Port of Mostyn

Mostyn Energy Park Extension

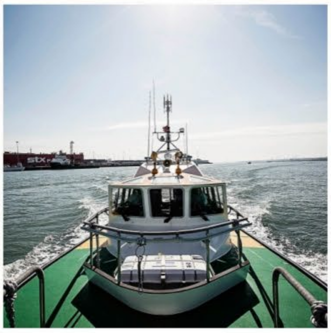
Environmental Statement

Chapter 7: Water and Sediment Quality

January 2023







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E San Martin	N J Frost	D O'Brien

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Authors

ABPmer

Notice

ABPmer
Quayside Suite, Medina Chambers, Town Quay, Southampton, Hampshire SO14 2AQ
T: +44 (0) 2380 711844 W: http://www.abpmer.co.uk/

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7.1 Introduction

This chapter provides an assessment of the potential significant effects of the MEPE Project on water and sediment quality, specifically within the marine environment. This chapter has been prepared by ABPmer.

Section 7.2 provides a definition of the study area for this topic, Section 7.3 presents the impact assessment approach that has been followed and Section 7.4 details the consultation which has taken place. Section 7.5 describes the legislation, policy and guidance position in respect of this topic and Section 7.6 describes the baseline conditions of the study area. An impact assessment describing changes to the baseline environment is then presented in Section 7.7, mitigation measures and residual effects are reviewed in Section 7.8, and Section 7.9 provides an overall final summary of the topic assessment.

A number of figures included in this chapter support the description of the existing environment (baseline). Figure 7.1 shows the location of Water Framework Directive (WFD) water bodies, bathing waters and Nitrate Vulnerable Zones (NVZs) within the study area. Figure 7.2 shows the stations that were sampled in accordance with the sediment sample plan for the MEPE Project.

The physical processes assessment (Chapter 6) has informed the outcomes of the water and sediment quality assessment in terms of changes in suspended sediment concentrations (SSC).

Relevant aspects of the water and sediment quality assessment have informed the outcomes of the nature conservation and marine ecology assessment (Chapter 8) in terms of changes that may influence marine ecological receptors. Furthermore, the water and sediment quality assessment has informed the Habitats Regulations Assessment (HRA) included in Appendix 8.5 and the WFD Compliance Assessment included in Appendix 7.1.

7.2 Definition of study area

The study area for this assessment is the area over which potential direct and indirect effects of the MEPE Project are predicted to occur during construction and operation. The direct effects on water and sediment quality are those that may arise due to accidental releases during construction. Indirect effects are those that may arise due to sediment that is disturbed 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.

The study area for the water and sediment quality topic is considered to be the Dee Estuary, particularly the areas adjacent to Mostyn and the existing licensed disposal sites at Mostyn Deep (IS102) and Mostyn Breakwater (IS203).

7.3 Impact assessment methodology

7.3.1 Data and information sources

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

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

- Natural Resources Wales (NRW) 'Water Watch Wales' website (NRW, 2022);
- 'Find a bathing water' website (Environment Agency, 2022);
- Shellfish classification zone maps (Cefas, 2022);
- Shellfish Classifications England and Wales 2022-23 (Food Standards Agency, 2022);
- Water body summary table within the Environment Agency (2016) 'Clearing the Waters for All' guidance;
- Lle Nitrate Vulnerable Zones (NVZ) map browser (Lle, 2022); and
- Multi-Agency Geographic Information for the Countryside (MAGIC) website (Natural England, 2022);

A sediment contamination survey was undertaken in September 2022 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 NRW/Centre for Environment Fisheries and Aquaculture Science (Cefas) sample plan (SP2106) 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 (OSPAR Commission, 2014).

Contaminant concentrations in sediment samples have been compared to Cefas Guideline Action Levels to determine the suitability of the dredge material for disposal at sea. Contaminant concentrations in sediments have also informed the assessment of potential changes to dissolved concentrations in the water column and predicted potential redistribution of contaminants as a result of the proposed development.

7.3.2 Determining significance of effects

To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology has been applied, as described in the Impact Assessment Approach ES Chapter (Chapter 5). To assess the significance of effects, the magnitude of the impact and the probability of it occurring is evaluated to understand the exposure to change, and this is assessed against the sensitivity of a receptor/feature to understand its vulnerability. Finally, this is compared against the importance of a receptor/feature to generate a level of significance for effects resulting from each impact pathway.

The outputs of the physical processes assessment (Chapter 6), in particular the assessment of changes in SSC during construction and operation, have been used to inform the water and sediment quality assessment. Incremental changes to dissolved contaminant concentrations, in addition to background concentrations, have been compared to Environmental Quality Standard (EQS) values to consider potential ecological impacts, based on the maximum allowable concentration (MAC; short-term) and thresholds for annual averages (long-term). The outputs of the physical processes assessment have also supported an assessment of changes to dissolved oxygen concentrations.

A WFD Compliance Assessment has been undertaken to determine the potential implications of the proposed development on the objectives of relevant water bodies (Section 4.8.4 of the Legislative and Consenting Framework Chapter 4). This assessment has been based on the information and analysis provided within the ES in relation to changes in physical processes (Chapter 6), water and sediment quality (Chapter 7) and impacts on nature conservation and marine ecology receptors (Chapter 8). The WFD Compliance Assessment follows the format specified in the Environment Agency's 'Clearing the Waters for All' guidance (Environment Agency, 2016) and is provided in Appendix 7.1.

7.4 Consultation

Consultation with regard to the outcomes of the formal scoping process and whether there are any likely effects of the MEPE Project on water and sediment quality has been undertaken with NRW.

The consultation that has been undertaken, along with the outcome of such consultation and how it has influenced this assessment is provided in Table 7.1.

Table 7.1. Summary of consultation to date

Consultee	Reference, Date	Summary of Response	How Comments have Been Addressed in this Chapter
NRW Marine Licensing Team	Scoping Opinion, 06 January 2022	We agree with the potential impacts identified within section 5.2.35 and 5.2.36 of the scoping report. These must be considered within the ES.	The impact pathways scoped into the water and sediment quality assessment are assessed in Section 7.7.
	Scoping Opinion, 06 January 2022	We agree with the scoping report that the risk of spills can be scoped out of the EIA due to mitigation and NRW TE recommend a Construction Environment Management Plan (CEMP) is drawn up to manage the risk of spills to the marine environment. We also recommend the applicant take note of the Guidance for Pollution Prevention (GPP) (particularly GPP5 although others are also relevant). However; please note that the risk of spills cannot be screened/scoped out of the HRA or WFD compliance assessment and a full assessment will be required for both.	Adherence to environmental management best practice, including managing the risk of spills, will be controlled through a CEMP as detailed in Section 3.3 of the Project Methodology Chapter 3 and Section 7.8 of this chapter. The CEMP will be provided to NRW prior to works commencing and will set out the mitigation measures needed to manage environmental effects. The risks of spills have not been screened out of the WFD Compliance Assessment (Appendix 7.1) or the HRA (Appendix 8.5) and are fully considered in the assessment stage.
	Scoping Opinion, 06 January 2022	The disposal ground location should be included within the Figures.	The disposal ground locations are shown on Figure 7.1 and in relevant figures of the WFD Compliance Assessment (Appendix 7.1 and HRA (Appendix 8.5).
NRW Advisory	Scoping Opinion, 06 January 2022	Transboundary impacts might include the EAs West Kirby Bathing Water which is included in the Water Quality section and which will presumably show up in the applicants WFD compliance assessment.	West Kirby Bathing Water is considered in Section 7.6 and in the WFD Compliance Assessment (Appendix 7.1).

7.5 Implications of legislation, policy and guidance

This section of the chapter sets out key aspects and implications of policy and guidance that are relevant to the assessment of likely impacts on water and sediment quality. It builds upon the overarching chapter covering Legislative and Consenting Framework (Chapter 4).

7.5.1 Legislation

The Water Framework Regulations

The WFD (2000/60/EEC) establishes a framework for the management and protection of Europe's water resources. It is implemented in England and Wales through the Water Environment (WFD) (England and Wales) Regulations 2017, known as the Water Framework Regulations.

The overall objectives of the WFD as implemented by the Water Framework Regulations is to achieve "good ecological and good chemical status" in all inland and coastal waters by 2021 unless alternative objectives are set or there are grounds for time limited derogation. For example, where pressures preclude the achievement of good status (e.g., navigation, coastal defence) in heavily modified water bodies (HMWBs), the WFD provides that an alternative objective of "good ecological potential" is set.

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.

The water and sediment quality assessment takes account of the location of any WFD water bodies within the study area.

A WFD Compliance Assessment has been undertaken to determine whether the proposed development complies with the objectives of the WFD and is presented as an appendix to the ES (Appendix 7.1). This includes a consideration of the potential risks for key receptors, including water quality. The WFD Compliance Assessment has been informed by the outcomes of the water and sediment quality assessment reported in this chapter.

Bathing Water Regulations

The revised Bathing Water Directive (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Bathing Water Directive (76/160/EEC) and the process used to measure/monitor water quality at identified bathing waters. It is implemented in England and Wales under the Bathing Water Regulations 2013 (as amended). The revised Bathing Water Directive focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the original Bathing Water Directive. Bathing waters under the revised Bathing Water Directive are classified as excellent, good, sufficient, or poor according to the levels of certain types of bacteria (intestinal enterococci and *Escherichia coli*) in samples obtained during the bathing season (May to September).

The original Bathing Water Directive was repealed at the end of 2014 and the UK Government's target under the revised Bathing Water Directive was to achieve a classification of 'sufficient' for all bathing waters by 2015, as described under the Bathing Water Regulations 2013 (as amended). Monitoring of bathing water quality has been reported against revised Bathing Water Directive indicators since 2015. The new classification system considers all samples obtained during the previous four years and, therefore, data has been collected for revised Bathing Water Directive indicators since 2012.

The water and sediment quality assessment takes into account the location of any designated bathing waters within the study area for the project.

Nitrate Pollution Prevention Regulations

The Nitrates Directive (91/676/EEC) is implemented in Wales under the Nitrate Pollution Prevention Regulations 2013 (as amended). It aims to reduce water pollution from agricultural sources and to prevent such pollution occurring in the future (nitrogen is one of the nutrients that can affect plant growth). Under the Nitrates Directive, surface waters are identified if too much nitrogen has caused a change in plant growth which affects existing plants and animals and the use of the water body.

The water and sediment quality assessment takes account of the location of any designated NVZs within the study area for the project.

Urban Waste Water Treatment Regulations

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. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. In general, the Urban Waste Water Treatment Directive requires that collected waste water is treated to at least secondary treatment standards for significant discharges. Secondary treatment is a biological treatment process where bacteria are used to break down the biodegradable matter (already much reduced by primary treatment) in waste water. Sensitive areas under the Urban Waste Water Treatment Directive are water bodies affected by eutrophication due to elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

The water and sediment quality assessment takes into account the location of any sensitive areas within the study area for the project.

