	1.3 (AA); 14 (MAC)	Range	<0.04 - 0.074	0.04 - 0.098	-	<0.04 - 0.0876	0.0656 - 0.108	-	0.046 - 0.12	<0.04 - 0.088	0.054 - 0.09
			Average	0.06	0.07		0.05	0.08		0.07	0.07	0.08
			n	9	3		9	3		8	12	4
Mercury	µg/l	0.07 (MAC)	Range	<0.01 - 0.01	<0.01 - 0.01	-	<0.01 - 0.01	<0.01 - 0.01	-	-	-	0.013 - 0.013
			Average	0.01	0.01		0.01	0.01				0.013
			n	9	3		9	3				1
Nickel	µg/l	8.6 (AA); 34 (MAC)	Range	1.25 - 2.29	1.14 - 2.11	1.79 - 2.11	1.4 - 2.48	1.35 - 1.8	-	1.4 - 7.8	1.3 - 7.2	1.3 - 2

Parameter	Unit	EQS	Results	2015	2016	2017	2018	2019	2020	2021	2022	2023
			Average	1.69	1.61	1.95	1.80	1.54		2.43	2.05	1.73
			n	9	4	2	9	3		8	12	4
Zinc	µg/l	7.9 (AA)	Range	2.2 - 4.7	3.47 - 4.86	4.22 - 4.86	2.21 - 4.32	4.05 - 4.05	-	1.9 - 5.7	1.9 - 4.6	3 - 4.1
			Average	3.79	4.17	4.54	3.15	4.05		3.29	3.16	3.68
			n	3	2	2	3	1		8	12	4
Tributyltin (TBT)	µg/l	0.0002 (AA); 0.0015 (MAC)	Range	0.00021 - 0.00096	<0.0002 - 0.0008	0.00029 - 0.00092	<0.0002 - 0.00081	0.00025 - 0.00032	-	<0.0002 - 0.00023	<0.0002 - 0.00042	<0.0002 - 0.00026
			Average	0.0004	0.0004	0.0005	0.0003	0.0003		0.0002	0.0003	0.0002
			n	9	12	3	10	2		8	12	4
Benzo(a)-pyrene	µg/l	0.00017 (AA); 0.0027 (MAC)	Range	>0.002 - <0.01	>0.002 - 0.22	0.00055 - >0.05	<0.0004 - 0.0874	0.0146 - 0.017	-	<0.0004 - 0.033	<0.0004 - 0.026	0.00077 - >0.05
			Average	0.01	0.04	0.03	0.03	0.02		0.01	0.01	0.02
			n	12	12	3	8	3		8	12	4
Benzo(g,h,i)-perylene	µg/l	0.00082 (MAC)	Range	>0.002 - <0.01	0.002 - 0.239	0.00063 - 0.05	0.00057 - 0.0911	0.0149 - 0.0183	-	0.0004 - 0.03	<0.0004 - 0.024	0.00054 - >0.05
			Average	0.01	0.04	0.02	0.03	0.02		0.01	0.01	0.02
			n	12	12	3	8	2		8	12	4
Benzo(b)-fluoranthene	µg/l	0.017 (MAC)	Range	>0.002 - <0.01	>0.002 - 0.196	0.00056 - >0.05	0.00045 - 0.0743	0.013 - 0.0139	-	0.00052 - 0.03	<0.0004 - 0.021	0.00071 - 0.048
			Average	0.01	0.04	0.02	0.03	0.01		0.01	0.01	0.02
			n	12	12	3	8	2		8	12	4
Benzo(k)-fluoranthene	µg/l	0.0063 (AA);	Range	>0.002 - <0.01	>0.002 - 0.111	<0.0004 - >0.05	0.0004 - 0.0379	0.00701 - 0.00746	-	<0.0004 - 0.016	<0.0004 - 0.012	<0.0004 - 0.028

Parameter	Unit	EQS	Results	2015	2016	2017	2018	2019	2020	2021	2022	2023
		0.017 (MAC)	Average	0.01	0.02	0.02	0.01	0.01		0.01	0.00	0.01
			n	12	12	3	8	2		8	12	4
Fluoranthene	µg/l	0.12 (MAC)	Range	>0.002 - <0.01	>0.002 - 0.142	0.00103 - >0.05	<0.0004 - 0.0953	0.0163 - 0.0185	-	0.0015 - 0.026	0.0012 - 0.023	0.0015 - 0.03
			Average	0.01	0.04	0.03	0.03	0.02		0.01	0.01	0.02
			n	12	12	3	8	3		8	12	4
Hexa-chlorobenzene	µg/l	0.05 (MAC)	Range	<0.001 - 0.001	<0.0001 - 0.001	<0.0001 - 0.005	-	-	-	-	-	-
			Average	0.001	0.0005	0.002						
			n	12	7	3						
Hexa-chlorobutadiene	µg/l	0.6 (MAC)	Range	<0.003 - 0.003	<0.0001 - <0.003	<0.0001 - <0.005	-	-	-	-	-	-
			Average	0.003	0.001	0.002						
			n	12	7	3						
BDE 28	µg/l	-	Range	<0.00006 - <0.00006	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.00006	0.00006	0.00006						
			n	7	7	3						
BDE 47	µg/l	-	Range	<0.00006 - 0.0001	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.0001	0.00006	0.00006						
			n	7	7	3						

Parameter	Unit	EQS	Results	2015	2016	2017	2018	2019	2020	2021	2022	2023
BDE 99	µg/l	-	Range	<0.00006 - 0.00017	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.0001	0.00006	0.00006						
			n	7	7	3						
BDE 100	µg/l	-	Range	<0.00006 - 0.00017	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.0001	0.00006	0.00006						
			n	7	7	3						
BDE 153	µg/l	-	Range	<0.00006 - 0.00007	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.0001	0.00006	0.00006						
			n	7	7	3						
BDE 154	µg/l	-	Range	<0.00006 - <0.00006	<0.00006 - <0.00006	<0.00006 - <0.00006	-	-	-	-	-	-
			Average	0.00006	0.00006	0.00006						
			n	7	7	3						
Data from sampling point 'Clean Site - Ti02 Monitoring Point, 1985, ID: AN-CLNMON1)' in the Humber Estuary, obtained from the Environment Agency's 'Water Quality Archive' (Ref 17-23)												

Sediment quality

17.6.11 The UK has not adopted formal quantitative EQS for sediments. In the absence of any quantified UK standards, therefore, common practice for characterising baseline sediment quality conditions is to compare against the Cefas Guideline Action Levels for the disposal of dredged material (Ref 17-24).

17.6.12 Cefas Guideline Action Levels are used as part of a 'weight of evidence' approach to assessing material suitability for disposal at sea. Cefas guidance indicates that, in general, contaminant levels below Action Level 1 ("AL1") are of no concern. Material with contaminant levels above Action Level 2 ("AL2"), however, is generally considered unsuitable for disposal at sea whilst dredged material with contaminant levels between AL1 and AL2 requires further consideration before a decision can be made as to disposal. Consequently, the Action Levels should not be viewed as pass/fail thresholds, and it is also recognised that these guidelines are not statutory requirements. Cefas Action Levels are not available for every contaminant and where appropriate comparisons may be made to other alternative guidance levels, e.g. Canadian Sediment Quality Guidelines or thresholds from other European/OSPAR[4] nations, to provide context. It is also noted that Action Levels in the UK are currently being reviewed but have yet to be formally adopted (Ref 17-25).

17.6.13 In February 2023, a sample plan (SAM/2022/00106) was provided by the MMO, prepared in consultation with Cefas. In March 2023, sediment samples were collected from eight stations (1 to 8) across the proposed dredge area comprising the Project, including subsurface samples (**Figure 17.3 [TR030008/APP/6.3]**).

17.6.14 The sampling regime and analysis was undertaken in accordance with the sample plan. The sediment samples were analysed by an MMO-approved laboratory for the following physical and chemical parameters:

a. Particle size analysis ("PSA")
b. Trace metals
c. Organotins
d. Polycyclic aromatic hydrocarbons ("PAHs")
e. Polychlorinated biphenyls ("PCBs")
f. Total hydrocarbon content ("THC")
g. Organochlorine pesticides ("OCPs")

17.6.15 The PSA results are presented in **Table 17-4**. Sediments from most sampling locations were dominated by silt material with limited amounts of gravel. Samples from Sample 1 (1m), Sample 2 (2m), and Sample 3 (1m) were predominantly comprised of sand. Sample 2 (0m), Sample 7 (0m), and Sample 8 (0m and 2.9m) were predominantly comprised of gravel.

[4] Countries signed up to the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic.

17.6.16 Sediment samples have also been analysed for total organic carbon ("TOC") (**Table 17-4**). Values typically ranged from about 0.5% to 2%, with a minimum of 0.17% and a maximum of 6.36%. The average organic carbon content across all samples was 1.31%. Generally, samples with higher proportions of sand and gravel had lower TOC as organic matter tends to accumulate in finer grained sediments.

