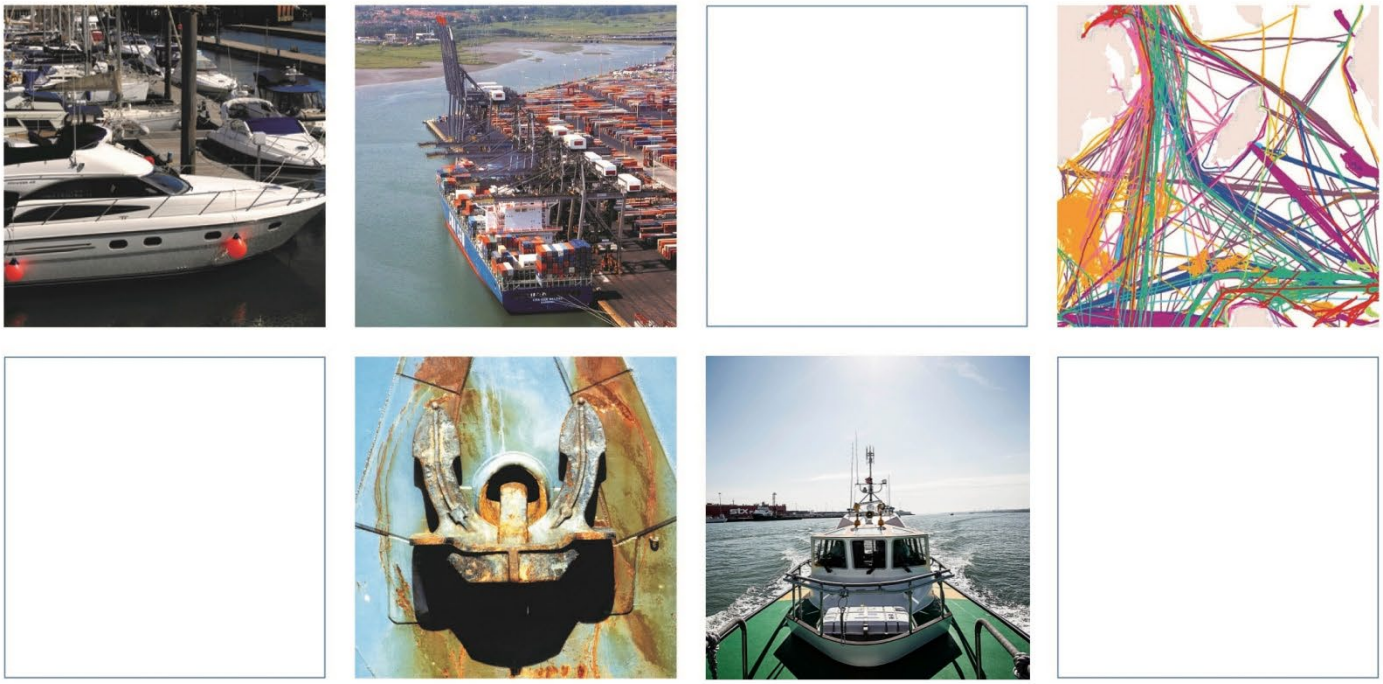
Peel Ports Group

# Medway Maintenance Dredge Protocol (MDP) Baseline Update

## Water Framework Directive (WFD) Compliance Assessment

July 2022



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## Water Framework Directive (WFD) Compliance Assessment

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# Document Information

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## Notice



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# 1 Introduction

## 1.1 Project overview

ABPmer was commissioned by Peel Ports Group to update the Medway Maintenance Dredge Protocol (MDP) Baseline Document, as well as prepare a Water Framework Directive (WFD) compliance assessment to determine whether maintenance dredging and disposal activities undertaken in the Medway Estuary and The Swale comply with the objectives of the WFD. The Medway Estuary and The Swale is collectively referred to "the Medway" in this report.