Shellfish Waters Directive

The Shellfish Waters Directive (2006/113/EC) was repealed in December 2013 and subsumed within the WFD. However, the Shellfish Water Protected Areas (England and Wales) Directions 2016 require that NRW (in Wales) 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 NRW 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).

The water and sediment quality assessment takes into account the location of any Shellfish Water Protected Areas within the study area for the project.

The Marine and Coastal Access Act (MCAA)

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 Habitats Regulations

The Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations) transpose the Habitats Directive (Directive 92/43/EEC) and the Birds Directive (2009/147/EC) into English law.

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 Habitats Regulations also require the compilation and maintenance of a register of European sites, to include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (classified under the Birds Directive). These sites form the Natura 2000 network. These regulations 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.

Where a development project is located close to, or within, a European/Ramsar Site, the Habitats Regulations apply. This requires the 'Competent Authority' to determine whether the proposed works have 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, to undertake an Appropriate Assessment of the implications of the proposals in light of the site's conservation objectives.

An HRA has been undertaken given the proposed development is within the Dee Estuary SAC, SPA and Ramsar site and there is potential for an LSE. The outcomes of the water and sediment quality assessment have informed the HRA (Appendix 8.5), in particular with respect to the potential release of sediment-bound contaminants.

7.5.2 National policy

National Policy Statement for Ports (NPSfP)

The NPSfP provides the policy framework for decisions on proposals for new port developments (DfT, 2012). In 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 proposed 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 proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges: a consideration of surface water discharges is presented in Flood Risk and Drainage Chapter 11;
- Existing water resources affected by the proposed project and the impacts of the proposed project on water resources: a consideration of groundwater and surface waters is presented in the Flood Risk and Drainage Chapter 11;
- Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics: a consideration of these is presented in the Physical Processes Chapter 6;
- Any impacts of the proposed project on water bodies or protected areas under the WFD and source protection zones (SPZs) around potable groundwater abstractions: a consideration of these is provided in this chapter and also assessed in the WFD Compliance Assessment (Appendix 7.1); and
- Any cumulative effects: an assessment of any cumulative water and sediment quality effects that could arise from the proposed development alone, as well as through other plans, projects and ongoing activities within the study area is considered in the Cumulative and In-Combination Effects Chapter 13.

The mitigation measures that are proposed to be implemented as standard good practice to manage water quality impacts are presented in Section 7.8 of this chapter. A CEMP which sets out these mitigation measures will be provided to NRW prior to commencing the construction of the MEPE Project.

UK Marine Policy Statement (MPS)

The MPS 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 permitting development in the UK marine areas.

Section 2.6.4 of the MPS is relevant to the water and sediment quality assessment. In particular, paragraph 2.6.8.4 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

The aim of the UK Marine Strategy is to more effectively protect the marine environment across the UK. 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 (Defra, 2019). It aims to achieve good environmental status of marine waters by 2020 (followed by a six-year review) and to protect the resource base upon which marine-related economic and social activities depend. The Strategy constitutes the 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 MHWS) to the outer limit of the UK Exclusive Economic Zone (EEZ), as well as the area of UK continental shelf beyond the EEZ. Reporting against the Strategy is a cyclical process, and updated assessments and Marine Strategy documents are anticipated in due course. The anticipated pressures exerted on the marine environment by the MEPE Project are considered to be of small magnitude in the context of UK Marine Regions that they are unlikely to be a significant issue. The Strategy is, therefore, not considered further in this ES with regards to the water and sediment quality assessment.

Welsh National Marine Plan (WNMP)

The WNMP (Welsh Government, 2019) is the first marine plan for Wales and represents that start of a process to shape seas to support economic, social, cultural and environmental objectives. The plan was prepared and adopted under the MCAA 2009 for the purposes of Section 51 of the MCAA and in accordance with the UK MPS.

The following marine plan policies are of particular relevance to the water and sediment quality topic:

- **Policy SOC_03 Marine pollution incidents**: Proposals should demonstrate how they minimise their risk of causing or contributing to marine pollution incidents;
- **Policy ENV_04 Marine litter**: Proposals should demonstrate how they: avoid the deliberate introduction of litter into the marine plan area; and minimise the risk of accidental release of litter; and
- **Policy ENV_06 Air and water quality**: Proposals should demonstrate that they have considered their potential air and water quality impacts and should, in order of preference: a) avoid adverse impacts; and/or b) minimise adverse impacts where they cannot be avoided; and/or c) mitigate adverse impacts where they cannot be minimised. If significant adverse

impacts cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding.

The implications of the proposed development on WNMP policies are reviewed in the marine plan conformance assessment included in Appendix 4.1.

Well-being of Future Generations (Wales) Act

The Well-being of Future Generations (Wales) Act is concerned with improving the social, economic, environmental and cultural well-being of Wales. It requires public bodies to consider the long-term issues, work better with people and communities and each other, look to prevent problems and take a more joined-up approach. One of its well-being goals is for a Resilient Wales "*A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change*". The MEPE Project is considered to provide a positive contribution to this goal as detailed further in the Legislative and Consenting Framework Chapter 4 of the ES.

Environment (Wales) Act

The Environment (Wales) Act 2016 sets out the legislative framework to promote the 'Sustainable Management of Natural Resources in Wales'. The Act received Royal Assent in 2016. It delivers against Welsh Government Programme for Government commitment to introduce new legislation for the environment (Welsh Government, 2016).

North West Marine Plan

The North West Marine Plan covers the north west inshore and north west offshore marine plan areas. The Plan introduces a strategic approach to planning within the English inshore and offshore waters between the Solway Firth border with Scotland and the River Dee border with Wales. It provides a clear, evidence-based approach to inform decision-making by marine users and regulators on where, when or how activities might take place within the north west inshore and north west offshore marine plan areas. The plan was prepared and adopted under the MCAA 2009 for the purposes of Section 51 of the MCAA and in accordance with the UK MPS.

Given the Dee (N. Wales) transitional waterbody overlaps both the Welsh and English jurisdictions, the following marine plan policies are considered of particular relevance to the water and sediment quality topic:

- **Policy NW-WQ-1**: Proposals that protect, enhance and restore water quality will be supported. Proposals that cause deterioration of water quality must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate -deterioration of water quality in the marine environment;
- **Policy NW-ML-1**: Public authorities must make adequate provision for the prevention, re-use, recycling and disposal of waste to reduce and prevent marine litter. Public authorities should aspire to undertake measures to remove marine litter within their jurisdiction; and
- **Policy NW-ML-2**: Proposals that facilitate waste re-use or recycling to reduce or remove marine litter will be supported. Proposals that could potentially increase the amount of marine litter in the marine plan areas must include measures to, in order of preference: a) avoid b) minimise c) mitigate -waste entering the marine environment.

These policies complement and are in line with WNMP Policy ENV_04 Marine litter and Policy ENV_06 Air and water quality. The implications of the proposed development on WNMP policies are reviewed in the marine plan conformance assessment included in Appendix 4.1 of this ES.

7.5.3 Local policy

Flintshire Local Development Plan (FLDP)

The draft FLDP, together with relevant supporting documents and evidence, sets out the planning strategy for Flintshire up to 2030, along with the policy framework that will be used to guide how this strategy will be followed and achieved (Flintshire County Council, 2019).

The following FLDP policies are of particular relevance to the water and sediment quality topic:

- **PC11: Mostyn Docks**: Development proposals which enhance the transport and employment role of the docks will be permitted provided that such proposals do not have a significant adverse effect on the ecological, landscape, historic, recreational integrity and water and air quality of the Dee Estuary; and
- **EN15: Water Resources**: Development affecting water resources will only be permitted if:
  a) it would not have a significant adverse impact on the capacity and flow of groundwater, surface water, or coastal water systems;
  b) it would not pose an unacceptable risk to the quality of groundwater, surface water, or coastal water; and
  c) it would have access to adequate water supply, sewerage and sewage treatment facilities which either already exist, or will be provided in time to serve the development, without detriment to existing abstractions, water quality, fisheries, amenity or nature conservation.

7.5.4 Guidance

Clearing the Waters for All

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 (Environment Agency, 2016). The guidance sets out the 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.

NRW signposts applicants for marine licences in Wales to this guidance. The WFD Compliance Assessment for the proposed development in Appendix 7.1 to this ES follows the format specified in this guidance.

7.6 Description of the existing environment

7.6.1 Water quality

Water Framework Regulations

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. 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 1 nm 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.

NRW publish River Basin Management Plan (RBMPs), which set out measures through which compliance with WFD objectives will be achieved. The 'Dee (N. Wales)' transitional waterbody (ID: GB531106708200) overlaps the proposed development and marine disposal sites (Figure 7.1). It is recorded as a heavily modified waterbody (HMWB) due to navigation, ports and harbours use. This means 'ecological potential' is applied rather than 'ecological status'. The current (2021) overall status of the waterbody is 'moderate', with an ecological potential of 'good', and a chemical status of 'moderate'. The reason for the 'moderate' chemical status is based on priority hazardous substances, brominated diphenylethers (BDPE), and polyaromatic hydrocarbons (PAHs).