17.6.17 A summary of sediment quality (chemical analysis) of samples from the dredge area is provided in **Table 17-5**: to

17.6.18 **Table 17-12**: concentrations above or below Cefas Guideline Action Levels are highlighted to provide an indication of sediment quality (comparisons to other thresholds are noted below where these do not exist). Contaminant concentrations were generally low, with most values below the respective Cefas Guideline AL1 or marginally exceeding AL1. There were no instances where the concentration exceeded the respective AL2 (or a sample concentration was close to exceeding this threshold).

17.6.19 Trace metal concentrations were typically below AL1 in most samples, with some minor exceedances of AL1 for some metals (mainly in Samples 4, 5 and 6). Most individual PAHs were found to be below AL1, though some samples exceeded AL1, particularly in Samples 4, 5 and 6. There is currently no AL2 for individual or total PAHs. Cefas and Defra are proposing to introduce updated ALs for these contaminants, however, these proposed ALs are still subject to review and are not yet implemented. Nevertheless, at the request of the MMO, PAH concentrations have been compared against the proposed Cefas ALs for the sum of low molecular weight ("LMW") and high molecular weight ("HMW") PAHs. Most samples were also below the proposed AL1, though again some exceeded the proposed AL1 (again in Vibrocores 4, 5 and 6). None exceeded the proposed AL2 for PAHs. The CSQGs define a Probable Effect Level ("PEL") concentration (considered the concentration which adverse effects frequently occur) for benzo(a)pyrene (763 µg/kg) and fluoranthene (1494 µg/kg); all samples were below these concentrations.

17.6.20 PCB concentrations were low, mostly below the Limit of Detection ("LOD"), and both the sum of ICES 7 and the sum of 25 congeners were below AL1 for all samples. OCP concentrations were also often below the LOD in most samples; dieldrin concentrations were below AL1 in all samples, and p,p'-Dichlorodiphenyltrichloroethane ("DDT") concentrations were predominantly below AL1 in most samples, with some minor exceedances of AL1.

Table 17-4: Particle size analysis (PSA) results from sediment samples collected in March 2023

Sample	Depth (m)	Visual Appearance	Total organic carbon (TOC) M/M %	Particle Size Distribution (%)		
				Gravel (>2mm)	Sand (2mm – 63 µm)	Silt (<63 µm)
Sample 1	0	Odourless Brown Mud with Organic Matter.	6.07	0.39	16.25	83.36
Sample 1	1	Odourless Brown Gravelly Sandy Mud with Organic Matter.	0.85	1.91	52.30	45.79
Sample 1	2.2	Odourless Brown Gravelly Mud.	1.02	8.26	14.19	77.55
Sample 2	0	Odourless Brown Gravelly Sandy Mud with Shell Fragments.	0.79	49.45	8.79	41.76
Sample 2	1	Odourless Brown Gravelly Mud.	0.98	6.96	15.49	77.56
Sample 2	2	Odourless Brown Gravelly Muddy Sand.	0.17	2.58	61.59	35.83
Sample 2	2.95	Odourless Brown Sandy Mud.	0.59	0.00	21.59	78.41
Sample 3	0	Brown Mud with Organic Matter and a Peat Odour.	6.36	0.00	37.51	62.49
Sample 3	1	Odourless Brown Muddy Sand.	0.56	0.00	60.13	39.87
Sample 3	2	Odourless Brown Gravelly Mud.	1.05	10.46	10.71	78.84
Sample 3	2.5	Odourless Brown Gravelly Mud.	0.97	11.93	12.58	75.48
Sample 4	0	Odourless Brown Sandy Mud.	1.44	0.00	20.09	79.91

Sample	Depth (m)	Visual Appearance	Total organic carbon (TOC) M/M %	Particle Size Distribution (%)		
				Gravel (>2mm)	Sand (2mm – 63 µm)	Silt (<63 µm)
Sample 4	1	Odourless Brown Mud.	1.60	0.00	17.23	82.77
Sample 4	2	Odourless Brown Mud.	2.01	0.00	15.53	84.47
Sample 4	3	Odourless Brown Sandy Mud.	2.22	0.00	40.04	59.96
Sample 4	4	Odourless Brown Mud.	0.93	0.00	0.00	100.00
Sample 5	0	Odourless Brown Mud.	1.39	0.00	20.27	79.73
Sample 5	1	Odourless Brown Sandy Mud.	0.86	0.00	32.08	67.92
Sample 5	2	Odourless Brown Mud.	1.55	0.00	24.55	75.45
Sample 5	3	Odourless Brown Sandy Mud.	1.13	0.00	2.23	97.77
Sample 5	4	Odourless Brown Gravelly Sandy Mud.	0.71	9.57	5.38	85.05
Sample 6	0	Odourless Brown Mud.	1.68	0.00	13.94	86.06
Sample 6	1	Brown Mud with a Peat Odour.	1.50	0.00	13.34	86.66
Sample 6	2	Brown Sandy Mud with a Peat Odour.	0.79	0.00	37.24	62.76
Sample 6	3	Odourless Brown Gravelly Mud.	0.79	4.87	5.84	89.29
Sample 6	4	Odourless Brown Sandy Mud.	0.94	0.00	0.00	100.00

Sample	Depth (m)	Visual Appearance	Total organic carbon (TOC) M/M %	Particle Size Distribution (%)		
				Gravel (>2mm)	Sand (2mm – 63 µm)	Silt (<63 µm)
Sample 7	0	Odourless Brown Muddy Gravel.	0.41	80.07	11.06	8.87
Sample 7	1	Odourless Brown Sandy Mud.	0.59	0.00	1.76	98.24
Sample 7	1.4	Odourless Brown-White Gravelly Mud.	0.33	20.20	8.42	71.37
Sample 8	0	Odourless White Muddy Gravel.	1.11	47.44	6.16	46.40
Sample 8	1	Odourless Brown Gravelly Mud.	0.85	5.98	2.36	91.66
Sample 8	2	Odourless Brown Gravelly Mud.	0.46	4.20	10.72	85.09
Sample 8	2.9	Odourless Other Muddy Gravel.	0.39	72.45	4.46	23.09

Table 17-5: Sediment contamination data for Sample 1 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 1 (0m)	Sample 1 (1.0m)	Sample 1 (2.2m)
Arsenic	mg/kg	20	100	12.3	9.4	9.6
Cadmium	mg/kg	0.4	5	0.59	0.05	0.12
Chromium	mg/kg	40	400	36.8	7.80	21.8
Copper	mg/kg	40	400	23.4	5.90	16.9
Lead	mg/kg	50	500	20.4	5.40	11.2
Mercury	mg/kg	0.3	3	0.06	0.04	0.03
Nickel	mg/kg	20	200	43.9	6.40	26.9
Zinc	mg/kg	130	800	143	38.4	48.1
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001
Acenaphthene	µg/kg	100	-	<5	<5	5.0
Acenaphthylene	µg/kg	100	-	<5	<5	2.3
Anthracene	µg/kg	100	-	<5	<5	7.0

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 1 (0m)	Sample 1 (1.0m)	Sample 1 (2.2m)
Benzo[a]anthracene	µg/kg	100	-	17.1	<5	24.9
Benzo[a]pyrene	µg/kg	100	-	23.3	<5	34.1
Benzo[b]fluoranthene	µg/kg	100	-	34.4	<5	35.8
Benzo[e]pyrene	µg/kg	100	-	58.4	<5	56.9
Benzo[ghi]perylene	µg/kg	100	-	62.2	<5	80.7
Benzo[k]fluoranthene	µg/kg	100	-	23.9	<5	19.5
C1-naphthalenes	µg/kg	100	-	190.0	<5	132.0
C1-phenanthrene	µg/kg	100	-	163.0	7.5	159.0
C2-naphthalenes	µg/kg	100	-	183.0	<5	141.0
C3-naphthalenes	µg/kg	100	-	123.0	<5	150.0
Chrysene	µg/kg	100	-	51.1	<5	51.5
Dibenzo[ah]anthracene	µg/kg	100	-	<5	<5	5.2
Fluoranthene	µg/kg	100	-	35.2	<5	42.9
Fluorene	µg/kg	100	-	28.7	<5	11.9

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 1 (0m)	Sample 1 (1.0m)	Sample 1 (2.2m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	14.4	<5	19.1
Naphthalene	µg/kg	100	-	48.6	<5	23.8
Perylene	µg/kg	100	-	869.0	5160.0	14.5
Phenanthrene	µg/kg	100	-	141.0	6.2	108.0
Pyrene	µg/kg	100	-	44.4	<5	60.6
Total Hydrocarbon Content (THC)	mg/kg	-	-	6.09	4.11	24.8
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00056	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.002	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	0.0002	<0.0001	<0.0001
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 1 (0m)	Sample 1 (1.0m)	Sample 1 (2.2m)
PPTDE	mg/kg	-	-	0.0001	<0.0001	<0.0001
PPDDE	mg/kg	-	-	<0.0001	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0018	<0.0001	<0.0001
Key	Below AL1					
	Above AL1, Below AL2					
	Above AL2					