This report presents the WFD compliance assessment and is supported by a range of relevant environmental information which is included in the updated Medway MDP Baseline Document (ABPmer, 2021). The Baseline Document also provides current and historical information on dredging activities in the Medway and its approaches. The Baseline Document should be read alongside this WFD compliance assessment. The assessment is based on the potential effects associated with the maximum total annual volume of material that has been maintenance dredged from the Medway and its approaches since 2002 as a worst case (i.e. 263,000 $m^3$ in 2007).

Figure 1 shows the location of the surrounding WFD water bodies. Figure 2 to Figure 5 show the location of the Peel Ports Medway maintenance dredge areas and also, where spatial information is available, the third party dredge areas.

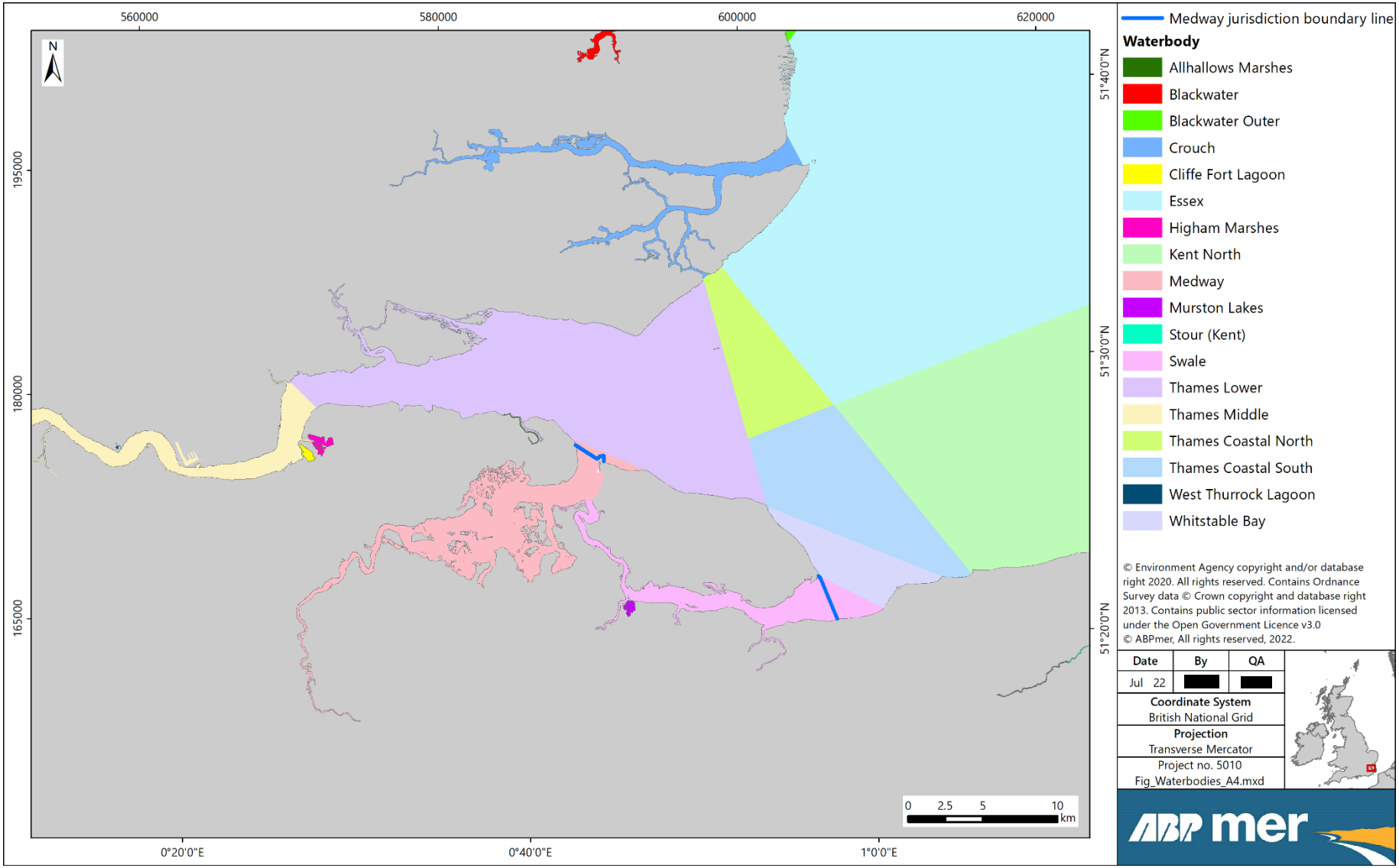


**Figure 1. WFD Waterbodies in the study area**

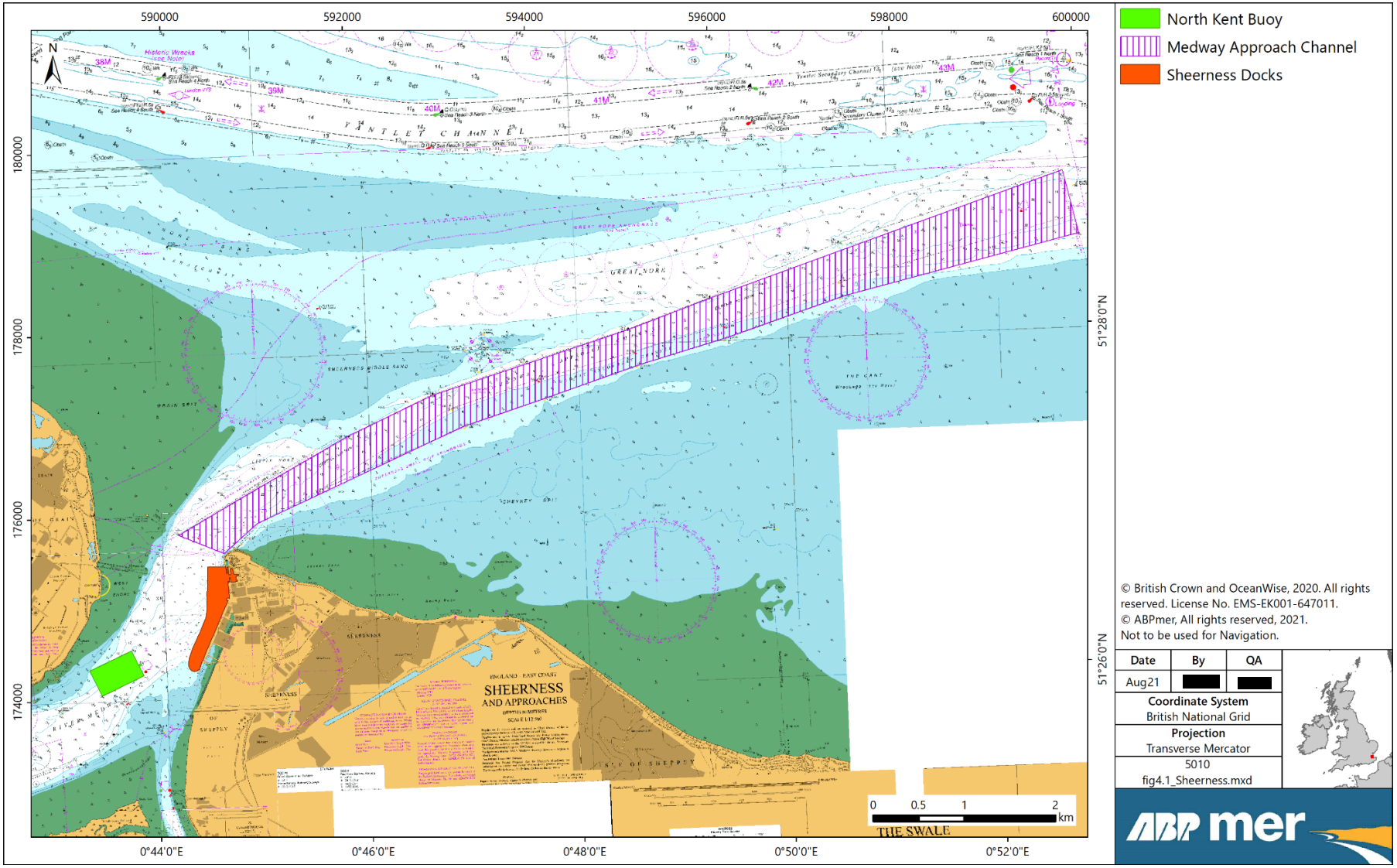


**Figure 2.** **The Medway Approach Channel, Sheerness Docks and North Kent Buoy dredge locations**

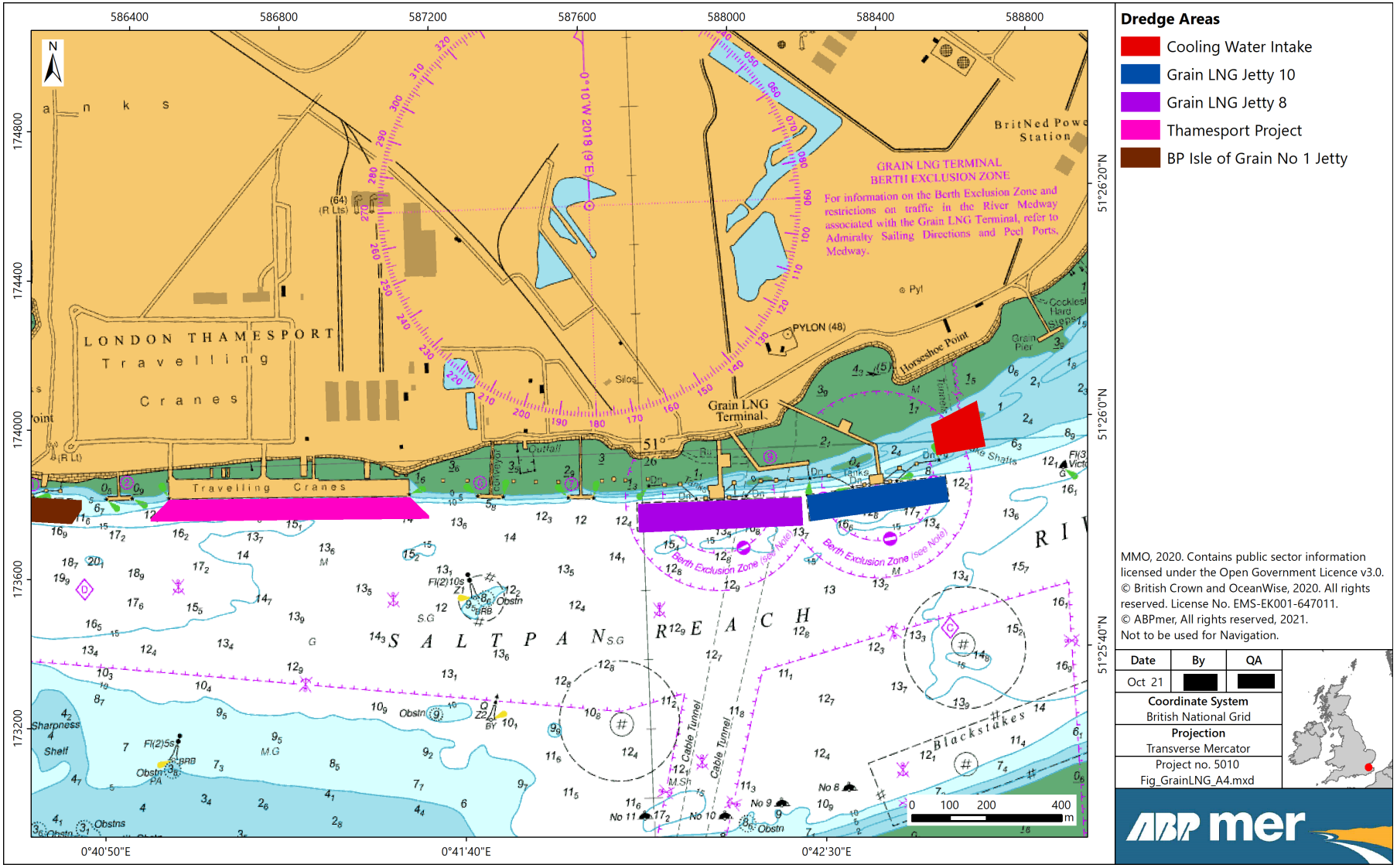


**Figure 3. Dredge areas around the Isle of Grain LNG Jetty**

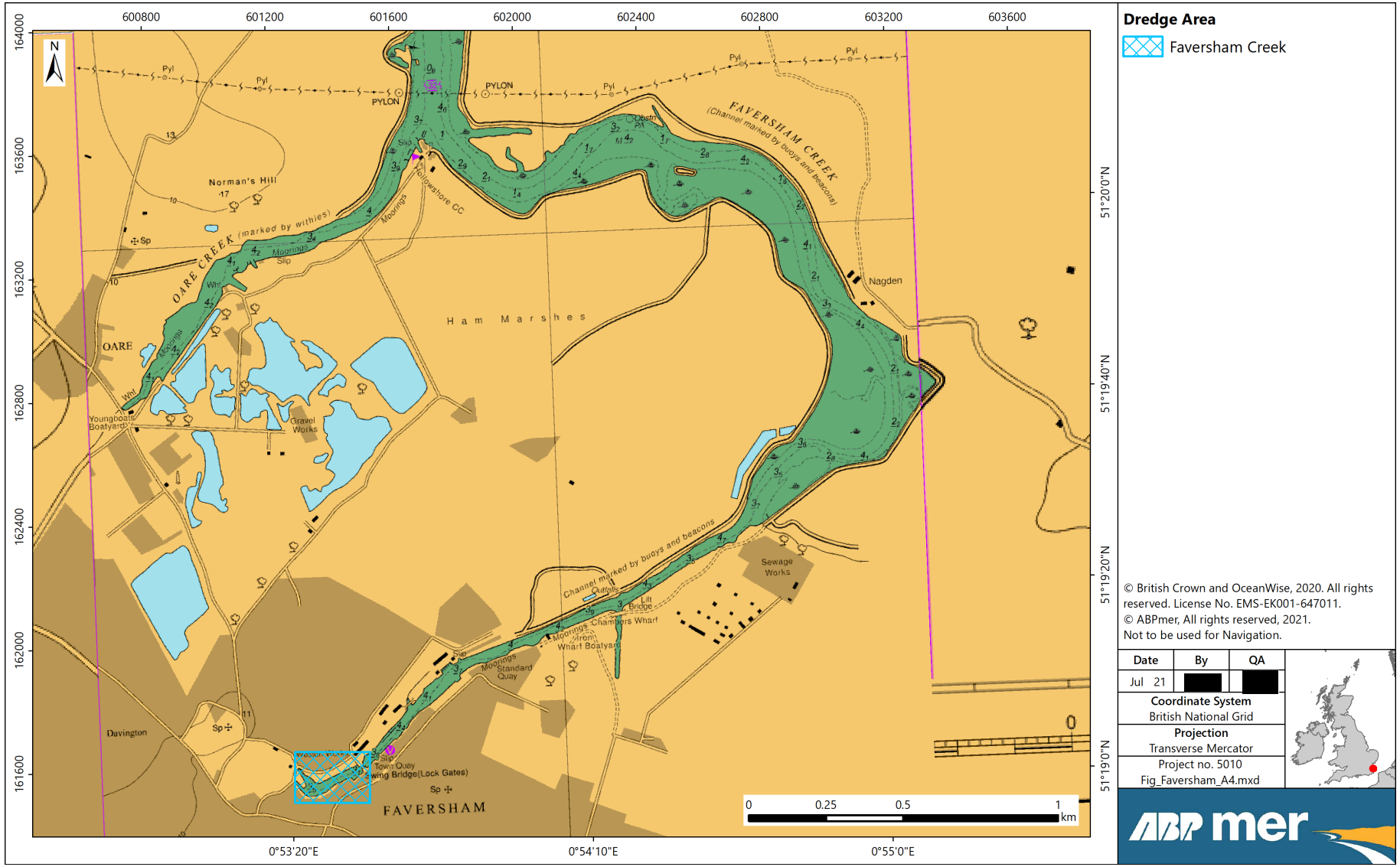


**Figure 4.** **The Faversham Creek dredge area**

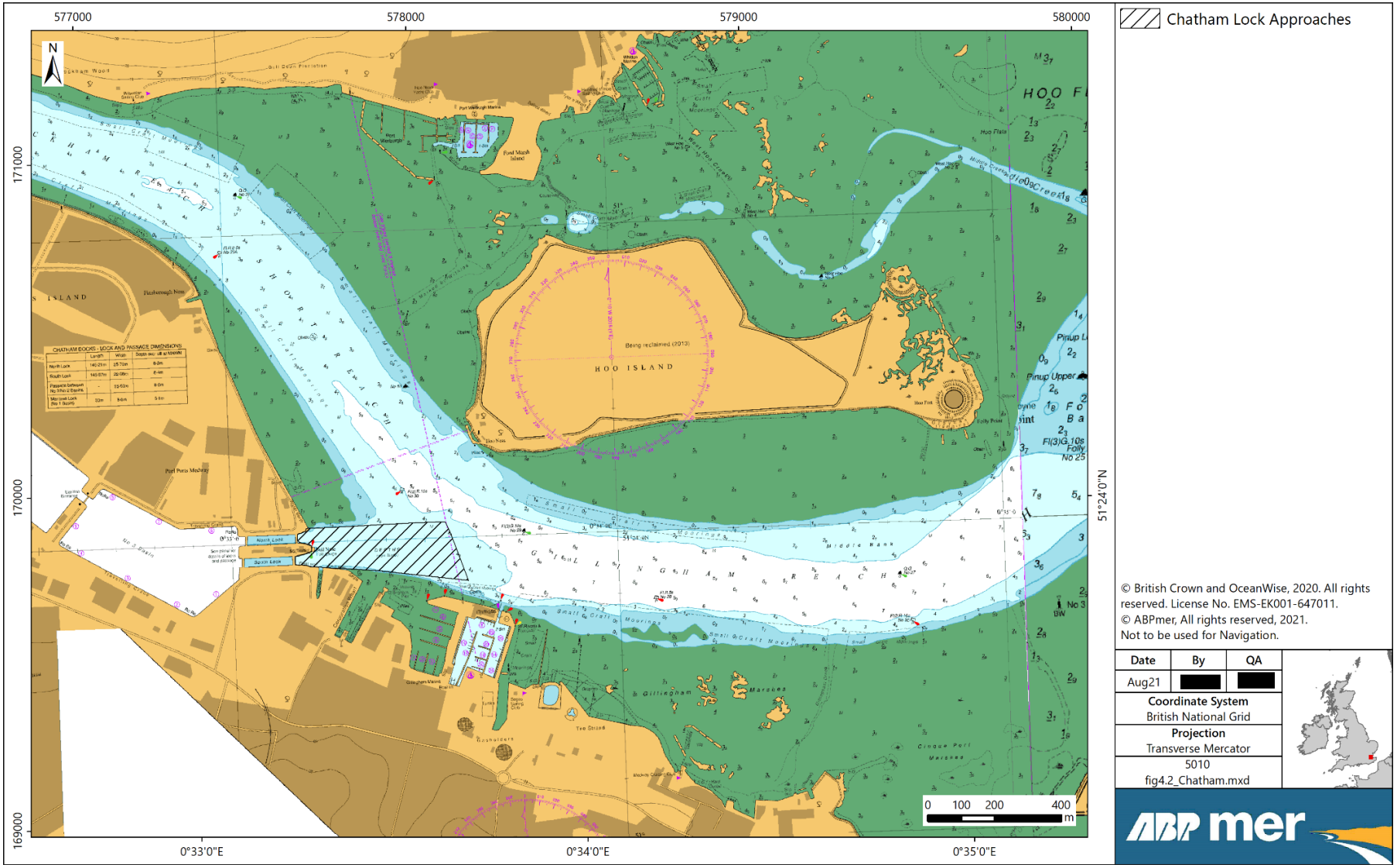


**Figure 5. The Chatham Lock Approaches dredge area**

## 1.2 Water Framework Directive

The WFD (2000/60/EC) came into force in 2000 and 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 (the Water Framework Regulations)[1] (as amended). The overall objective of the WFD is to achieve good status (GS) in all inland, transitional, coastal and ground waters by 2021, unless alternative objectives are set and there are appropriate reasons for time limited derogation.