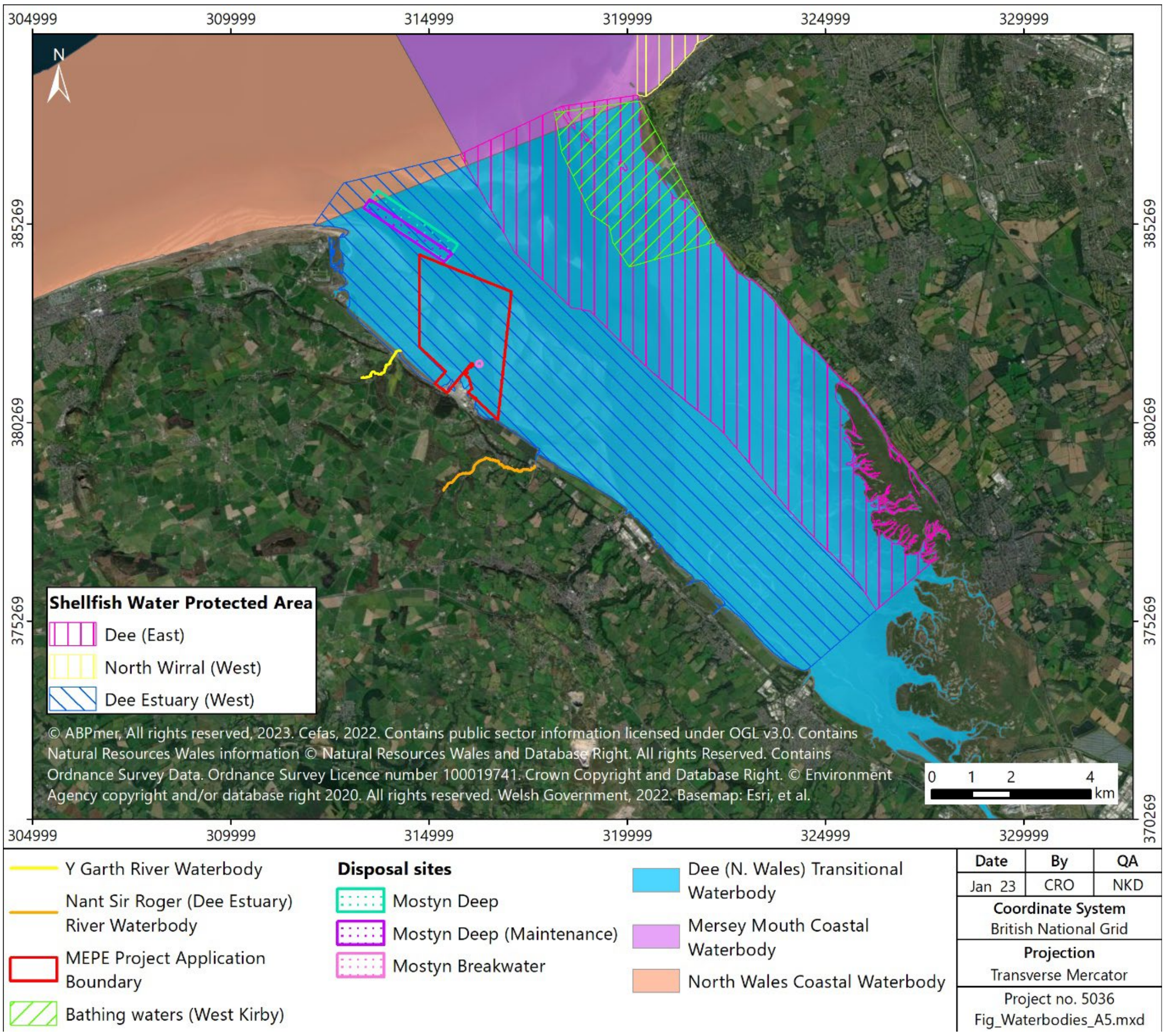

Figure 7.1. Location of WFD waterbodies, bathing waters and Shellfish Water Protected Areas

A small portion of the north west edge of the Mostyn Deep disposal site (IS102) also overlaps with the North Wales coastal water body (ID: GB641011650000), though the majority lies within the Dee (N. Wales) transitional water body. It is recorded as a HMWB due to coastal protection. As above, this means 'ecological potential' is applied rather than 'ecological status'. The current (2021) overall status of the waterbody is 'moderate', with an ecological potential of 'moderate', and a chemical status of 'moderate'. The reason for the 'moderate' ecological status is based on the biological quality element phytoplankton, and the reason for the 'moderate' chemical status is based on priority hazardous substance mercury.

The main watercourses in the vicinity of the proposed development site (within 5 km) are Y Garth river waterbody and Nant Sir Roger (Dee Estuary) river waterbody which drains to the north-west and south-east of the Port of Mostyn, and the Dee Estuary itself which is designated as the Dee (N. Wales) transitional water body. The Y Garth and Nant Sir Roger (Dee estuary) river waterbodies are currently (2021) at moderate and good overall status respectively.

Bathing waters

West Kirby designated bathing water is located approximately 7 km north east of the MEPE Project (Figure 7.1). West Kirby was assessed as having 'excellent' bathing water quality between 2017 and 2021 (Environment Agency, 2022).

Shellfish Water Protected Areas

The proposed development and marine disposal sites overlap the Dee (West) Shellfish Water Protected Area (NRW, 2022; Figure 7.1) and the Salisbury and Salisbury Middle classification zone within the Dee bivalve mollusc production area (Cefas, 2022). The Salisbury classification zone is currently designated as Class A for *Cerastoderma edule* and *Mytilus* spp. (Cefas, 2022; Food Standards Agency, 2022). The Salisbury Middle classification zone is currently designated as Class A for *C. edule* (Cefas, 2022; Food Standards Agency, 2022).

Nitrate Vulnerable Zones and Sensitive Areas

There are no Nitrate Vulnerable Zones (NVZs) or Sensitive Areas (Eutrophic) designated under the Urban Waste Water Treatment Directive in the vicinity of the proposed development and marine disposal sites.

7.6.2 Sediment quality

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 (MMO, 2014).

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.

In August 2021, a sample plan (SP2106) was provided by NRW, prepared in consultation with Cefas. In September 2022, sediment samples were collected from eight borehole stations (A to H) across the proposed dredge area comprising the proposed development, including subsurface samples (Figure 7.2).

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

- Particle size analysis (PSA);
- Trace metals;
- Organotins;
- Polycyclic aromatic hydrocarbons (PAHs);
- Total hydrocarbon content (THC); and
- Organochlorine pesticides (OCPs).

Figure 7.2. Location of sediment samples collected in accordance with NRW sample plan

The PSA results are presented in Table 7.2. Sediments from most sampling locations were dominated by sand material. Site F (Sample ID: BH502 (ES1) 0.00 m) contained the most silt material of any sample comprising approximately 73 %. Site B (Sample ID: EB2 (ES4) 6.00 m), Site C (Sample ID: EB3 (ES3) 4.00 m), Site H (Sample ID: BH504 (ES1) 0.00 m), Site E (Sample ID: BH501 (ES1) 0.00 m), Site F (Sample ID: BH502 (ES4) 6.00 m and Sample ID: BH502 (ES5) 8.00 m), and Site A (Sample ID: EB1 (ES2) 2.00 m and Sample ID: EB1 (ES4) 6.00 m) comprised < 4% gravel, with all other samples containing no gravel.

A summary of sediment quality (chemical analysis) of samples from the dredge areas is provided in Table 7.3 to Table 7.7. Concentrations above or below Cefas Guideline Action Levels are highlighted to provide an indication of sediment quality. Contaminant concentrations were low, with most values below the respective AL1. There were no instances where the concentration exceeded the respective AL2 (or a sample concentration was close to exceeding this threshold).

Trace metal concentrations were below AL1 in most samples. AL1 for nickel, cadmium, and mercury was only marginally exceeded in one sample at Site C (Sample ID: EB3 (ES5) 8.00 m), Site G (Sample ID: BH503 (ES4) 6.00 m), and Site H (Sample ID: BH504 (ES4) 6.00 m), respectively. AL1 for zinc was exceeded in three samples: Site B (Sample ID: EB2 (ES4) 6.00 m), and Site F (Sample ID: BH502 (ES5) 8.00 m and Sample ID: BH502 (ES6) 10.00 m). Organotins in all samples were below the respective AL1.

Some individual PAHs were found to be marginally above AL1 (there is currently no AL2 for individual or total PAHs), primarily at Site H (Sample ID: BH504 (ES4) 6.00 m) and Site F (Sample ID: BH502 (ES1) 0.00 m and Sample ID: BH502 (ES2) 2.00 m). OCP concentrations were often below the limit of detection (LOD) in most samples.

The full results of the sediment analysis undertaken on the samples that were collected in accordance with the sediment sample plan are provided in the required NRW results template and included in Appendix 7.2 of this ES.

7.6.3 Future baseline

In the absence of the MEPE Project, water and sediment quality will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns and trends (e.g., 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).

Table 7.2. Particle size analysis (PSA) results from sediment samples collected in September 2022

Site	Sample ID	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2 mm)	Sand (2 mm – 63 µm)	Silt (<63 µm)
Site B	EB2 (ES1) 0.00 m	Odourless Brown Muddy Sand	0.00	93.96	6.04
	EB2 (ES2) 2.00 m	Odourless Brown Muddy Sand	0.00	80.89	19.11
	EB2 (ES3) 4.00 m	Odourless Brown Muddy Sand	0.00	86.01	13.99
	EB2 (ES4) 6.00 m	Brown Gravelly Muddy Sand with Shell Fragments and a Peat Odour	0.34	89.59	10.08
Site D	EB4 (ES1) 0.00 m	Odourless Brown Muddy Sand	0.00	89.24	10.76
	EB4 (ES2) 2.00 m	Odourless Brown Muddy Sand	0.00	82.73	17.27
	EB4 (ES3) 4.00 m	Odourless Brown Muddy Sand	0.00	76.79	23.21
	EB4 (ES4) 6.00 m	Odourless Brown Muddy Sand	0.00	85.17	14.83
	EB4 (ES5) 8.00 m	Odourless Brown Muddy Sand	0.00	88.70	11.30
Site C	EB3 (ES1) 0.00 m	Odourless Brown Sand	0.00	96.92	3.08
	EB3 (ES2) 2.00 m	Odourless Brown Muddy Sand	0.00	92.15	7.85
	EB3 (ES3) 4.00 m	Brown-Black Gravelly Muddy Sand with Shell Fragments and a Hydrocarbons Odour	1.38	66.04	32.58
	EB3 (ES4) 6.00 m	Odourless Brown Muddy Sand	0.00	71.43	28.57
	EB3 (ES5) 8.00 m	Brown Sandy Mud with a Peat Odour	0.00	80.24	19.76
Site H	BH504 (ES1) 0.00 m	Brown Muddy Sand with Shell Fragments and Organic Matter and a Peat Odour	0.20	48.62	51.19
	BH504 (ES2) 2.00 m	Brown Muddy Sand with a Peat Odour	0.00	85.21	14.79
	BH504 (ES3) 4.00 m	Odourless Brown Muddy Sand with Organic Matter	0.00	58.16	41.84
	BH504 (ES4) 6.00 m	Brown Muddy Sand with Shell Fragments and a Peat Odour	0.00	70.49	29.51
	BH504 (ES5) 8.00 m	Odourless Brown Muddy Sand with Shell Fragments	0.00	95.63	4.37
Site G	BH503 (ES1) 0.00 m	Odourless Brown Muddy Sand with Organic Matter	0.00	64.54	35.46
	BH503 (ES2) 2.00 m	Odourless Brown Muddy Sand	0.00	74.29	25.71
	BH503 (ES3) 4.00 m	Odourless Brown Muddy Sand	0.00	83.25	16.75
	BH503 (ES4) 6.00 m	Brown Muddy Sand with an Earthy Odour	0.00	93.54	6.46
	BH503 (ES5) 8.00 m	Brown Muddy Sand with a Hydrocarbons Odour	0.00	89.70	10.30