Table 17-6: Sediment contamination data for Sample 2 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 2 (0m)	Sample 2 (1.0m)	Sample 2 (2.0m)	Sample 2 (2.95m)
Arsenic	mg/kg	20	100	11.2	11.5	3.5	3.9
Cadmium	mg/kg	0.4	5	<0.04	0.11	<0.04	<0.04
Chromium	mg/kg	40	400	22.8	21.3	6.60	9.40
Copper	mg/kg	40	400	15.8	14.1	7.60	9.60
Lead	mg/kg	50	500	14.3	9.80	3.60	5.10
Mercury	mg/kg	0.3	3	0.05	0.02	0.01	0.03
Nickel	mg/kg	20	200	23.3	25.2	8.10	11.2
Zinc	mg/kg	130	800	96.0	53.6	18.0	24.2
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Acenaphthene	µg/kg	100	-	14.0	8.1	1.7	20.8
Acenaphthylene	µg/kg	100	-	7.0	2.3	<1	6.9
Anthracene	µg/kg	100	-	19.2	11.3	1.9	26.0

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 2 (0m)	Sample 2 (1.0m)	Sample 2 (2.0m)	Sample 2 (2.95m)
Benzo[a]anthracene	µg/kg	100	-	61.4	30.8	6.9	106.0
Benzo[a]pyrene	µg/kg	100	-	79.0	39.6	9.8	100.0
Benzo[b]fluoranthene	µg/kg	100	-	78.6	46.1	8.5	82.2
Benzo[e]pyrene	µg/kg	100	-	89.2	58.6	12.6	113.0
Benzo[ghi]perylene	µg/kg	100	-	128.0	87.7	19.6	134.0
Benzo[k]fluoranthene	µg/kg	100	-	75.5	27.7	6.9	71.3
C1-naphthalenes	µg/kg	100	-	216.0	130.0	28.8	400.0
C1-phenanthrene	µg/kg	100	-	212.0	205.0	38.3	607.0
C2-naphthalenes	µg/kg	100	-	192.0	142.0	34.9	475.0
C3-naphthalenes	µg/kg	100	-	197.0	175.0	46.1	625.0
Chrysene	µg/kg	100	-	87.5	54.1	11.8	153.0
Dibenzo[ah]anthracene	µg/kg	100	-	14.2	7.7	1.7	16.3
Fluoranthene	µg/kg	100	-	101.0	51.2	8.4	139.0
Fluorene	µg/kg	100	-	24.2	22.9	2.7	29.2

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 2 (0m)	Sample 2 (1.0m)	Sample 2 (2.0m)	Sample 2 (2.95m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	57.7	23.4	5.0	44.5
Naphthalene	µg/kg	100	-	60.9	26.0	5.6	80.3
Perylene	µg/kg	100	-	29.6	15.2	2.8	23.1
Phenanthrene	µg/kg	100	-	142.0	122.0	23.1	375.0
Pyrene	µg/kg	100	-	118.0	67.8	16.2	198.0
Total Hydrocarbon Content (THC)	mg/kg	-	-	71.6	15.3	19.1	86.7
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00057	0.00056	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.00201	0.002	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	0.0001	<0.0001	<0.0001	<0.0001
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 2 (0m)	Sample 2 (1.0m)	Sample 2 (2.0m)	Sample 2 (2.95m)
PPTDE	mg/kg	-	-	0.0014	<0.0001	<0.0001	<0.0001
PPDDE	mg/kg	-	-	0.0002	<0.0001	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0002	<0.0001	0.0009	<0.0001
Key	Below AL1						
	Above AL1, Below AL2						
	Above AL2						

Table 17-7: Sediment contamination data for Sample 3 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 3 (0m)	Sample 3 (1.0m)	Sample 3 (2.0m)	Sample 3 (2.5m)
Arsenic	mg/kg	20	100	10.2	6.1	10.4	7.3
Cadmium	mg/kg	0.4	5	0.47	<0.04	0.11	0.28
Chromium	mg/kg	40	400	34.5	9.20	20.4	19.6
Copper	mg/kg	40	400	20.3	11.5	18.0	15.4
Lead	mg/kg	50	500	18.0	6.90	12.2	10.4
Mercury	mg/kg	0.3	3	0.04	0.02	0.03	0.02
Nickel	mg/kg	20	200	38.6	17.5	29.4	24.4
Zinc	mg/kg	130	800	130.0	24.1	56.7	41.0
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Acenaphthene	µg/kg	100	-	<5	<5	7.6	15.4
Acenaphthylene	µg/kg	100	-	<5	<5	2.6	2.6
Anthracene	µg/kg	100	-	<5	<5	9.0	6.9

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 3 (0m)	Sample 3 (1.0m)	Sample 3 (2.0m)	Sample 3 (2.5m)
Benzo[a]anthracene	µg/kg	100	-	21.6	<5	24.9	24.2
Benzo[a]pyrene	µg/kg	100	-	23.8	<5	29.3	31.6
Benzo[b]fluoranthene	µg/kg	100	-	54.5	12.3	36.6	38.7
Benzo[e]pyrene	µg/kg	100	-	65.1	16.3	53.0	54.2
Benzo[ghi]perylene	µg/kg	100	-	84.6	19.2	77.7	80.0
Benzo[k]fluoranthene	µg/kg	100	-	20.5	<5	21.4	17.8
C1-naphthalenes	µg/kg	100	-	194.0	12.0	111.0	111.0
C1-phenanthrene	µg/kg	100	-	171.0	31.1	162.0	187.0
C2-naphthalenes	µg/kg	100	-	229.0	14.0	125.0	136.0
C3-naphthalenes	µg/kg	100	-	135.0	14.9	140.0	188.0
Chrysene	µg/kg	100	-	56.3	14.8	49.9	49.1
Dibenzo[ah]anthracene	µg/kg	100	-	10.2	<5	7.4	7.7
Fluoranthene	µg/kg	100	-	36.4	9.3	49.6	44.4
Fluorene	µg/kg	100	-	30.3	<5	17.0	27.4

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 3 (0m)	Sample 3 (1.0m)	Sample 3 (2.0m)	Sample 3 (2.5m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	23.8	<5	17.7	19.2
Naphthalene	µg/kg	100	-	47.2	<5	18.9	20.8
Perylene	µg/kg	100	-	973.0	<5	12.0	12.3
Phenanthrene	µg/kg	100	-	138.0	20.2	101.0	140.0
Pyrene	µg/kg	100	-	45.1	12.8	63.6	56.8
Total Hydrocarbon Content (THC)	mg/kg	-	-	9.24	16.4	14.5	19.1
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00056	0.00056	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.00201	0.002	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	<0.0001	<0.0001	<0.0001	<0.0001
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 3 (0m)	Sample 3 (1.0m)	Sample 3 (2.0m)	Sample 3 (2.5m)
PPTDE	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
PPDDE	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	<0.0001	<0.0001	<0.0001	<0.0001
Key	Below AL1						
	Above AL1, Below AL2						
	Above AL2						

Table 17-8: Sediment contamination data for Sample 4 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 4 (0m)	Sample 4 (1.0m)	Sample 4 (2.0m)	Sample 4 (3.0m)	Sample 4 (4.0m)
Arsenic	mg/kg	20	100	14.8	26.2	31.4	26.8	5.1
Cadmium	mg/kg	0.4	5	0.48	0.57	0.6	0.37	0.25
Chromium	mg/kg	40	400	32.2	49.8	59.2	50.5	22.0
Copper	mg/kg	40	400	21.7	30.2	37.9	32.6	16.4
Lead	mg/kg	50	500	42.0	60.6	75.3	63.1	10.5
Mercury	mg/kg	0.3	3	0.12	0.18	0.25	0.2	0.02
Nickel	mg/kg	20	200	23.1	26.6	31.4	26.6	25.1
Zinc	mg/kg	130	800	103	151	189	160	47.5
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.005	<0.005	<0.001	<0.005
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.005	0.00828	<0.001	<0.005
Acenaphthene	µg/kg	100	-	9.6	54.5	106.0	<5	7.3
Acenaphthylene	µg/kg	100	-	5.6	35.7	36.2	<5	2.5
Anthracene	µg/kg	100	-	19.6	108.0	137.0	<5	10.9

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 4 (0m)	Sample 4 (1.0m)	Sample 4 (2.0m)	Sample 4 (3.0m)	Sample 4 (4.0m)
Benzo[a]anthracene	µg/kg	100	-	43.9	237.0	263.0	14.4	34.1
Benzo[a]pyrene	µg/kg	100	-	56.6	323.0	336.0	12.8	39.5
Benzo[b]fluoranthene	µg/kg	100	-	52.3	281.0	304.0	14.2	47.2
Benzo[e]pyrene	µg/kg	100	-	44.4	242.0	247.0	17.5	61.4
Benzo[ghi]perylene	µg/kg	100	-	52.2	295.0	292.0	21.2	90.0
Benzo[k]fluoranthene	µg/kg	100	-	48.6	275.0	276.0	10.6	23.3
C1-naphthalenes	µg/kg	100	-	151.0	775.0	814.0	63.2	154.0
C1-phenanthrene	µg/kg	100	-	95.0	461.0	503.0	75.9	179.0
C2-naphthalenes	µg/kg	100	-	123.0	606.0	653.0	65.3	148.0
C3-naphthalenes	µg/kg	100	-	109.0	528.0	584.0	75.4	160.0
Chrysene	µg/kg	100	-	53.1	281.0	307.0	23.3	62.2
Dibenzo[ah]anthracene	µg/kg	100	-	9.1	51.4	52.6	<5	8.9
Fluoranthene	µg/kg	100	-	87.9	503.0	560.0	19.9	59.3
Fluorene	µg/kg	100	-	17.8	101.0	126.0	6.1	21.1