The WFD divides rivers, lakes, lagoons, estuaries, coastal waters (out to one nautical mile from the low water mark), man-made docks and canals into a series of discrete surface water bodies. It sets ecological as well as chemical targets (objectives) for each surface water body. For a surface water body to be at overall GS, the water body must be achieving good ecological status (GES) and good chemical status (GCS). Ecological status is measured on a scale of high, good, moderate, poor or bad, while chemical status is measured as good or fail (i.e. failing to achieve good).

Each surface water body has a hydromorphological designation that describes how modified a water body is from its natural state. Water bodies are either undesignated (i.e. natural, unchanged), designated as a heavily modified water body (HMWB) or designated as an artificial water body (AWB). HMWBs are defined as bodies of water which, as a result of physical alteration by sustainable human use activities (such as flood protection and navigation) are substantially changed in character and cannot therefore meet GES. AWBs are artificially created through human activity. The default target for HMWBs and AWBs under the WFD is to achieve good ecological potential (GEP), a status recognising the importance of their human use while ensuring ecology is protected as far as possible.

The ecological status/potential of surface waters is classified using information on the biological (e.g. fish, benthic invertebrates, phytoplankton, angiosperms and macroalgae), physico-chemical (e.g. dissolved oxygen and salinity) and hydromorphological (e.g. hydrological regime) quality of the body of water, as well as several specific pollutants (e.g. copper and zinc). Compliance with chemical status objectives is assessed in relation to environmental quality standards (EQS) for a specified list of 'priority' and 'priority hazardous' substances. These substances were first established by the Priority Substances Directive (PSD) (2008/105/EC) which entered into force in 2009. The PSD sets objectives, amongst other things, for the reduction of these substances through the cessation of discharges or emissions.

As required by the WFD and PSD, a proposal to revise the list of priority (hazardous) substances was submitted in 2012. The PSD (and WFD) was amended in 2013[2] by identifying new priority substances, setting EQSs for those newly identified substances, revising the EQS for some existing substances in line with scientific progress and setting biota EQSs for some existing and newly identified priority substances. The Water Framework Regulations transpose the PSD into English law.

In addition to surface water bodies, the WFD also incorporates groundwater water bodies. Groundwaters are assessed against different criteria compared to surface water bodies since they do not support ecological communities (i.e. it is not appropriate to consider the ecological status of a groundwater). Therefore, groundwater water bodies are classified as good or poor quantitative status in terms of their quantity (groundwater levels and flow directions) and quality (pollutant concentrations and conductivity), along with chemical (groundwater) status.

[1] Modified by the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 on 31 January 2020.