Site	Sample ID	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2 mm)	Sand (2 mm – 63 µm)	Silt (<63 µm)
Site E	BH501 (ES1) 0.00 m	Odourless Brown Gravelly Sandy Mud with Shell Fragments and Organic Matter.	4.11	58.68	37.21
	BH501 (ES2) 2.00 m	Odourless Brown Muddy Sand.	0.00	89.74	10.26
	BH501 (ES3) 4.00 m	Odourless Brown Muddy Sand.	0.00	93.61	6.39
	BH501 (ES4) 6.00 m	Odourless Brown Muddy Sand.	0.00	37.70	62.30
Site F	BH502 (ES1) 0.00 m	Brown Sandy Mud with Organic Matter and a Peat Odour.	0.00	27.26	72.74
	BH502 (ES2) 2.00 m	Odourless Brown Muddy Sand.	0.00	74.99	25.01
	BH502 (ES3) 4.00 m	Odourless Brown Muddy Sand.	0.00	70.82	29.18
	BH502 (ES4) 6.00 m	Odourless Brown Muddy Sand with Organic Matter.	0.64	86.56	12.80
	BH502 (ES5) 8.00 m	Brown Gravelly Muddy Sand with Shell Fragments and Organic Matter and an Earthy Odour.	0.92	41.88	57.20
	BH502 (ES6) 10.00 m	Odourless Brown Muddy Sand.	0.00	41.88	58.12
Site A	EB1 (ES1) 0.00 m	Odourless Brown Muddy Sand.	0.00	93.97	6.03
	EB1 (ES2) 2.00 m	Odourless Brown Muddy Sand with Shell Fragments.	0.03	75.95	24.03
	EB1 (ES3) 4.00 m	Odourless Brown Muddy Sand.	0.00	96.20	3.80
	EB1 (ES4) 6.00 m	Odourless Brown Gravelly Muddy Sand with Shell Fragments.	2.39	74.71	22.90
	EB1 (ES5) 8.00 m	Odourless Brown Muddy Sand.	0.00	89.69	10.31

Table 7.3. Sediment contamination data collected in September 2022 (1 of 5)

Contaminant	Units	Cefas Action Level AL1	Cefas Action Level AL2	Sample Concentration Site B EB2 (ES1) 0.00 m	Site B EB2 (ES2) 2.00 m	Site B EB2 (ES3) 4.00 m	Site B EB2 (ES4) 6.00 m	Site D EB4 (ES1) 0.00 m	Site D EB4 (ES2) 2.00 m	Site D EB4 (ES3) 4.00 m	Site D EB4 (ES4) 6.00 m	Site D EB4 (ES5) 8.00 m
Arsenic	mg/kg	20	100	4.4	7.2	6.9	8.7	4.8	4.9	5.8	6	5
Cadmium	mg/kg	0.4	5	0.15	0.21	0.21	0.18	0.11	0.1	0.13	0.13	0.1
Chromium	mg/kg	40	400	7.8	19.1	14	15.2	8.2	8.9	13.1	14.2	14.1
Copper	mg/kg	40	400	4.4	9.3	8.2	10.3	4.4	4.2	7	11.3	5.2
Mercury	mg/kg	0.3	3	<0.01	0.07	0.05	0.14	<0.01	<0.01	0.03	0.02	0.02
Nickel	mg/kg	20	200	8	17.1	13.4	14.5	7.4	9.5	11.6	14.2	14.8
Lead	mg/kg	50	500	4.4	18.6	16.3	20.1	6.3	7.1	12.3	11.7	7.9
Zinc	mg/kg	130	800	29.5	88.8	80	130	35.8	40.4	70.4	58.6	50.4
Dibutyltin (DBT)	mg/kg	0.1	1	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<LOD
Tributyltin (TBT)	mg/kg	0.1	1	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<LOD
Acenaphthene	µg/kg	100	-	<5	4.74	6.78	2.49	<1	2.35	3.57	1.44	<LOD
Acenaphthylene	µg/kg	100	-	<5	5.4	7.25	4.21	<1	2.53	2.59	2.91	3.06
Anthracene	µg/kg	100	-	<5	8.12	15.3	6.31	1.68	6.25	4.82	3.32	3.97
Benzo[a]anthracene	µg/kg	100	-	<5	22.2	35.1	15.2	3.5	17	9.55	10.7	10.2
Benzo[a]pyrene	µg/kg	100	-	1.05	27.2	48	24.6	3.81	18.3	12.3	11.1	9.44
Benzo[b]fluoranthene	µg/kg	100	-	1.72	37	66.2	31.3	5.47	21	18.3	10.4	10.1
Benzo[ghi]perylene	µg/kg	100	-	1.04	23.1	38.4	20	2.89	13.4	9.88	6.7	6.58
Benzo[e]pyrene	µg/kg	100		1.29	29	47.4	22.1	4.43	16.4	13.2	10.2	8.79
Benzo[k]fluoranthene	µg/kg	100	-	<5	29.1	38.8	23.5	3.88	14.6	11.3	10.6	6.59
C1-naphthalenes	µg/kg	100	-	4.43	62.3	81.4	31.9	13.4	26.6	44.8	14.9	15.8
C1-phenanthrene	µg/kg	100	-	3.65	72.4	76.8	29.2	10.6	33.7	24	22.5	19.7
C2-naphthalenes	µg/kg	100	-	9.29	91.9	62.2	26.8	14.7	26.6	31	16.7	19.8
C3-naphthalenes	µg/kg	100	-	3.28	86.4	62.4	24.2	12.1	25.1	20.6	20.7	25.8
Chrysene	µg/kg	100	-	1.14	29.7	44.5	19.7	4.89	20.3	13.3	13.9	11.6
Dibenzo[ah]anthracene	µg/kg	100	-	<5	4.7	8.18	3.87	<1	2.62	1.72	1.15	1.03
Fluoranthene	µg/kg	100	-	1.5	37.1	65.9	25.9	6.16	25.6	19.6	15.9	14.6

Contaminant	Units	Cefas Action Level		Sample Concentration								
				Site B				Site D				
		AL1	AL2	EB2 (ES1) 0.00 m	EB2 (ES2) 2.00 m	EB2 (ES3) 4.00 m	EB2 (ES4) 6.00 m	EB4 (ES1) 0.00 m	EB4 (ES2) 2.00 m	EB4 (ES3) 4.00 m	EB4 (ES4) 6.00 m	EB4 (ES5) 8.00 m
Fluorene	µg/kg	100	-	<5	9.92	12.4	4.79	1.5	4.28	5.56	3.5	3.07
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	1.12	25.8	42.6	22.5	2.88	13	9.49	6.27	5.41
Naphthalene	µg/kg	100	-	<5	15	38.8	11	3.8	9.66	9.51	5.81	6.69
Perylene	µg/kg	100	-	<5	10.3	16.5	6.7	1.36	5.72	3.85	3.58	2.34
Phenanthrene	µg/kg	100	-	1.83	51.9	55.7	22.8	7.89	24.7	19.1	13.9	16.6
Pyrene	µg/kg	100	-	1.7	40.4	67.5	29.5	6.51	28.5	20.4	18.5	17.2
Total Hydrocarbon Content (THC)	mg/kg	-	-	2.13	18.3	18.2	31.6	15.9	14.9	23.1	11	12.8
AHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
BHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
GHCH	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
Dieldrin	mg/kg	0.005	-	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<LOD
HCB	mg/kg	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
PPTDE	mg/kg	-	-	<0.0001	0.0003	<0.0001	0.0003	<0.0001	<0.0001	0.0002	0.0002	<LOD
PPDDE	mg/kg	-	-	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
PPDDT	mg/kg	0.001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<LOD
Key	Below AL1											
	Above AL1, Below AL2											
	Above AL2											

Table 7.4. Sediment contamination data collected in September 2022 (2 of 5)

Contaminant	Units	Cefas Action Level		Sample Concentration						
				Site C					Site H	
		AL1	AL2	EB3 (ES1) 0.00 m	EB3 (ES2) 2.00 m	EB3 (ES3) 4.00 m	EB3 (ES4) 6.00 m	EB3 (ES5) 8.00 m	BH504 (ES1) 0.00 m	BH504 (ES2) 2.00 m
Arsenic	mg/kg	20	100	4.1	4.7	7.1	5.3	8.7	10.8	6.7
Cadmium	mg/kg	0.4	5	0.14	0.05	0.1	0.04	0.23	0.19	0.06
Chromium	mg/kg	40	400	7.7	13.7	19.5	11.6	28.5	22	12.8
Copper	mg/kg	40	400	3.5	5.5	8.8	3.8	14.5	11.8	6.8
Mercury	mg/kg	0.3	3	<0.01	<0.01	0.06	<0.01	0.14	0.11	0.05
Nickel	mg/kg	20	200	7.8	9.7	15	8.8	22.5	15.6	10.1
Lead	mg/kg	50	500	4.9	6.4	17.8	6.7	26.8	24.2	13.2
Zinc	mg/kg	130	800	31.9	38	81.2	50.9	124	106	71.6
Dibutyltin (DBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Tributyltin (TBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthene	µg/kg	100	-	<LOD	<LOD	3.84	9.32	<LOD	2.36	2.57
Acenaphthylene	µg/kg	100	-	<LOD	<LOD	4.22	6.35	<LOD	2.6	1.75
Anthracene	µg/kg	100	-	<LOD	<LOD	8.23	15.4	<LOD	5.14	2.93
Benzo[a]anthracene	µg/kg	100	-	1.3	<LOD	17.8	38.2	1.1	12.6	6.96
Benzo[a]pyrene	µg/kg	100	-	1.28	<LOD	22.1	50.3	<LOD	16.7	7.21
Benzo[b]fluoranthene	µg/kg	100	-	1.71	<LOD	35.3	66.1	<LOD	24.1	10.1
Benzo[ghi]perylene	µg/kg	100	-	1.12	<LOD	19.7	43	<LOD	16	5.47
Benzo[e]pyrene	µg/kg	100		1.69	<LOD	25.3	53.7	<LOD	17.2	7.88
Benzo[k]fluoranthene	µg/kg	100	-	1.37	<LOD	22.6	47.5	<LOD	15.9	8.49
C1-naphthalenes	µg/kg	100	-	7.94	1.37	43.3	91.2	1.96	27.6	15.6
C1-phenanthrene	µg/kg	100	-	9.44	1.52	39.5	136	1.93	29.8	15.6
C2-naphthalenes	µg/kg	100	-	9.24	1.87	38.8	99.7	2.5	25.3	36.3
C3-naphthalenes	µg/kg	100	-	10.6	1.48	36.2	104	1.95	17.2	11.1
Chrysene	µg/kg	100	-	1.95	<LOD	25.4	54	1.23	17.2	9.23
Dibenzo[ah]anthracene	µg/kg	100	-	<LOD	<LOD	3.2	8.12	<LOD	2.59	<LOD
Fluoranthene	µg/kg	100	-	2.32	<LOD	36.7	75.8	2.03	24	15.8