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 4 (0m)	Sample 4 (1.0m)	Sample 4 (2.0m)	Sample 4 (3.0m)	Sample 4 (4.0m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	43.1	257.0	257.0	<5	21.7
Naphthalene	µg/kg	100	-	55.5	295.0	322.0	15.6	31.2
Perylene	µg/kg	100	-	18.9	119.0	136.0	<5	16.8
Phenanthrene	µg/kg	100	-	90.5	443.0	531.0	50.8	121.0
Pyrene	µg/kg	100	-	84.9	474.0	524.0	26.1	87.9
Total Hydrocarbon Content (THC)	mg/kg	-	-	22.5	64.9	49.3	33.5	8.90
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00228	0.00507	0.00707	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.00537	0.01148	0.01538	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	0.0001	0.0003	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	0.0003	0.0008	0.0010	<0.0001	<0.0001
HCB	mg/kg	-	-	0.0004	0.0007	0.0010	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 4 (0m)	Sample 4 (1.0m)	Sample 4 (2.0m)	Sample 4 (3.0m)	Sample 4 (**4.0m**)
PPTDE	mg/kg	-	-	0.0042	0.0070	0.0103	0.0001	<0.0001
PPDDE	mg/kg	-	-	0.0008	0.0017	0.0021	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0002	<0.0001	0.0034	<0.0001	<0.0001
Key	Below AL1							
	Above AL1, Below AL2							
	Above AL2							

Table 17-9: Sediment contamination data for Sample 5 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 5 (0m)	Sample 5 (1.0m)	Sample 5 (2.0m)	Sample 5 (3.0m)	Sample 5 (4.0m)
Arsenic	mg/kg	20	100	15.4	12.4	25.8	7.7	8.6
Cadmium	mg/kg	0.4	5	0.18	0.2	0.57	0.38	0.41
Chromium	mg/kg	40	400	32.4	21.3	46.8	28.0	22.0
Copper	mg/kg	40	400	21.6	14.2	30.0	21.4	19.2
Lead	mg/kg	50	500	41.0	28.4	58.7	16.7	13.3
Mercury	mg/kg	0.3	3	0.12	0.07	0.18	0.01	0.03
Nickel	mg/kg	20	200	22.6	15.2	25.1	33.2	45.5
Zinc	mg/kg	130	800	104	73.0	154	63.7	56.6
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.005	0.008	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.005	0.029	<0.001	<0.001
Acenaphthene	µg/kg	100	-	45.7	26.7	155.0	14.1	<5
Acenaphthylene	µg/kg	100	-	25.8	16.3	62.0	<5	<5
Anthracene	µg/kg	100	-	84.7	46.6	215.0	10.3	<5

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 5 (0m)	Sample 5 (1.0m)	Sample 5 (2.0m)	Sample 5 (3.0m)	Sample 5 (4.0m)
Benzo[a]anthracene	µg/kg	100	-	210.0	105.0	424.0	47.9	15.1
Benzo[a]pyrene	µg/kg	100	-	267.0	125.0	507.0	70.3	21.4
Benzo[b]fluoranthene	µg/kg	100	-	242.0	112.0	432.0	104.0	65.5
Benzo[e]pyrene	µg/kg	100	-	206.0	98.9	360.0	168.0	78.2
Benzo[ghi]perylene	µg/kg	100	-	232.0	110.0	395.0	154.0	60.5
Benzo[k]fluoranthene	µg/kg	100	-	209.0	104.0	415.0	37.4	15.7
C1-naphthalenes	µg/kg	100	-	683.0	335.0	1240.0	569.0	236.0
C1-phenanthrene	µg/kg	100	-	454.0	224.0	682.0	387.0	148.0
C2-naphthalenes	µg/kg	100	-	550.0	264.0	988.0	389.0	140.0
C3-naphthalenes	µg/kg	100	-	488.0	242.0	886.0	277.0	106.0
Chrysene	µg/kg	100	-	261.0	125.0	481.0	153.0	64.0
Dibenzo[ah]anthracene	µg/kg	100	-	41.3	17.1	62.9	20.2	8.6
Fluoranthene	µg/kg	100	-	429.0	210.0	878.0	71.3	26.7
Fluorene	µg/kg	100	-	72.6	36.8	157.0	77.8	14.4

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 5 (0m)	Sample 5 (1.0m)	Sample 5 (2.0m)	Sample 5 (3.0m)	Sample 5 (4.0m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	190.0	83.4	348.0	38.2	14.8
Naphthalene	µg/kg	100	-	259.0	125.0	464.0	147.0	80.5
Perylene	µg/kg	100	-	92.1	50.3	147.0	10.8	<5
Phenanthrene	µg/kg	100	-	396.0	184.0	794.0	324.0	146.0
Pyrene	µg/kg	100	-	410.0	201.0	835.0	116.0	39.3
Total Hydrocarbon Content (THC)	mg/kg	-	-	99.8	77.7	129	14.7	6.86
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00247	0.00155	0.005	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.0055	0.00358	0.01141	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	0.0003	0.0004	0.0008	<0.0001	<0.0001
HCB	mg/kg	-	-	0.0004	0.0003	0.0009	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 5 (0m)	Sample 5 (1.0m)	Sample 5 (2.0m)	Sample 5 (3.0m)	Sample 5 (4.0m)
PPTDE	mg/kg	-	-	0.0059	0.0036	0.0061	<0.0001	<0.0001
PPDDE	mg/kg	-	-	0.0008	0.0005	0.0014	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0050	0.0003	0.0010	<0.0001	<0.0001
Key	Below AL1							
	Above AL1, Below AL2							
	Above AL2							

Table 17-10: Sediment contamination data for Sample 6 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 6 (0m)	Sample 6 (1.0m)	Sample 6 (2.0m)	Sample 6 (3.0m)	Sample 6 (4.0m)
Arsenic	mg/kg	20	100	15.6	23.5	26.5	6	6
Cadmium	mg/kg	0.4	5	0.4	0.41	0.38	0.3	0.38
Chromium	mg/kg	40	400	33.5	42.4	28.8	21.3	27.2
Copper	mg/kg	40	400	22.2	24.8	18.3	13.3	21.5
Lead	mg/kg	50	500	42.1	54.4	39.9	9.70	15.5
Mercury	mg/kg	0.3	3	0.13	0.17	0.1	0.02	0.01
Nickel	mg/kg	20	200	25.5	25.8	19.2	24.1	33.7
Zinc	mg/kg	130	800	109	136	105	43.3	62.6
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.005	<0.005	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	0.01	<0.005	<0.001	<0.001
Acenaphthene	µg/kg	100	-	49.2	50.8	42.0	6.6	17.8
Acenaphthylene	µg/kg	100	-	23.5	33.4	22.0	<5	9.6
Anthracene	µg/kg	100	-	74.6	97.2	79.9	9.0	10.4

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 6 (0m)	Sample 6 (1.0m)	Sample 6 (2.0m)	Sample 6 (3.0m)	Sample 6 (4.0m)
Benzo[a]anthracene	µg/kg	100	-	211.0	201.0	163.0	21.5	59.7
Benzo[a]pyrene	µg/kg	100	-	257.0	293.0	220.0	29.2	93.4
Benzo[b]fluoranthene	µg/kg	100	-	240.0	262.0	186.0	34.1	161.0
Benzo[e]pyrene	µg/kg	100	-	206.0	219.0	155.0	47.8	242.0
Benzo[ghi]perylene	µg/kg	100	-	227.0	254.0	179.0	63.8	214.0
Benzo[k]fluoranthene	µg/kg	100	-	247.0	248.0	179.0	21.5	53.8
C1-naphthalenes	µg/kg	100	-	708.0	697.0	566.0	149.0	744.0
C1-phenanthrene	µg/kg	100	-	429.0	395.0	321.0	156.0	510.0
C2-naphthalenes	µg/kg	100	-	577.0	540.0	433.0	134.0	497.0
C3-naphthalenes	µg/kg	100	-	512.0	545.0	410.0	154.0	326.0
Chrysene	µg/kg	100	-	280.0	239.0	190.0	46.2	219.0
Dibenzo[ah]anthracene	µg/kg	100	-	39.1	41.1	29.6	6.2	21.6
Fluoranthene	µg/kg	100	-	429.0	427.0	354.0	39.5	93.7
Fluorene	µg/kg	100	-	78.1	77.6	62.4	18.3	115.0