Contaminant	Units	Cefas Action Level		Sample Concentration						
				Site C					Site H	
		AL1	AL2	EB3 (ES1) 0.00 m	EB3 (ES2) 2.00 m	EB3 (ES3) 4.00 m	EB3 (ES4) 6.00 m	EB3 (ES5) 8.00 m	BH504 (ES1) 0.00 m	BH504 (ES2) 2.00 m
Fluorene	µg/kg	100	-	<LOD	<LOD	9.14	16.7	<LOD	4.69	3.05
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	<LOD	<LOD	19.3	44.9	<LOD	15.8	4.45
Naphthalene	µg/kg	100	-	1.31	<LOD	15.9	30.7	<LOD	10.3	6.98
Perylene	µg/kg	100	-	<LOD	<LOD	7.52	16.5	<LOD	5.58	2.41
Phenanthrene	µg/kg	100	-	5.46	1.09	33.4	99.3	1.38	21.5	14
Pyrene	µg/kg	100	-	2.67	1.12	37.4	82.3	2.43	23.4	16.7
Total Hydrocarbon Content (THC)	mg/kg	-	-	2.2	4.49	16.7	19.8	6.16	43.2	24.7
AHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Dieldrin	mg/kg	0.005	-	0.0001	<LOD	0.0001	0.0002	<LOD	<LOD	<LOD
HCB	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPTDE	mg/kg	-	-	<LOD	<LOD	0.0002	0.0003	<LOD	0.0004	<LOD
PPDDE	mg/kg	-	-	<LOD	<LOD	<LOD	0.0002	<LOD	0.0001	<LOD
PPDDT	mg/kg	0.001	-	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD	<LOD
Key	Below AL1									
	Above AL1, Below AL2									
	Above AL2									

Table 7.5. Sediment contamination data collected in September 2022 (3 of 5)

Contaminant	Units	Cefas Action Level		Sample Concentration							
				Site H			Site G				
		AL1	AL2	BH504 (ES3) 4.00 m	BH504 (ES4) 6.00 m	BH504 (ES5) 8.00 m	BH503 (ES1) 0.00 m	BH503 (ES2) 2.00 m	BH503 (ES3) 4.00 m	BH503 (ES4) 6.00 m	BH503 (ES5) 8.00 m
Arsenic	mg/kg	20	100	5.8	15.9	8.3	5.6	7.8	6	6.3	5.4
Cadmium	mg/kg	0.4	5	0.15	0.32	0.2	0.08	0.05	<LOD	0.43	0.33
Chromium	mg/kg	40	400	10.2	23.3	17.4	9.3	16.2	12.1	8.7	7.7
Copper	mg/kg	40	400	7.9	17.3	14.7	5.7	8.8	5.6	6.2	4.6
Mercury	mg/kg	0.3	3	0.03	0.33	0.11	0.03	0.08	0.02	0.07	0.01
Nickel	mg/kg	20	200	9.8	15	16.6	7.3	11.6	8.8	7.7	8.5
Lead	mg/kg	50	500	11.4	45.6	23.9	12.8	20	12	9.8	7.3
Zinc	mg/kg	130	800	67.2	219	97.6	60.2	89.4	64.6	65.2	56.1
Dibutyltin (DBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Tributyltin (TBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthene	µg/kg	100	-	3.93	14.8	5.37	<LOD	2.92	8.59	2.13	<LOD
Acenaphthylene	µg/kg	100	-	2.68	18.3	5.95	1.25	3.52	3.56	1.54	1.27
Anthracene	µg/kg	100	-	9.98	41.1	13.8	1.36	7.17	7.84	4.18	3.41
Benzo[a]anthracene	µg/kg	100	-	34.5	93.4	51.7	2.16	12.5	25.2	5.92	5.36
Benzo[a]pyrene	µg/kg	100	-	39.4	136	74.7	2.65	13.3	25	6.94	4.47
Benzo[b]fluoranthene	µg/kg	100	-	39.6	204	85.1	4.02	21	34	10.3	7.72
Benzo[ghi]perylene	µg/kg	100	-	31	129	62.9	2.62	16.8	21.1	6.9	4.7
Benzo[e]pyrene	µg/kg	100		33.4	136	76.4	3.36	19.6	27.2	9.85	7.15
Benzo[k]fluoranthene	µg/kg	100	-	36.9	131	66	3.19	15.7	28.4	7.81	7.08
C1-naphthalenes	µg/kg	100	-	21.7	120	60.1	11.4	31.5	34	15.8	12.7
C1-phenanthrene	µg/kg	100	-	35.4	153	78.6	12.8	34.4	41.1	17.4	15.3
C2-naphthalenes	µg/kg	100	-	25.8	119	64.5	11.2	34.6	36.2	18.3	14.6
C3-naphthalenes	µg/kg	100	-	22.1	116	68.3	6.19	28.2	34.7	13.8	13.2
Chrysene	µg/kg	100	-	39.3	118	68.4	2.94	19.1	32.9	8.69	7.33
Dibenzo[ah]anthracene	µg/kg	100	-	5.76	17.7	14.8	<LOD	2.36	3.49	<LOD	<LOD
Fluoranthene	µg/kg	100	-	62.8	169	94.6	4.41	28.7	56.6	13.4	10.2

Contaminant	Units	Cefas Action Level		Sample Concentration							
				Site H			Site G				
		AL1	AL2	BH504 (ES3) 4.00 m	BH504 (ES4) 6.00 m	BH504 (ES5) 8.00 m	BH503 (ES1) 0.00 m	BH503 (ES2) 2.00 m	BH503 (ES3) 4.00 m	BH503 (ES4) 6.00 m	BH503 (ES5) 8.00 m
Fluorene	µg/kg	100	-	5.67	25.5	12.8	1.72	6.78	10.3	2.98	1.77
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	40.3	127	85.1	2.22	14.1	20.1	5.36	4.08
Naphthalene	µg/kg	100	-	9.49	56.5	24.4	3.39	13.9	13.4	7.53	5.46
Perylene	µg/kg	100	-	14.8	43.2	46	1.53	7.05	8.97	2.32	1.23
Phenanthrene	µg/kg	100	-	33.1	132	57.3	4.34	27.3	37.5	12.8	10.5
Pyrene	µg/kg	100	-	60.2	184	93.9	5.38	29.5	52.2	14.5	14.7
Total Hydrocarbon Content (THC)	mg/kg	-	-	8.68	12.2	25.8	12.7	18.5	26.6	8.73	11.8
AHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Dieldrin	mg/kg	0.005	-	<LOD	<LOD	<LOD	0.0002	0.0001	<LOD	<LOD	<LOD
HCB	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPTDE	mg/kg	-	-	<LOD	0.0007	0.0003	<LOD	0.0003	0.0002	<LOD	0.0002
PPDDE	mg/kg	-	-	<LOD	0.0001	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD
PPDDT	mg/kg	0.001	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Key	Below AL1										
	Above AL1, Below AL2										
	Above AL2										

Table 7.6. Sediment contamination data collected in September 2022 (4 of 5)

Contaminant	Units	Cefas Action Level		Sample Concentration							
				Site E				Site F			
		AL1	AL2	BH501 (ES1) 0.00 m	BH501 (ES2) 2.00 m	BH501 (ES3) 4.00 m	BH501 (ES4) 6.00 m	BH502 (ES1) 0.00 m	BH502 (ES2) 2.00 m	BH502 (ES3) 4.00 m	BH502 (ES4) 6.00 m
Arsenic	mg/kg	20	100	5.3	5.2	4.4	9.4	9.7	15.5	6	5.6
Cadmium	mg/kg	0.4	5	0.11	<LOD	<LOD	0.07	0.2	0.2	0.06	<LOD
Chromium	mg/kg	40	400	11.2	11.6	9.6	25.2	25.9	17.1	10.9	10.1
Copper	mg/kg	40	400	16	21.8	9.4	22.3	21.3	19.3	16.4	11
Mercury	mg/kg	0.3	3	0.04	0.02	<LOD	0.17	0.22	0.1	0.06	0.03
Nickel	mg/kg	20	200	10	10.7	8	19.8	19	13.6	9.8	8.9
Lead	mg/kg	50	500	16.1	14.1	6.2	33.3	35.8	22.5	12.9	10
Zinc	mg/kg	130	800	92.4	51.5	52.5	118	122	97.3	71.8	65.4
Dibutyltin (DBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Tributyltin (TBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthene	µg/kg	100	-	4.76	1.99	<LOD	8.81	11.4	61.2	4.09	3.75
Acenaphthylene	µg/kg	100	-	4.16	2.19	<LOD	8.35	11.4	7.29	7.81	3.44
Anthracene	µg/kg	100	-	6.82	2.21	<LOD	22.4	28	83.5	10.2	11.4
Benzo[a]anthracene	µg/kg	100	-	16.5	5.49	<LOD	52.1	62.8	156	25.4	34.3
Benzo[a]pyrene	µg/kg	100	-	26.5	6.82	1.23	88.3	105	199	30.1	46
Benzo[b]fluoranthene	µg/kg	100	-	29.1	6.65	1.47	112	119	179	27.7	46.9
Benzo[ghi]perylene	µg/kg	100	-	24.6	6.55	1.13	95.9	119	154	24.7	43.4
Benzo[e]pyrene	µg/kg	100		26.6	6.62	1.44	87	103	133	26.1	36.7
Benzo[k]fluoranthene	µg/kg	100	-	24.9	5.73	1.24	92.7	79.7	158	31.1	42.4
C1-naphthalenes	µg/kg	100	-	100	17.2	4.7	103	117	89.8	31.2	24.7
C1-phenanthrene	µg/kg	100	-	85.8	20.7	3.22	97.6	123	184	46.2	41.1
C2-naphthalenes	µg/kg	100	-	130	22	3.39	101	113	88.9	30.9	24.7
C3-naphthalenes	µg/kg	100	-	97.1	15.8	2.62	80.2	98.5	95.1	35.1	27.8
Chrysene	µg/kg	100	-	26.7	8.17	1.17	78.3	90.1	186	32.2	42.4
Dibenzo[ah]anthracene	µg/kg	100	-	5.04	1.24	<LOD	15.9	21.6	24.1	5.24	7.37
Fluoranthene	µg/kg	100	-	26.3	9.14	1.24	97.2	118	462	42	76.8