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 6 (0m)	Sample 6 (1.0m)	Sample 6 (2.0m)	Sample 6 (3.0m)	Sample 6 (4.0m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	180.0	209.0	158.0	15.0	49.9
Naphthalene	µg/kg	100	-	255.0	237.0	222.0	32.4	175.0
Perylene	µg/kg	100	-	90.3	100.0	79.5	15.9	14.3
Phenanthrene	µg/kg	100	-	389.0	352.0	293.0	110.0	425.0
Pyrene	µg/kg	100	-	402.0	425.0	336.0	56.9	146.0
Total Hydrocarbon Content (THC)	mg/kg	-	-	94.2	122	59.9	16.6	17.2
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00302	0.00443	0.00292	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.00639	0.00959	0.00651	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	0.0006	0.0008	0.0003	<0.0001	0.0001
HCB	mg/kg	-	-	0.0003	0.0005	0.0005	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration				
		AL1	AL2	Sample 6 (0m)	Sample 6 (1.0m)	Sample 6 (2.0m)	Sample 6 (3.0m)	Sample 6 (4.0m)
PPTDE	mg/kg	-	-	0.0048	0.0069	0.0039	<0.0001	<0.0001
PPDDE	mg/kg	-	-	0.0010	0.0015	0.0008	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0014	0.0034	0.0002	<0.0001	0.0002
Key	Below AL1							
	Above AL1, Below AL2							
	Above AL2							

Table 17-11: Sediment contamination data for Sample 7 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 7 (0m)	Sample 7 (1.0m)	Sample 7 (1.4m)
Arsenic	mg/kg	20	100	15.3	5.5	1.3
Cadmium	mg/kg	0.4	5	0.67	0.28	0.43
Chromium	mg/kg	40	400	16.6	16.0	4.40
Copper	mg/kg	40	400	10.1	14.1	4.90
Lead	mg/kg	50	500	14.8	8.9	2.80
Mercury	mg/kg	0.3	3	0.02	<0.01	<0.01
Nickel	mg/kg	20	200	23.6	20.1	12.6
Zinc	mg/kg	130	800	68.2	34.3	15.4
Dibutyltin (DBT)	mg/kg	0.1	1	<0.001	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.001	<0.001	<0.001
Acenaphthene	µg/kg	100	-	<5	<5	<1
Acenaphthylene	µg/kg	100	-	<5	<5	<1
Anthracene	µg/kg	100	-	3.3	<5	<1

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 7 (0m)	Sample 7 (1.0m)	Sample 7 (1.4m)
Benzo[a]anthracene	µg/kg	100	-	8.1	<5	<1
Benzo[a]pyrene	µg/kg	100	-	6.9	<5	<1
Benzo[b]fluoranthene	µg/kg	100	-	9.1	<5	<1
Benzo[e]pyrene	µg/kg	100	-	13.9	68.4	1.2
Benzo[ghi]perylene	µg/kg	100	-	13.4	<5	<1
Benzo[k]fluoranthene	µg/kg	100	-	5.7	<5	<1
C1-naphthalenes	µg/kg	100	-	50.6	227.0	3.3
C1-phenanthrene	µg/kg	100	-	47.8	191.0	3.5
C2-naphthalenes	µg/kg	100	-	46.4	182.0	2.6
C3-naphthalenes	µg/kg	100	-	56.8	179.0	2.7
Chrysene	µg/kg	100	-	14.6	64.0	1.3
Dibenzo[ah]anthracene	µg/kg	100	-	<5	<5	<1
Fluoranthene	µg/kg	100	-	15.1	<5	<1
Fluorene	µg/kg	100	-	<5	<5	<1

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 7 (0m)	Sample 7 (1.0m)	Sample 7 (1.4m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	<5	<5	<1
Naphthalene	µg/kg	100	-	13.9	<5	<1
Perylene	µg/kg	100	-	<5	<5	<1
Phenanthrene	µg/kg	100	-	<5	159.0	2.5
Pyrene	µg/kg	100	-	21.7	65.3	1.4
Total Hydrocarbon Content (THC)	mg/kg	-	-	20.2	8.58	3.81
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00056	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.002	0.002	0.002
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	<0.0001	<0.0001	<0.0001
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration		
		AL1	AL2	Sample 7 (0m)	Sample 7 (1.0m)	Sample 7 (1.4m)
PPTDE	mg/kg	-	-	<0.0001	<0.0001	<0.0001
PPDDE	mg/kg	-	-	<0.0001	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	0.0014	<0.0001	0.0002
Key	Below AL1					
	Above AL1, Below AL2					
	Above AL2					

Table 17-12: Sediment contamination data for Sample 8 collected in March 2023

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 8 (0m)	Sample 8 (1.0m)	Sample 8 (2.0m)	Sample 8 (2.9m)
Arsenic	mg/kg	20	100	10.8	5.9	1	<0.5
Cadmium	mg/kg	0.4	5	0.44	0.11	0.26	0.15
Chromium	mg/kg	40	400	20.2	18.9	0.90	1.00
Copper	mg/kg	40	400	13.6	13.9	3.90	5.10
Lead	mg/kg	50	500	14.1	9.10	1.40	1.50
Mercury	mg/kg	0.3	3	0.03	0.03	0.01	<0.01
Nickel	mg/kg	20	200	26.1	23.8	8.30	6.60
Zinc	mg/kg	130	800	58.4	43.9	18.0	14.6
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.001	<0.001	<0.001
Acenaphthene	µg/kg	100	-	5.3	<1	<1	<1
Acenaphthylene	µg/kg	100	-	1.7	<1	<1	<1
Anthracene	µg/kg	100	-	7.0	<1	<1	<1

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 8 (0m)	Sample 8 (1.0m)	Sample 8 (2.0m)	Sample 8 (2.9m)
Benzo[a]anthracene	µg/kg	100	-	23.7	<1	<1	<1
Benzo[a]pyrene	µg/kg	100	-	31.1	<1	<1	<1
Benzo[b]fluoranthene	µg/kg	100	-	36.4	<1	<1	<1
Benzo[e]pyrene	µg/kg	100	-	48.3	<1	<1	<1
Benzo[ghi]perylene	µg/kg	100	-	65.0	<1	<1	<1
Benzo[k]fluoranthene	µg/kg	100	-	20.0	<1	<1	<1
C1-naphthalenes	µg/kg	100	-	116.0	<1	<1	1.3
C1-phenanthrene	µg/kg	100	-	137.0	<1	<1	<1
C2-naphthalenes	µg/kg	100	-	108.0	<1	<1	<1
C3-naphthalenes	µg/kg	100	-	111.0	<1	<1	<1
Chrysene	µg/kg	100	-	48.6	<1	<1	<1
Dibenzo[ah]anthracene	µg/kg	100	-	5.8	<1	<1	<1
Fluoranthene	µg/kg	100	-	38.4	<1	<1	<1
Fluorene	µg/kg	100	-	15.0	<1	<1	<1

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 8 (0m)	Sample 8 (1.0m)	Sample 8 (2.0m)	Sample 8 (2.9m)
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	18.0	<1	<1	<1
Naphthalene	µg/kg	100	-	24.9	<1	<1	<1
Perylene	µg/kg	100	-	13.4	<1	<1	<1
Phenanthrene	µg/kg	100	-	92.8	<1	<1	<1
Pyrene	µg/kg	100	-	58.6	<1	<1	<1
Total Hydrocarbon Content (THC)	mg/kg	-	-	5.14	10.9	<1	<1
PCBs – Sum of ICES 7	mg/kg	0.02	0.01	0.00056	0.00056	0.00056	0.00056
PCBs – Sum of 25 Congeners	mg/kg	0.2	-	0.0	0.0	0.0	0.0
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Dieldrin	mg/kg	0.005	-	<0.0001	<0.0001	0.0001	<0.0001
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001

Contaminant	Units	Cefas Action Level		Sample Concentration			
		AL1	AL2	Sample 8 (0m)	Sample 8 (1.0m)	Sample 8 (2.0m)	Sample 8 (2.9m)
PPTDE	mg/kg	-	-	0.0003	<0.0001	<0.0001	<0.0001
PPDDE	mg/kg	-	-	0.0001	<0.0001	<0.0001	<0.0001
PPDDT	mg/kg	0.001	-	<0.0001	<0.0001	<0.0001	<0.0001
Key	Below AL1						
	Above AL1, Below AL2						
	Above AL2						

Future baseline

17.6.21 In the absence of the Project, water and sediment quality will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns, and trends (e.g. changes in prevalence of chemicals in marine sediments in response to legislative controls, degradation of some contaminants, ongoing maintenance dredging and disposal, and existing discharge licences in the area). The future baseline will also be influenced by climate change, such as changes in sea pH and temperature, which in turn can have an impact on water quality (e.g. dissolved oxygen concentrations). These parameters have been factored into the assessment of potential changes to marine water and sediment quality introduced via the Project.

17.7 Development Design and Impact Avoidance

Embedded Mitigation Measures

17.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to marine water and sediment quality through the process of design development, and by embedding mitigation measures into the design, such as minimising the dredge requirements as far as possible.

Standard Mitigation Measures

17.7.2 Standard mitigation measures will be undertaken to manage commonly occurring environmental effects. Although these are not likely to alter the assessment conclusions, they are considered to be standard good practice. In terms of water and sediment quality, the potential risk from accidents and spillages/leaks during construction will be avoided or minimised by ensuring that the construction methods, proposed design, and the contractual arrangements follow environmental management best practice. In particular, the following guidance will be adopted:

a. ‘Pollution prevention for businesses’ Guidance in England (Ref 17-26).

b. Pollution Prevention Guidance (“PPG”), or Guidance for Pollution Prevention (“GPP”) in the UK (Ref 17-27);

   i Understanding Your Environmental Responsibilities – Good Environmental Practices (“PPG1”).

   ii Works and maintenance in or near water (“GPP5”).

   iii Working at construction and demolition sites (“PPG6”).

   iv Safe storage and disposal of used oils (“GPP8”).

c. The Oil Care Code.

d. CIRIA’s Environmental Good Practice on Site (Ref 17-28).