Contaminant	Units	Cefas Action Level		Sample Concentration							
				Site E				Site F			
		AL1	AL2	BH501 (ES1) 0.00 m	BH501 (ES2) 2.00 m	BH501 (ES3) 4.00 m	BH501 (ES4) 6.00 m	BH502 (ES1) 0.00 m	BH502 (ES2) 2.00 m	BH502 (ES3) 4.00 m	BH502 (ES4) 6.00 m
Fluorene	µg/kg	100	-	7.99	3.03	<LOD	19	22	42.8	7.27	6.47
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	29.8	6.2	<LOD	104	122	159	27.2	46.7
Naphthalene	µg/kg	100	-	19.4	5.93	1.65	43.6	48.4	37.3	10.5	10
Perylene	µg/kg	100	-	9.59	2.53	<LOD	42.7	57.3	73.9	11.2	17.3
Phenanthrene	µg/kg	100	-	56	11.9	2.22	90.7	112	457	33.4	42.1
Pyrene	µg/kg	100	-	29.2	10.2	1.82	96.9	118	425	42.3	73.7
Total Hydrocarbon Content (THC)	mg/kg	-	-	9.75	7.69	1.04	10.2	9.76	154	105	7.2
AHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0002	<LOD
GHCH	mg/kg	-	-	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Dieldrin	mg/kg	0.005	-	0.0009	<LOD	<LOD	0.0002	<LOD	<LOD	0.0001	<LOD
HCB	mg/kg	-	-	<LOD	<LOD	<LOD	0.0001	0.0001	<LOD	<LOD	<LOD
PPTDE	mg/kg	-	-	0.0002	0.0041	<LOD	0.0006	0.0008	0.0003	0.0004	<LOD
PPDDE	mg/kg	-	-	0.0002	0.0002	<LOD	0.0002	0.0003	0.0001	0.0002	<LOD
PPDDT	mg/kg	0.001	-	0.0001	0.0017	<LOD	<LOD	<LOD	<LOD	0.0002	<LOD
Key	Below AL1										
	Above AL1, Below AL2										
	Above AL2										

Table 7.7. Sediment contamination data collected in September 2022 (5 of 5)

Contaminant	Units	Cefas Action Level		Sample Concentration						
				Site F		Site A				
		AL1	AL2	BH502 (ES5) 8.00 m	BH502 (ES6) 10.00 m	EB1 (ES1) 0.00 m	EB1 (ES2) 2.00 m	EB1 (ES3) 4.00 m	EB1 (ES4) 6.00 m	EB1 (ES5) 8.00 m
Arsenic	mg/kg	20	100	11.8	6.8	4.7	5.8	4.8	5.1	5.8
Cadmium	mg/kg	0.4	5	0.24	0.28	<LOD	<LOD	<LOD	<LOD	0.07
Chromium	mg/kg	40	400	27	24	9.9	12.5	7.8	8.8	11.9
Copper	mg/kg	40	400	22.8	21.4	9.3	9.4	6.9	7	9.3
Mercury	mg/kg	0.3	3	0.26	0.22	<LOD	0.04	0.01	<LOD	0.04
Nickel	mg/kg	20	200	18.7	17.3	7.9	10.1	8	8.2	10
Lead	mg/kg	50	500	43.8	32.4	7.2	15.2	7.7	8.2	11.9
Zinc	mg/kg	130	800	170	137	39.8	66.1	64.2	56.6	65.5
Dibutyltin (DBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Tributyltin (TBT)	mg/kg	0.1	1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthene	µg/kg	100	-	7.89	9.9	<LOD	2.56	1.33	<LOD	5.84
Acenaphthylene	µg/kg	100	-	7.8	11.9	<LOD	3.19	1.37	1.67	3.9
Anthracene	µg/kg	100	-	18.4	21.1	1.15	5.64	3.56	3.86	11
Benzo[a]anthracene	µg/kg	100	-	47.6	60.2	2.83	20.2	8.68	9.87	29.9
Benzo[a]pyrene	µg/kg	100	-	87.5	92.4	3.37	24.3	13.7	8.4	31.5
Benzo[b]fluoranthene	µg/kg	100	-	102	106	2.71	30.3	15	8.84	46.8
Benzo[ghi]perylene	µg/kg	100	-	94.9	99.1	3.14	27.8	13.5	7.02	47.8
Benzo[e]pyrene	µg/kg	100		81.7	83.1	2.8	26.6	11.7	7.77	45.6
Benzo[k]fluoranthene	µg/kg	100	-	88.9	89	2.76	31.6	14.4	12.3	41.3
C1-naphthalenes	µg/kg	100	-	64.6	97.4	2.93	28.7	9.01	6.91	191
C1-phenanthrene	µg/kg	100	-	70.1	90.2	6.77	32.4	9.79	13.3	115
C2-naphthalenes	µg/kg	100	-	68.1	88.8	4.61	37.6	8.14	10.3	223
C3-naphthalenes	µg/kg	100	-	64.6	67.2	3.47	33.6	8.28	6.53	211
Chrysene	µg/kg	100	-	67.6	81.8	3.75	27.4	11.5	13.5	44.6
Dibenzo[ah]anthracene	µg/kg	100	-	14.1	19	<LOD	6.06	2.16	1.24	7.61
Fluoranthene	µg/kg	100	-	84.4	108	6.25	34.2	16.3	15.3	48.7

Contaminant	Units	Cefas Action Level		Sample Concentration						
				Site F		Site A				
		AL1	AL2	BH502 (ES5) 8.00 m	BH502 (ES6) 10.00 m	EB1 (ES1) 0.00 m	EB1 (ES2) 2.00 m	EB1 (ES3) 4.00 m	EB1 (ES4) 6.00 m	EB1 (ES5) 8.00 m
Fluorene	µg/kg	100	-	14.4	17.2	<LOD	5.19	2.06	2.12	14.6
Indeno[1,2,3-cd]pyrene	µg/kg	100	-	96.2	109	3.02	31.2	13.7	6.21	38.9
Naphthalene	µg/kg	100	-	27.1	40.4	1.24	12.8	4.26	3.32	75.9
Perylene	µg/kg	100	-	29	23	1	8.55	3.61	2.72	14.1
Phenanthrene	µg/kg	100	-	59.9	75.6	3.91	24.7	9.69	6.37	73.2
Pyrene	µg/kg	100	-	93.6	110	5.87	35.7	19	14.2	58.7
Total Hydrocarbon Content (THC)	mg/kg	-	-	44.9	10.3	3.18	13.8	7.16	8.01	29.4
AHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Dieldrin	mg/kg	0.005	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
HCB	mg/kg	-	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPTDE	mg/kg	-	-	0.0004	0.0004	<LOD	0.0002	0.0001	0.0001	0.0003
PPDDE	mg/kg	-	-	0.0003	0.0002	<LOD	0.0001	<LOD	<LOD	0.0001
PPDDT	mg/kg	0.001	-	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Key	Below AL1									
	Above AL1, Below AL2									
	Above AL2									

7.7 Impact assessment

This section identifies the potential likely effects on water and sediment quality receptors as a result of the construction and subsequent operation of the MEPE Project.

The following impact pathways have been assessed:

Construction phase

- Changes to dissolved oxygen concentrations as a result of increased SSC during piling, capital dredging and disposal activities;
- Changes to chemical water quality as a result of potential sediment-bound contaminants being released during piling, capital dredging and disposal activities;
- Redistribution of sediment-bound contaminants during piling, capital dredging and disposal activities;
- Changes to nutrient concentrations in water during piling, capital dredging and disposal activities; and
- Changes to water quality as a result of potential of sediment-bound microbiological contaminants being released during piling, capital dredging and disposal activities.

Operational phase

- Changes to dissolved oxygen concentrations as a result of increased SSC during the maintenance dredging and disposal activities;
- Changes to chemical water quality as a result of potential sediment-bound contaminants being released during maintenance dredging and disposal activities;
- Redistribution of sediment-bound contaminants during maintenance dredging and disposal activities;
- Changes to nutrient concentrations in water during the maintenance dredging and disposal activities; and
- Changes to water quality as a result of potential of sediment-bound microbiological contaminants being released during the maintenance dredging and disposal activities.

In addition, the potential risks to human health, the potential impacts on climate and the vulnerability of the proposed development to climate change, as well as to risks of major accidents and/or disasters have been considered in the context of the potential likely effects on physical processes.

Cumulative impacts on water and sediment quality could arise as a result of other coastal and marine developments and activities. These have been considered as necessary as part of the cumulative impacts and in-combination effects assessment included in Chapter 13 of this ES.

7.7.1 Changes to dissolved oxygen concentrations as a result of increased SSC during construction activities

Capital dredging

The increase in biochemical 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 Table 7.2), for which organic content can result in reduced dissolved oxygen concentrations. However, it should be noted that the majority of material disturbed during capital dredging works will be sucked from the bed to the hopper/barge or directly into the reclamation area via a floating pipeline, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the draghead/cutter head).

The proposed dredge area is situated within the Dee (N. Wales) transitional water body. The physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2021 classification, at high status for this water body, 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.

Increases in SSC will be short-term and localised to the dredging activity (see Physical Processes Chapter 6 of this ES). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. The probability of a localised effect is, therefore, medium to high, but the magnitude of change is considered to be small, leading to a low exposure to change. Therefore, while the sensitivity is moderate, based on the direct influence of dredging on water quality, and importance is high, given that changes in water quality is an impact pathway for other receptors as well as in its own right, the impact significance is assessed as **minor adverse** and not significant.

Piling

The increase in biochemical 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 likely to be highly localised (see Physical Processes Chapter 6).

The piling activity is proposed to occur within the Dee (N. Wales) transitional water body, for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2021 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.

It is considered that the probability of a localised effect will be medium to high, but the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate based on the direct influence of piling on water quality and importance is high, any impact is considered to be **insignificant**.

Disposal activities

The disposal of dredged material at sea associated with the proposed development (for material not used as engineering fill material for the reclamation) is proposed to be fulfilled at the existing licensed disposal site Mostyn Deep (IS102) (see Project Methodology Chapter 3).

During the placement of dredged material at the licensed disposal site, the potential for reduction in dissolved oxygen concentrations in the water column is considered to be low (see Physical Processes Chapter 6 for further information on changes in SSC during disposal). Any changes would be localised and short-lived given the dynamic nature of the site, which would rapidly be re-oxygenated. The Mostyn Deep (IS102) disposal site is located within the Dee (N. Wales) transitional water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2021 classification, at high status, despite routinely receiving maintenance dredging material. A small portion of the north west edge of the Mostyn Deep disposal site (IS102) also overlaps with the North Wales coastal water body for which the physico-chemical quality element 'Dissolved oxygen' is also currently, based on the 2021 classification, at high status.

The probability of a localised effect is likely to be medium to high, but the magnitude of change is likely to be small, leading to a low exposure to change. Therefore, while the sensitivity is moderate based on the direct influence of disposal activities on water quality and importance is high, the impact significance is assessed as **minor adverse** and not significant.

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

Capital dredging

The proposed dredge area is situated within the Dee (N. Wales) transitional water body. This water body currently, based on a 2021 classification, has a chemical status of 'moderate'. The reason for the 'moderate' chemical status is based on priority hazardous substances BDPEs and PAHs.

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) (Luoma, 1983). 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) (Eggleton and Thomas, 2004). Due to the variability in environmental conditions, a wide range of partition coefficients are reported in the literature.

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., draghead or cutter head). As noted in Physical Processes Chapter 6, 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 2,000 mg/l (at the point of release) at the Mostyn Deep (IS102) disposal site (for material not used as engineering fill material for the reclamation, see Project Methodology Chapter 3). 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 used in the calculations below on a precautionary basis.