17.7.3 In adhering to this guidance, a number of good practice measures will be followed. All wastes generated on site will be removed in a timely manner and any materials and containers giving rise to possible spills or contamination of the surrounding environment will be taken from site to be processed at a licensed facility. Liquid oils/chemicals required for use during construction will be stored in suitable containers/bunded storage areas. In the event of a pollution incident measures to report, manage, and minimise any impacts will be pursued, with construction spill response procedures to contain any accidental spills. In addition, an oil spill contingency plan is currently in place for the Port of Immingham to minimise any impacts in the event of a spill entering the water and these measures would also be applicable to the Project.

17.7.4 Plant will also be maintained regularly, and spill kits will be available for use in the event of a spill onsite. Refuelling will be in designated areas to limit the potential for spillages. Fuel will be stored in the Site compound overnight, limiting the potential for fuel theft and vandalism which could cause pollution. Should any pollution incidents occur, they will be reported immediately to the relevant authorities. The workforce will be trained in preventing and dealing with pollution incidents.

17.7.5 An **Outline CEMP [TR030008/APP/6.5]** has been prepared and provided with the DCO application which sets out the mitigation measures considered necessary to manage environmental effects during construction as described above.

17.8 Assessment of Likely Impacts and Effects

17.8.1 The assessment has identified potential likely effects on marine water and sediment quality receptors as a result of the construction and subsequent operation of the Project.

17.8.2 The Physical Processes assessment (**Chapter 16: Physical Processes [TR030008/APP/6.2]**) has informed the outcomes of the Marine Water and Sediment Quality assessment.

17.8.3 Cumulative impacts on water and sediment quality that could arise as a result of other coastal and marine developments and activities in the Humber Estuary are considered as part of the cumulative impacts and in-combination effects assessment (**Chapter 25: Cumulative and In-Combination Effects [TR030008/APP/6.2]**).

Construction

17.8.4 This section contains an assessment of the potential impacts to marine water and sediment quality receptors as a result of the construction phase of the Project. The following impact pathways have been identified as having potential for significant effects and have been assessed:

a. Changes to dissolved oxygen concentrations as a result of increased SSC during piling, capital dredging and disposal activities.

b. Changes to chemical water quality as a result of potential sediment-bound contaminants being released during piling, capital dredging and disposal activities;.

c. Redistribution of sediment-bound contaminants during piling, capital dredging and disposal activities.

d. Changes to marine water quality from accidental spillages or leaks during construction.

Changes to dissolved oxygen concentrations as a result of increased SSC

Capital dredging

17.8.5 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during capital dredging may have the potential to reduce dissolved oxygen concentrations. The material within the proposed dredge area ranges from coarse sediments (sands and gravel) which are unlikely to influence dissolved oxygen concentrations, to clays including alluvium deposits containing organic material (see **Section 17.6** and **Table 17-4**:), for which organic content can result in reduced dissolved oxygen concentrations. For the use of backhoe, it should be noted that the majority of material disturbed during capital dredging works will be lifted from the bed to the hopper/barge, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the bucket).

17.8.6 The proposed dredge area is situated within the Humber Lower transitional water body. The physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2022 interim classification, at high status for this water body (dissolved oxygen concentration of > 5.7 mg/l for 95% of the time), despite the area being subject to regular maintenance dredging activities. It is, therefore, considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of the proposed capital dredging.

17.8.7 Numerical modelling has been carried out to inform the assessment of the impacts of capital dredging on SSC and this indicates that increases in SSC will be short-term and localised to the dredging activity (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. Therefore, the magnitude of change is considered to be low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Piling

17.8.8 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during piling activity may, as with dredging, have the potential to reduce dissolved oxygen concentrations. However, the effects are anticipated to be highly localised (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). The piling activity is proposed to occur within the Humber Lower transitional water body, for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2022 interim classification, at high status. The seabed in the area is already subject to regular disturbance (e.g., maintenance dredging) and, therefore, it is considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of piling.

17.8.9 Based on the above, the magnitude of change is considered to be very low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Disposal activities

17.8.10 The disposal of dredged material at sea associated with the Project will be fulfilled at licensed disposal sites HU056 (for any inerodible boulder/glacial clay) and HU060 (for any sand/silt (alluvium) material) (see **Chapter 2: The Project [TR030008/APP/6.2]**). Numerical modelling has been carried out to inform the assessment of the impacts of disposal on SSC (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**).

17.8.11 During the placement of dredged material at the licensed disposal sites, the potential for reduction in dissolved oxygen concentrations in the water column is considered to be low based on modelling of the sediment plume dispersal which indicates that SSC levels are likely to become immeasurable above baseline within 1km of the disposal site. The measurable plume from each disposal operation is only likely to persist for a single tidal cycle (less than 6 hours from disposal). After this time, the dispersion under the peak flood or ebb tidal flows means concentrations will have reverted to background levels (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). Any changes would be localised and short-lived given the dynamic nature of the site, which would rapidly be re-oxygenated. Both HU056 and HU060 licensed disposal sites are located within the Humber Lower transitional water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2022 interim classification, at high status, despite routinely receiving maintenance dredging material from the ports within the Humber Estuary.

17.8.12 The magnitude of change is considered to be low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Changes to chemical water quality as a result of potential sediment-bound contaminants

Capital dredging

17.8.13 The proposed dredge area is situated within the Humber Lower transitional water body. This water body is currently, based on a 2022 interim classification, failing chemical status due to cypermethrin and dichlorvos, PBDEs, PFOS, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g-h-i)perylene, mercury and its compounds and TBT compounds.

17.8.14 As sediment is disturbed and re-distributed into the water column, any sediment-bound contaminants may be partitioned from the solid phase (i.e., bound to sediments or suspended matter), to the dissolved or aqueous phase (i.e., dissolved in pore water or overlying water) (Ref 17-29). To determine the maximum dissolved fraction of contaminants released into the water column, it is necessary to consider the relative potential for each contaminant to change from one phase to another (i.e., contaminant adsorbed to sediment surfaces to dissolved in the water), referred to as the partition coefficient. Partition coefficients describe the ratio between the freely dissolved concentration in water and another environmental phase (e.g., sediment-bound) at equilibrium. It should be noted that desorption rates of contaminants from suspended sediments into the water column are highly regulated by hydrodynamics, biogeochemical processes, and environmental conditions (redox, pH, salinity, and temperature) (Ref 17-30). Due to the variability in environmental conditions, a wide range of partition coefficients are reported in the literature.

17.8.15 There is potential for sediment-bound contaminants to be re-mobilised in the water column following an increase in SSC during the proposed capital dredging. Sediment disturbance will be caused at the bed by abrasion pressure from the dredging equipment (i.e., bucket). As noted in **Chapter 16: Physical Processes [TR030008/APP/6.2]**, maximum SSCs are associated with the disposal activities (with relatively small increases in SSC arising from the dredge itself). Peak excess SSC levels resulting from the disposal activities are predicted to be around 600 to 800 mg/l at HU060 licensed disposal site (this site is likely to receive the vast majority of the more unconsolidated dredged material, whereas HU056 will be used for any inerodible boulder/glacial clay, see **Chapter 2: The Project [TR030008/APP/6.2]**). Increased SSCs arising from the dredge operations will be of lower magnitude and persist for a shorter distance (and time) than that from the disposal. Therefore, while a different activity, the estimated maximum incremental SSC for disposal activities is considered here on a precautionary basis.

17.8.16 A Microsoft Excel Spreadsheet tool developed by APEM Ltd, referred to as SeDiChem (short for Sediment Disturbance on Chemical status), was provided by the Environment Agency to support consideration of potential uplift in contaminant concentrations following disturbance of contaminated sediments in estuarine and marine waters.

17.8.17 **Table 17-13**: provides a summary of the SeDiChem tool outputs, with empirical calculations based on a number of simple assumptions. This includes general site parameters (e.g., net flow rate of 20,736,000m³/day based on an average for the Humber of 240m³/second (Ref 17-36)), maximum incremental SSC (800 mg/l), worst case (or precautionary) partition coefficients from suggested literature and sediment quality from samples collected within the proposed dredge area. In addition, background water quality concentrations have been inputted based on Environment Agency monitoring data from nearby monitoring station Clean Site - Ti02 Monitoring Point, 1985 (sampling ID: AN-CLNMON1) (see **Section 17.6** of this chapter), averaged across the most recent five years of data.