A Microsoft Excel Spreadsheet tool developed by APEM Ltd, referred to as SeDiChem (short for Sediment Disturbance on Chemical status), is provided by the Environment Agency to support consideration of potential uplift in contaminant concentrations following disturbance of contaminated sediments in estuarine and marine waters. This tool has been used to assess risks from chemical contamination associated with dredging for the MEPE project.

Table 7.8 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 3,024,000 m^3/day based on an average for the River Dee of 35 m^3/second which is considered a conservative estimate at this location of the Dee Estuary, however, it has been used in this assessment on a precautionary basis (CH2M Hill, 2013)), maximum incremental SSC (2,000 mg/l), worst case (or precautionary) partition coefficients from suggested literature and sediment quality from samples collected within the proposed dredge area.

Table 7.8. Potential contaminant concentration increase as a result of the proposed development based on SeDiChem tool outputs

Parameter	Max. Sediment Concentration (mg/kg)	Partition Coefficient (l/kg)	EQS (µg/l)	Additional Dissolved Concentration (Dredging) (µg/l)	Concentration Increase as % of EQS
Arsenic	15.90	40	25 (dissolved)	1.334	5.34 %
Cadmium	0.43	100	0.2 (dissolved)	0.015	7.42 %
Chromium	28.50	79	32 (dissolved)	1.171	3.66 %
Copper	22.80	3,162	3.76 (dissolved)	0.024	0.65 %
Lead	45.60	35,481	14 (dissolved)	0.004	0.03 %
Mercury	0.33	6,310	0.07 (dissolved)	0.000	0.25 %
Nickel	22.50	500	34 (dissolved)	0.147	0.43 %
Zinc	170.00	12,589	8.8 (dissolved)	0.045	0.57 %
Benzo(a)pyrene	0.20	9,120	0.027 (total)	0.00007	0.27 %
Benzo(b) fluoranthene	0.20	20,795	0.017 (total)	0.00003	0.19 %
Benzo(g,h,i) perylene	0.15	18,904	0.00082 (total)	0.00003	3.17 %
Benzo(k) fluoranthene	0.16	19,859	0.017 (total)	0.00003	0.16 %
Fluoranthene	0.17	1,396	0.12 (total)	0.0004	0.34 %
Tributyltin (TBT)	0.005	49	0.0015 (total)	0.0003	21.95 %
Hexachloro-benzene	0.0001	5,978	0.05 (total)	0.000	0.00 %

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 bodies (e.g., PAHs), any disturbance of sediments during dredging activities will result in an uplift exacerbating the failure. However, the scale of this deterioration is considered to be small and highly localised. As a percentage increase of EQS, the increased concentration due to dredging is likely to be less than 1 % for benzo(a)pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, and fluoranthene, and around 3 % for benzo(g,h,i) perylene. For TBT, the uplift in concentration is likely to be around 20 % of the EQS. For metals, concentration increases as a percentage of the EQS range from less than 1 % to around 7 %. 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.

Furthermore, the proposed works will not directly introduce contaminants to the marine environment and good practice measures (Defra and Environment Agency, 2019), will be used to prevent/reduce the potential for accidental spillages throughout the dredging process.

The probability of a localised effect is medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is considered to be **insignificant**.

Piling

As discussed for capital dredging above and in Physical Processes Chapter 6, maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted to be around 2,000 mg/l (at the point of release) at the Mostyn Deep (IS102) disposal site (for material not used as engineering fill material for the reclamation, see Project methodology Chapter 3). 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 7.8 calculates the potential for sediment-bound contaminants to increase the concentration of in-water contaminants and, even when applying SSCs of 2,000 mg/l, the proposed piling works are considered unlikely to result in significant water quality impacts.

Overall, the probability of a localised effect is medium to high, but the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate, and importance is high any impact is considered to be **insignificant**.

Disposal activities

As discussed for capital dredging and piling above and in Physical Processes Chapter 6, maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted to be around 2,000 mg/l (at the point of release) at the Mostyn Deep (IS102) disposal site (for material not used as engineering fill material for the reclamation, see Project Methodology Chapter 3).

Table 7.8 calculates the potential for sediment-bound contaminants to increase the concentration of in-water contaminants and, when applying SSCs of 2,000 mg/l, the proposed disposal activities are considered unlikely to result in significant water quality impacts.

Overall, the probability of a localised effect is considered to be medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **insignificant**.

7.7.3 Redistribution of sediment-bound contaminants during construction activities

Capital dredging

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 sucked from the bed to the hopper/barge or directly into the reclamation area via a floating pipeline, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the draghead/cutter head).

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 low concentrations, mostly below Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed. Furthermore, sedimentation away from the dredge location is predicted to be relatively localised (see Physical Processes Chapter 6). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during capital dredging.

Overall, the probability of a localised effect is considered to be medium to high, but the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **insignificant**.

Piling

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.

However, the majority of contaminants in the sediments in the vicinity of the proposed piling activity are at low concentrations, mostly below 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 Physical Processes Chapter 6). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during piling.

Overall, the probability of a localised effect is at this stage considered to be medium to high, but the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **insignificant**.

Disposal activities

The disposal of dredged material at sea associated with the proposed development (for material not used as engineering fill material for the reclamation) is proposed to be fulfilled at the Mostyn Deep (IS102) licensed disposal site within the Dee Estuary (see Project Methodology Chapter 3).

During the placement of dredged material at the licensed disposal site, 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 low concentrations, mostly below 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 the Mostyn Deep (IS102) licensed disposal site receives ongoing maintenance dredging material from the Port of Mostyn. This disposal site, located within the Dee 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.

Overall, the probability of a localised effect is at this stage considered to be medium to high, but the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is overall likely to be **insignificant**.

7.7.4 Changes to nutrient concentrations in water during construction activities

Capital dredging

The amount of nutrients introduced into the water column by dredging will be small relative to other sources in the estuary, such as from agricultural surface run-off. The scale of temporary increases in nutrient levels during dredging is, therefore, likely to be small. Any change will be short-lived (in the order of days) and within the range of natural variability in the study area, as has previously been seen in other dredge research studies (Lohrer and Wetz, 2003). Consequently, the probability of occurrence in the Dee Estuary is considered to be low/medium, and the magnitude small. The exposure to change in nutrient levels is, therefore, low/negligible. The potential for much higher rates of nutrients to be added from other sources suggests that the estuary is unlikely to be sensitive to dredge induced nutrient release, except if these occurred during other conditions that have induced algal blooms in the past. Therefore, while the sensitivity is moderate and importance is high, the overall significance of potential changes to nutrient concentrations in the water column during capital dredging is assessed as being **insignificant to minor adverse**.

Piling

The anticipated increased SSCs related to piling will be less than that of dredging, as compaction will occur in the sediment rather than complete disturbance. The effects on SSCs are likely to be highly localised (see Physical Processes Chapter 6). As such, the magnitude of change in nutrient levels in the water column is considered to be negligible, leading to a negligible exposure to change. The potential changes to nutrient levels in the water column due to piling will, therefore, be **insignificant**.

Disposal activities

Nutrient levels will be increased temporarily in the water column during the disposal of fine-grained sediments. In the dynamic environment of the Dee Estuary, suspended sediments will be rapidly dispersed, and nutrients diluted rapidly to background levels. The magnitude of the change will be negligible/small and the probability of occurrence high, leading to a negligible/low exposure to increased nutrient levels during disposal activities. Therefore, while the sensitivity is moderate and importance is high, the overall significance of potential changes to nutrient concentrations in the water column during disposal activities is assessed as being **insignificant to minor adverse**.

7.7.5 Changes to water quality as a result of potential sediment-bound microbiological contaminants during construction activities

Capital dredging

There is the potential for pathogens that are associated with surficial sediments to be remobilised in the water column following an increase in SSCs during the proposed capital dredging. However, it should be noted that the majority of material disturbed during capital dredging works will be sucked from the bed to the hopper/barge or pumped directly into the reclamation area via a floating pipeline, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the draghead/cutter head).

The level of pathogens in the material that will be disturbed during construction is anticipated to be negligible to low given that there are no nearby sources of contamination and these microorganisms are primarily associated with only the recently deposited surface fines and, therefore, a very small proportion of the dredge material. As noted above, only a minor proportion of disturbed material during construction is expected to be raised into suspension and this material will be rapidly dispersed by strong tidal currents in the area. Some degree of bacterial die-off can also be expected to occur during dredging and disposal of contaminated material as the sediment is dispersed in the water column. Many studies have found the potential for 90 % of bacteria to become inactive within less than a few hours in seawater (Sinton *et al.*, 1999; Yukselen *et al.,* 2003). Significant elevations of contamination in the water column are, therefore, not anticipated. Furthermore, ongoing existing dredging and disposal activity has never raised an issue in terms of the classification of nearby shellfish beds, and the estuary is dynamic and surficial sediments are regularly disturbed by tidal action.

Due to the anticipated limited distribution of bacteria in the sediments and rapid die-off rates, the magnitude and consequent exposure to change is negligible. The potential changes to microbiological levels in the water column during capital dredging will, therefore, be **insignificant** with respect to the designated bathing waters and the designated Shellfish Water Protected Areas in the study area.

Piling

Similar to capital dredging (described above), there is the potential for pathogens that are associated with surficial sediments to be remobilised during piling. However, the effects are likely to be highly localised (see Physical Processes Chapter 6). The anticipated increased SSCs related to piling will be less than that of dredging, as compaction will occur in the sediment rather than complete disturbance.
Due to the anticipated limited distribution of bacteria in the sediments and rapid die-off rates, the magnitude and consequent exposure of change is negligible. The potential changes to microbiological levels in the water column will, therefore, be **insignificant** with respect to the designated bathing waters and the designated Shellfish Water Protected Areas in the study area.

Disposal activities

The disposal of dredged material at sea associated with the proposed development (for material not used as engineering fill material for the reclamation) is proposed to be fulfilled at the Mostyn Deep (IS102) licensed disposal site within the Dee Estuary (see Project Methodology Chapter 3).

During the placement of dredged material at the licensed disposal site, any sediment-bound microbiological contaminants within the dredge material will effectively be remobilised by the disposal activity. However, the magnitude of change at the receptor areas would be so low due to the anticipated limited distribution of bacteria in sediments and die-off rates, that there would be a negligible exposure to the change in microbiological levels in the water column. The impact is, therefore, considered **insignificant** with respect to the designated bathing waters and the designated Shellfish Water Protected Areas in the study area.

7.7.6 Changes to dissolved oxygen concentrations as a result of increased SSC during operation

Maintenance dredging

Volumes of material from maintenance dredging will be lower than those from the original capital dredge (described in the Project Methodology Chapter 3). Furthermore, the density of the newly settled material will be less than that from the consolidated bed dredged during the capital dredge campaign. Rather than a maintenance dredge campaign involving the removal of the full annual maintenance dredge requirement, future maintenance dredge activity will involve more frequent smaller individual dredging events (as required for operational requirements of the project). 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.

The increase in biochemical 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) which are unlikely to influence dissolved oxygen concentrations, to clays including alluvium deposits, 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.