17.8.18 Overall, the uplift in contaminant concentrations is anticipated to be minimal, and unlikely to present a significant issue at the water body level. Where contaminants are already reported to be failing within the water body (e.g., PBDEs, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g-h-i)perylene, mercury and its compounds and TBT compounds), any disturbance of sediments during dredging activities will result in an uplift effectively causing a 'worse failure'. However, the scale of this deterioration is considered to be small and highly localised. As a percentage increase of EQS headroom (i.e., the capacity for the concentration to increase whilst still remaining below the environmental threshold), the increased concentration due to dredging is likely to be less than 1% for mercury, and 70% for TBT. For benzo(a)pyrene, benzo(b)fluoranthene, benzo(g-h-i)perylene, and benzo(k)fluoranthene, the background dissolved concentration is above the EQS, therefore no headroom is available according to the SeDiChem tool. However, as a percentage increase of background concentrations, the increase in concentration of these contaminants as a result of dredging is calculated as < 1%. Furthermore, these calculations are based on a maximum sediment concentration and worst-case partition coefficients. It is, therefore, considered unlikely that the proposed dredging activity would cause even a short-term deterioration in water quality with regards to contaminants.

17.8.19 Based on the above, the magnitude of change is considered to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Table 17-13: Potential contaminant concentrations as a result of the Project in the Humber Lower transitional water body based on SeDiChem tool outputs

Parameter	Max. Sediment Concentration (mg/kg)	Current WFD Status	Partition Coefficient (l/kg)	EQS (µg/l)	Dissolved Concentration (Background* and Dredging) (µg/l)	Concentration Increase due to Dredging (% of Background)	Concentration Increase as % of EQS Headroom
Arsenic	31.40	High	40	25 (dissolved)	3.374	45.42%	4.65%
Cadmium	0.67	Good	100	0.2 (dissolved)	0.099	10.28%	8.41%
Chromium	59.20	High	79	32 (dissolved)	1.273	324.34%	3.07%
Copper	37.90	High	3,162	3.76 (dissolved)	2.946	0.56%	1.96%
Lead	75.30	Good	35,481	14 (dissolved)	0.083	3.56%	0.02%
Mercury	0.25	Fail	6,310	0.07 (dissolved)	0.013	0.40%	0.09%
Nickel	45.50	Good	500	34 (dissolved)	2.549	4.91%	0.38%
Zinc	189.00	High	12,589	8.8 (dissolved)	4.560	0.44%	0.60%
Benzo(a)pyrene	0.51	Fail	9,120	0.027 (total)	0.040	0.18%	No headroom
Benzo(b) fluoranthene	0.43	Fail	20,795	0.017 (total)	0.040	0.07%	No headroom
Benzo(g,h,i) perylene	0.40	Fail	18,904	0.00082 (total)	0.040	0.07%	No headroom

Parameter	Max. Sediment Concentration (mg/kg)	Current WFD Status	Partition Coefficient (l/kg)	EQS (µg/l)	Dissolved Concentration (Background* and Dredging) (µg/l)	Concentration Increase due to Dredging (% of Background)	Concentration Increase as % of EQS Headroom
Benzo(k) fluoranthene	0.42	Good	19,859	0.017 (total)	0.02	0.14%	No headroom
Fluoranthene	0.88	Good	1,396	0.12 (total)	0.041	2.10%	1.05%
Tributyltin (TBT)	0.03	Fail	49	0.0015 (total)	0.001	190.94%	69.43%
Hexachloro-benzene	0.001	Good	5,978	0.05 (total)	0.002	0.011%	0.00%

Piling

17.8.20 As discussed for capital dredging above and in **Chapter 16: Physical Processes [TR030008/APP/6.2]**, maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted to be around 600 to 800 mg/l at the HU060 licensed disposal site. Increased SSCs arising from the dredge operations will be of lower magnitude and persist for a shorter distance (and time) than that from the disposal. The anticipated increased SSC concentration related to piling will be less than that of dredging and disposal, as compaction will occur in the sediment rather than complete disturbance. **Table 17-13**: calculates the potential for sediment-bound contaminants to increase the concentration of in-water contaminants and, even when applying SSCs of 800mg/l, the proposed piling works are considered unlikely to result in significant water quality impacts.

17.8.21 Overall, the magnitude of change is likely to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Disposal activities

17.8.22 As discussed for capital dredging above and in **Chapter 16: Physical Processes [TR030008/APP/6.2]**, maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted to be around 600 to 800 mg/l at the HU060 licensed disposal site. **Table 17-13**: calculates the potential for sediment-bound contaminants to increase the concentration of in-water contaminants and, even when applying SSCs of 800mg/l, the proposed piling works are considered unlikely to result in significant water quality impacts.

17.8.23 Overall, the magnitude of change is likely to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Redistribution of sediment-bound contaminants

Capital dredging

17.8.24 The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere. However, it should be noted that the majority of material disturbed during capital dredging works will be lifted from the bed to the hopper/barge, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the bucket).

17.8.25 The material within the proposed dredge area ranges from coarse sediments (sands and gravel) which are generally unlikely to comprise high contaminant levels due to the material characteristics, to muds, silts and clays which are more typically associated with sediment-bound contaminants. The majority of contaminants in the sediments of the proposed dredge area are at relatively low concentrations, mostly below, or marginally exceeding, Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed. Furthermore, sedimentation in relation to the dredging of the berth pocket is predicted to be relatively localised (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during capital dredging.

17.8.26 Overall, the magnitude of change is likely to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Piling

17.8.27 Similar to capital dredging (see above), the potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere.

17.8.28 However, the majority of contaminants in the sediments in the vicinity of the proposed piling activity are at relatively low concentrations, mostly below, or marginally exceeding, Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed. Furthermore, sedimentation away from the piling locations is predicted to be highly localised (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during piling.

17.8.29 Overall, the magnitude of change is likely to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Disposal activities

17.8.30 The disposal of dredged material at sea associated with the Project will be fulfilled at licensed disposal sites HU056 and HU060 within the Humber Estuary (see **Chapter 2: The Project [TR030008/APP/6.2]**).

17.8.31 During the placement of dredged material at the licensed disposal sites, any sediment-bound contaminants within the dredge material will effectively be dispersed and redistributed by the disposal activity. However, the majority of contaminants in the sediments of the proposed dredge area are at relatively low concentrations, mostly below, or marginally exceeding, Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed and it is considered

that the dredge material is suitable for disposal at sea. It is also noted that disposal site HU060 routinely receives maintenance dredging material from ports within the Humber Estuary. These disposal sites, located within the Humber Estuary, will have similar levels of contamination to the dredge material and therefore disposal activity is not expected to lead to elevated concentrations of contaminants above prevailing background levels.

17.8.32 Overall, the magnitude of change is likely to be very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

Changes to marine water quality from accidental spillages or leaks during construction

17.8.33 Accidental spillages of oil and other substances have the potential to occur during construction from both land and marine-based plant and vessels. Depending on the source, spillages and leaks can potentially introduce contaminants which could reduce marine water quality. A range of standard practice pollution prevention guidelines have been outlined in **Section 17.7** and will be followed to minimise the risk of accidental spillages and the risk of introduction of contaminants throughout construction. This not only reduces the potential risk from accidents and spillages/leaks during construction but also outlines the response if such an event were to occur.

17.8.34 Given the low likelihood of this impact occurring and the measures in place to address an incident if one were to occur, the magnitude of change is considered very low. The sensitivity/importance is medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Therefore, the impact significance is assessed as **minor adverse** and **not significant**.

17.8.35 Risks associated with major incidents are considered in **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**.

Operation

17.8.36 This section contains an assessment of the potential impacts to water and sediment quality receptors as a result of the operational phase of the Project. The following impact pathways have been assessed:

a. Changes to dissolved oxygen concentrations as a result of increased SSC during the maintenance dredging and disposal activities.

b. Changes to chemical water quality as a result of potential sediment-bound contaminants being released during maintenance dredging and disposal activities.

c. Redistribution of sediment-bound contaminants during maintenance dredging and disposal activities.

Changes to dissolved oxygen concentrations as a result of increased SSC

Maintenance dredging

17.8.37 The need for future maintenance dredging within the new berth pocket is expected to be very limited (if required at all) (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). As a result, any dredging that is required will only be undertaken very periodically (frequency will be dictated by operational requirements). The volumes of material from maintenance dredging will be lower than those from the original capital dredge. Furthermore, the density of the newly settled material will be less than that from the consolidated bed dredged during the capital dredge campaign. As a result, maintenance dredge arisings and disposal will have a notably lower magnitude and the dredged material being deposited will be more dispersive than the impacts described above for the capital works during construction.

17.8.38 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during maintenance dredging may have the potential to reduce dissolved oxygen concentrations. The material within the proposed dredge area ranges from coarse sediments (sands and gravel) which are unlikely to influence dissolved oxygen concentrations, to clays including alluvium deposits containing organic material (see **Section 17.6** and **Table 17-4**:), for which organic content can result in reduced dissolved oxygen concentrations. That said, it should be noted that the material to be removed during the maintenance dredging campaign will have been recently deposited and in reduced volumes compared to the capital dredge. Furthermore, the majority of material disturbed during maintenance dredging works will be lifted from the bed to the hopper, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the bucket).

17.8.39 The dredge area is situated within the Humber Lower transitional water body. The physico-chemical quality element ‘Dissolved oxygen’ is currently, based on the 2022 interim classification, at high status for this water body, despite the area being subject to regular disturbance from dredging. It is, therefore, considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of the proposed maintenance dredging.