The dredge area is situated within the Dee (N. Wales) transitional water body. The physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2021 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.

Increases in SSC will be short-term and localised to the dredging activity (see Physical Processes Chapter 6). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. The probability of a localised effect is, therefore, medium to high, but the magnitude of change is likely to be small, leading to a low exposure to change. Therefore, while the sensitivity is moderate and importance is high, the impact significance is assessed as **minor adverse** and not significant.

Disposal activities

It is anticipated that disposal of maintenance dredge material will be required during operation of the proposed development. 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 by the Port.

The disposal of maintenance dredged material at sea associated with the proposed development is proposed to be fulfilled at the existing marine disposal sites at Mostyn Deep (IS102) and Mostyn Breakwater (IS103) and/or reused as is currently permitted under the existing maintenance dredge and disposal marine licences (see Project Methodology Chapter 3).

During the placement of dredged material at the disposal sites, 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. Mostyn Deep (IS102) and Mostyn Breakwater (IS103) is located within the Dee (N. Wales) water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2021 classification, at high status, despite routinely receiving maintenance dredging material. A small portion of the north west edge of the Mostyn Deep disposal site (IS102) also overlaps with the North Wales coastal water body for which the physico-chemical quality element 'Dissolved oxygen' is also currently, based on the 2021 classification, at high status. 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.

The probability of a localised effect is medium to high, but the magnitude of change is likely to be small, leading to a low exposure to change. Therefore, while the sensitivity is moderate and importance is high, the impact significance is assessed as **minor adverse** and not significant.

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

Maintenance dredging

As discussed for capital dredging above (see Table 7.8), the proposed maintenance dredging activities are considered unlikely to result in significant water quality impacts. The material that will be removed through maintenance dredging is anticipated to be similar to the surficial sediment samples shown in Table 7.3 to Table 7.7. Overall, the probability of a localised effect is medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is considered to be **insignificant**.

Disposal activities

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 (see Table 7.8). Maximum SSCs are associated with the disposal activities and peak excess SSC levels resulting from the disposal activities are predicted to be around 2,000 mg/l (at the point of release) at the Mostyn Deep (IS102) licensed disposal site. The material that will be removed and disposed of through maintenance dredging is anticipated to be similar to the surficial sediment samples shown in Table 7.3 to Table 7.7. It should also be noted that the proposed disposal sites are characterised and licensed for these disposal activities and the Mostyn Deep (IS102) has been used by the Port of Mostyn for the disposal of dredge material for almost 20 years.

Overall, the probability of a localised effect is medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **insignificant**.

7.7.8 Redistribution of sediment-bound contaminants during operation

Maintenance dredging

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.

The material within the proposed dredge area ranges from coarse sediments (sands) 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 low concentrations, mostly below Cefas AL1. There were no exceedances of AL2 in any sediment samples analysed. The material that will accumulate during operation and be removed during maintenance dredging is anticipated to be similar to the surficial sediment samples shown in Table 7.3 to Table 7.7.

Furthermore, sedimentation away from the dredge location is predicted to be relatively localised (see Physical Processes Chapter 6). 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 as part of the MEPE Project will be undertaken as part of the Port's regular sediment sampling and testing to ensure the material remains suitable for disposal at sea as is the case with the existing maintenance dredge and disposal licences.

Overall, it is considered that the probability of a localised effect is medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **insignificant**.

Disposal activities

The disposal of maintenance dredged material at sea associated with the proposed development is proposed to be fulfilled at the existing marine disposal sites at Mostyn Deep (IS102) and Mostyn Breakwater (IS103) and/or reused as is currently permitted under the existing maintenance dredge and disposal marine licences (see Project Methodology Chapter 3).

During the placement of dredged material at the licensed disposal sites, 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 below 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 Table 7.3 to Table 7.7.

The existing licensed disposal sites are characterised to receive maintenance dredge material, and the Mostyn Deep (IS102) has received dredge arisings for almost 20 years. Furthermore, periodic sediment sampling to assess the suitability for disposal at sea will continue as is required for the Port's existing maintenance dredge licences. This will ensure the material remains suitable for disposal at sea.

The probability of a localised effect is medium to high, but the magnitude of change is considered to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is considered likely to be **insignificant**.

7.7.9 Changes to nutrient concentrations in water during operation

Maintenance dredging

As discussed for capital dredging above, the proposed maintenance dredging activities are considered unlikely to result in significant changes to nutrient concentrations in the water column. Overall, the exposure to change is considered low/negligible. Therefore, while the sensitivity is moderate and importance is high, the overall significance of potential changes to nutrient concentrations in the water column during maintenance dredging is assessed as being **insignificant to minor adverse**.

Disposal activities

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 changes to nutrient concentrations in the water column. Overall, the exposure to change is considered low/negligible. Therefore, while the sensitivity is moderate and importance is high, the overall significance of potential changes to nutrient concentrations in the water column during maintenance disposal activities is assessed as being **insignificant to minor adverse**.

7.7.10 Changes to water quality as a result of potential sediment-bound microbiological contaminants during operation

Maintenance dredging

As discussed for capital dredging above, the proposed maintenance dredging activities are considered unlikely to result in significant water quality impacts with respect to microbiological contaminants. Overall, the magnitude and consequent exposure to change is considered to be negligible. The potential changes to microbiological levels in the water column during maintenance dredging will, therefore, be **insignificant** with respect to the designated bathing waters and the designated Shellfish Water Protected Areas in the study area.

Disposal activities

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 with respect to microbiological contaminants. Overall, the magnitude of change is considered to be negligible, leading to a negligible exposure to change. The impact is, therefore, considered **insignificant** with respect to the designated bathing waters and the designated Shellfish Water Protected Areas in the study area.

7.7.11 Potential risks to human health

All water and sediment quality changes arising from the construction (dredging, piling, and disposal) and operation of the MEPE Project are confined to the marine water environment and are not considered to result in a potential risk to human health. The nearest designated bathing waters to the project area, namely West Kirby designated bathing water located approximately 7 km north east of the MEPE Project, will not be influenced by the proposed works.

7.7.12 Potential impacts on climate and vulnerability of proposed development to climate change

The nature and scale of the changes in water and sediment quality that will result from the MEPE Project are not expected to influence, or be influenced by, climate change.

7.7.13 Risks of major accidents and/or disasters

The nature and scale of the changes in water and sediment quality that will result from the MEPE Project are such that they are not anticipated to cause any risk of a major accident and/or disaster occurring.

7.8 Mitigation and residual impacts

7.8.1 Tertiary mitigation

Tertiary 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 (Project Methodology Chapter 3). In particular, the following guidance will be adopted:

- Pollution Prevention Guidance (PPG), or Guidance for Pollution Prevention (GPP) in the UK (NetRegs, 2020):
    - Understanding Your Environmental Responsibilities – Good Environmental Practices (PPG1);
    - Works and maintenance in or near water (GPP5);
    - Working at construction and demolition sites (PPG6); and
    - Safe storage and disposal of used oils (GPP8);
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (CIRIA, 2015).

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 to minimise any impacts in the event of a spill entering the water.

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.

7.9 Summary of impacts

A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence is presented in Table 7.9.

Table 7.9. Summary of potential impact, mitigation measures and residual impacts for water and sediment quality

Receptor	Impact Pathway	Impact Significance	Mitigation Measures	Residual Impact	Confidence
Construction Phase					
Water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during construction activities	Insignificant (piling) Minor adverse (dredging and disposal)	N/A	Insignificant (piling) Minor adverse (dredging and disposal)	Medium
	Changes to chemical water quality as a result of potential sediment-bound contaminants during construction	Insignificant	N/A	Insignificant	High

Receptor	Impact Pathway	Impact Significance	Mitigation Measures	Residual Impact	Confidence
	Redistribution of sediment-bound contaminants during construction activities	Insignificant	N/A	Insignificant	High
	Changes to nutrient concentrations in water during construction activities	Insignificant (piling) Insignificant to minor adverse (dredging and disposal)	N/A	Insignificant (piling) Insignificant to minor adverse (dredging and disposal)	Medium
Shellfish Water Protected Areas, bathing waters	Changes to water quality as a result of potential of sediment-bound microbiological contaminants during construction activities	Insignificant	N/A	Insignificant	Medium
Operational Phase					
Water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during operation	Minor adverse	N/A	Minor adverse	Medium
	Changes to chemical water quality as a result of potential sediment-bound contaminants during operation	Insignificant	N/A	Insignificant	High
	Redistribution of sediment-bound contaminants during operation	Insignificant	N/A	Insignificant	High
	Changes to nutrient concentrations in water during operation	Insignificant to minor adverse	N/A	Insignificant to minor adverse	Medium
Shellfish Water Protected Areas, bathing waters	Changes to water quality as a result of potential of sediment-bound microbiological contaminants being released during the maintenance dredging and disposal activities	Insignificant	N/A	Insignificant	Medium

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7.11 Abbreviations/Acronyms

AHCH	Alpha-hexachlorocyclohexane
AL	Action Level
BDPE	Brominated Diphenylethers
BHCH	Beta-hexachlorocyclohexane
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
cSAC	Candidate Special Area of Conservation
DBT	Dibutyltin
EC	European Commission
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ENV	Environment
EQS	Environmental Quality Standards
ES	Environmental Statement
FLDP	Flintshire Local Development Plan
GHCH	Gamma-hexachlorocyclohexane
GPP	Guidance for Pollution Prevention

HCB	Hexachlorobenzene
HMWB	Heavily Modified Water Body
HRA	Habitats Regulations Assessment
ID	Identity
LOD	Limit of Detection
LSE	Likely Significant Effect
MAC	Maximum Allowable Concentrations
MAGIC	Multi-Agency Geographic Information for the Countryside
MCAA	Marine and Coastal Access Act
MEPE	Mostyn Energy Park Extension
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MPS	Marine Policy Statement
NPSfP	National Policy Statement for Ports
NRW	Natural Resources Wales
NVZ	Nitrate Vulnerable Zone
OCP	Organochlorine pesticides
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PPDDE	1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene
PPDDT	Dichlorodiphenyltrichloro ethane
PPG	Pollution Prevention Guidance
PPTDE	1,1-dichloro-2,2-bis(pchlorophenyl)ethane
PSA	Particle Size Analysis
pSPA	Potential Special Protection Area
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SOC	Society
SPA	Special Protection Area
SPZ	Source Protection Zones
SSC	Suspended Sediment Concentration
TBT	Tributyl Tin
THC	Total hydrocarbon content
UK	United Kingdom
WFD	Water Framework Directive
WNMP	Welsh National Marine Plan

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Contact Us

ABPmer

Quayside Suite,
Medina Chambers
Town Quay, Southampton
SO14 2AQ

T +44 (0) 23 8071 1840
F +44 (0) 23 8071 1841
E enquiries@abpmer.co.uk

www.abpmer.co.uk