17.8.40 Numerical modelling of the capital dredge has shown that increases in SSC will be short-term and localised to the dredging activity and therefore as the maintenance dredging volumes are smaller the change in SSC would be lower than that of the capital dredge (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. Therefore, the magnitude of change is considered to be low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Disposal activities

17.8.41 As noted above and in **Chapter 16: Physical Processes [TR030008/APP/6.2]**, the need for future maintenance dredging within the new berth pocket is expected to be very limited (if required at all). Volumes of material from maintenance dredging of the Project berth pocket will be lower than those from the original capital dredge. Whilst the overall maintenance dredge volume will potentially increase very slightly as a result of the Project, the amount will be far below the current overall annual licensed volume for Immingham. Of particular importance in relation to potential effects, the frequency and volume of material deposited from each load will not change compared with current maintenance dredging activities as the same plant and methods are proposed to be used. Future disposal of maintenance dredge arisings will, therefore, result in the same changes in SSC within the disposal plumes as existing maintenance dredging activities undertaken for the Port.

17.8.42 During operation the disposal of dredged material (which would be sand/silt (alluvium)) at sea associated with the Project will be fulfilled at licensed disposal site HU060 (see **Chapter 2: The Project [TR030008/APP/6.2]**).

17.8.43 During the placement of dredged material at the Clay Huts licensed disposal site (HU060), the potential for reduction in dissolved oxygen concentrations in the water column is considered to be low. Any changes would be localised and short-lived given the dynamic nature of the site, which would rapidly be re-oxygenated. HU060 is located within the Lower Humber water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2022 interim classification, at high status, despite routinely receiving maintenance dredging material from ports within the Humber Estuary. It should be noted that material to be disposed during the maintenance dredging campaign would be recently deposited and in reduced volumes compared to the capital dredge.

17.8.44 The magnitude of change is considered to be low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Changes to chemical water quality as a result of potential sediment-bound contaminants

Maintenance dredging

17.8.45 As discussed for capital dredging above, the proposed maintenance dredging activities are considered unlikely to result in significant water quality impacts. The level of contamination of the material that will be removed through maintenance dredging (if required at all) is anticipated to be similar to the existing surficial sediment samples collected within the vicinity of the Project (see **Section 17.6**). Overall, the magnitude of change is considered very low. The sensitivity/ importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Disposal activities

17.8.46 As discussed for the proposed disposal of capital dredge material above, the proposed disposal activities for maintenance dredging are considered unlikely to result in significant water quality impacts. Maximum SSCs are associated with the disposal activities and peak excess SSC levels resulting from the disposal activities are predicted to be around 600 to 800 mg/l at the HU060 licensed disposal site. The level of contamination of the material that will be removed through maintenance dredging is anticipated to be similar to the existing surficial sediment samples collected within the vicinity of the Project (see **Section 17.6**). It should also be noted that this disposal site is already used and has been used by the Port of Immingham for the disposal of maintenance dredge material for over 30 years.

17.8.47 Overall, the magnitude of change is considered very low. The sensitivity/importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

Redistribution of sediment-bound contaminants

Maintenance dredging

17.8.48 The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere.

17.8.49 The material within the proposed dredge area ranges from coarse sediments (sands and gravel) which are generally unlikely to comprise high contaminant levels, to muds, silts and clays which are more typically associated with sediment-bound contaminants. The results of the sediment sampling analysis from within the proposed dredge area confirmed that contaminants are at relatively low concentrations, mostly below, or marginally exceeding, Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed. Furthermore, sedimentation in relation to dredging of the berth pocket is predicted to be relatively localised and the need for future maintenance dredging within the new berth pocket is expected to be very limited (if required at all) (see **Chapter 16: Physical Processes [TR030008/APP/6.2]**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution of material during maintenance dredging. In addition, maintenance dredging of the Project berth will be carried out in line with the existing regime across the Port which requires regular sediment sampling and testing to ensure the material remains suitable for disposal at sea.

17.8.50 Overall, the magnitude of change is considered very low. The sensitivity/ importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse and not significant**.

Disposal activities

17.8.51 The disposal of maintenance dredged material at sea associated with the Project will be fulfilled at licensed disposal site HU060 (see **Chapter 2: The Project [TR030008/APP/6.2]**).

17.8.52 During the placement of dredged material at the Clay Huts licensed disposal site (HU060), any sediment-bound contaminants within the dredge material will effectively be redistributed by the disposal activity. As discussed in the preceding sections, material types more typically associated with sediment-bound contaminants are muds, silts and clays and all recent sediment sampling data has returned contaminant levels at or around Cefas AL1. Material removed during the maintenance dredging campaign would be recently deposited alluvium and in reduced volumes compared to the capital dredge. It is also anticipated to be similar to the surficial sediment samples shown in **Section 17.6**. The proposed HU060 licensed disposal site has received maintenance dredge arisings from the Port of Immingham (and other ports within the Humber Estuary) for more than 30 years and periodic sediment sampling to assess the suitability for disposal at sea will continue in accordance with the conditions of the Port's existing maintenance dredge licences. This will ensure the material remains suitable for disposal at sea.

17.8.53 Overall, the magnitude of change is considered very low. The sensitivity/ importance is considered medium, given that the Humber Estuary can accommodate the change without detriment but is considered of high importance. Given this, the impact significance is assessed as **minor adverse** and **not significant**.

17.9 Mitigation and Enhancement Measures

17.9.1 None of the impact pathways assessed in **Section 17.8** are considered to result in significant adverse effects and, therefore, no mitigation is needed to address the effects. However, embedded and standard mitigation measures are provided in **Section 17.7**.

17.10 Assessment of Residual Effects

17.10.1 The following sections summarise the likely effects on Marine Water and Sediment Quality receptors.

Construction

17.10.2 The assessment considered four impact pathways in detail during construction as a result of the capital dredging, piling and disposal activities. These addressed the potential for impacts as a result of the potential changes to dissolved oxygen concentrations, changes to chemical water quality as a result of potential sediment-bound contaminants, redistribution of sediment-bound contaminants, and accidental spillages or leaks.

17.10.3 All of the potential impacts on marine water and sediment quality receptors during construction were assessed as not significant. Given this, no specific mitigation measures have been identified as being likely to be required, and residual effects remain unchanged. However, standard mitigation measures will be undertaken to manage commonly occurring environmental effects (see **Section 17.7**). As noted in **Section 17.7**, an outline CEMP has been prepared and provided with the DCO application which sets out the mitigation measures considered necessary to manage environmental effects during construction **[TR030008/APP/6.5]**. This will be implemented prior to works commencing and during works as relevant.

Operation

17.10.4 The assessment considered three impact pathways in detail during operation as a result of maintenance dredging and disposal activities. These addressed the potential for impacts as a result of the potential changes to dissolved oxygen concentrations, changes to chemical water quality as a result of potential sediment-bound contaminants, and redistribution of sediment-bound contaminants.

17.10.5 As for impacts during construction, all of the potential impacts on marine water and sediment quality receptors during operation were assessed as not significant. Given this, no specific mitigation measures have been identified as being likely to be required, and residual effects remain unchanged. However, standard mitigation measures will be undertaken to manage commonly occurring environmental effects.

Decommissioning

17.10.6 The DCO will not make any provision for the decommissioning of the main elements of the marine infrastructure above and below water level. This is because the jetty, jetty head, loading platforms, access ramps and the jetty access road, would, once constructed, become part of the fabric of the Port estate and would, in simple terms, continue to be maintained so that they can be used for port related activities to meet a long-term need. It is anticipated that plant and equipment on the jetty topside would be decommissioned in parallel with the decommissioning of the related landside elements. On this basis, potential effects on marine water and sediment quality receptors from decommissioning have been scoped out.

17.11 Summary of Assessment

17.11.1 A summary of the impact pathways that have been assessed, together with the identified residual impacts and level of confidence is presented in **Table 17-14**:. The confidence assigned to the impact pathways relating to sediment-bound contaminants is considered ‘High’ as it is based on site-specific sampling and chemical analysis of sediments within the dredge area. A ‘Medium’ level of confidence is assigned to impact pathways relating to dissolved oxygen as no site-specific data has been collected for this Project, however, concentrations of

dissolved oxygen are measured regularly in the Humber Estuary and are well understood.

Table 17-14: Summary of potential impact, mitigation measures and residual impacts

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Marine water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during piling, capital dredging and disposal activities	Minor adverse	N/A	Minor adverse	Medium
	Changes to chemical water quality as a result of potential sediment-bound contaminants being released during piling, capital dredging and disposal activities	Minor adverse	N/A	Minor adverse	High
	Redistribution of sediment-bound contaminants during piling, capital dredging and disposal activities	Minor adverse	N/A	Minor adverse	High
	Changes to marine water quality from accidental spillages of leaks	Minor adverse	N/A	Minor adverse	High
Operational Phase					
Marine water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during the maintenance dredging and disposal activities	Minor adverse	N/A	Minor adverse	Medium
	Changes to chemical water quality as a result of potential contaminants in the seabed sediment being released during maintenance dredging and disposal activities	Minor adverse	N/A	Minor adverse	High

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
	Redistribution of sediment-bound contaminants during maintenance dredging and disposal activities	Minor adverse	N/A	Minor adverse	High

17.12 References

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