[2] OJEU (2013). Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

River Basin Management Plans (RBMPs) are a requirement of the WFD, setting out measures for each river basin district to maintain and improve quality in surface and groundwater water bodies where necessary. In 2009, the Environment Agency published the first cycle (2009 to 2015) of RBMPs for England and Wales, reporting the status and objectives of each individual water body. The Environment Agency subsequently published updated RBMPs for England as part of the second cycle (2015 to 2021), as well as providing interim water body classification results via the Environment Agency Catchment Data Explorer (http://environment.data.gov.uk/catchment-planning). The maintenance dredging activities (including material disposal) undertaken to support the Medway Estuary, are located within the Medway, Swale and Thames Lower transitional coastal water bodies (see Figure 1) in the Thames River Basin District which is reported in the Thames RBMP (Environment Agency, 2016).

Consideration of WFD requirements is necessary for works which have the potential to cause deterioration in ecological, quantitative and/or chemical status of a water body or to compromise improvements which might otherwise lead to a water body meeting its WFD objectives. Therefore, it is necessary to consider the potential for the ongoing maintenance dredging works to impact WFD water bodies, specifically referring to the following environmental objectives of the WFD:

- Prevent deterioration in status of all surface water bodies (Article 4.1 (a)(i));
- Protect, enhance and restore all surface water bodies with the aim of achieving good surface water status by 2015 or later assuming grounds for time limited derogation (Article 4.1 (a)(ii));
- Protect and enhance all HMWBs/AWBs, with the aim of achieving GEP and GCS by 2015 or later assuming grounds for time limited derogation (Article 4.1 (a)(iii));
- Reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances (Article 4.1 (a)(iv));
- Prevent or limit the input of pollutants into groundwater and prevent deterioration of the status of all groundwater water bodies (Article 4.1 (b)(i));
- Protect, enhance and restore all groundwater water bodies and ensure a balance between abstraction and recharge of groundwater (Article 4.1 (b)(ii));
- Ensure the achievement of objectives in other water bodies is not compromised (Article 4.8); and
- Ensure compliance with other community environmental legislation (Article 4.9).

The Environment Agency has published guidance ("Clearing the Waters for All") regarding how to assess the impact of activities in transitional and coastal waters for the WFD[3]. The guidance sets out the following three discrete stages to WFD compliance assessments:

- **Screening**: excludes any activities that do not need to go through the scoping or impact assessment stages (Section 2);
- **Scoping**: identifies the receptors that are potentially at risk from an activity and need impact assessment (Section 3); and
- **Impact Assessment**: considers the potential impacts of an activity, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving GS (Section 4).

[3] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters (Accessed August 2021).

# 2 Screening

## 2.1 Project description

The Medway is located South of the Outer Thames Estuary on the north Kent coast, containing a complex arrangement of tidal channels, which drain around large islands of saltmarsh and mudflat with peninsulas of marshland. Human influence within the Medway has a history spanning many centuries.

It is estimated that dredge activities began in *circa* 1840 to facilitate clay extraction for brickmaking. Since then, the estuary has been subject to regular maintenance dredging for over 40 years, with the first significant capital dredge occurring in 1952, deepening the approach channel by 0.2 m, followed by dredging over the stretch 2.4 to 7.4 km off Garrison Point, increasing water depths up to 0.5 m (IECS, 1993). Maintenance dredge activities, however, began in 1983 around the dock system at Sheerness and Chatham, with dredge campaigns varying from a single day to three weeks. Prior to this, capital dredges were maintained by the estuary system itself (HR Wallingford, 1975)

In the years between 2002 and 2020, the maintenance of the Medway Estuary dredge areas yielded sediment quantities in the range of 500 to 185,092 $m^3$ per year. The dredge areas maintained by Peel Ports Medway are:

- Medway Approach Channel;
- Sheerness Docks;
- North Kent Buoy Spit:
- Chatham Lock Approaches; and
- Faversham Creek.

The quantities of dredge material within this period are illustrated in Figure 6 below.

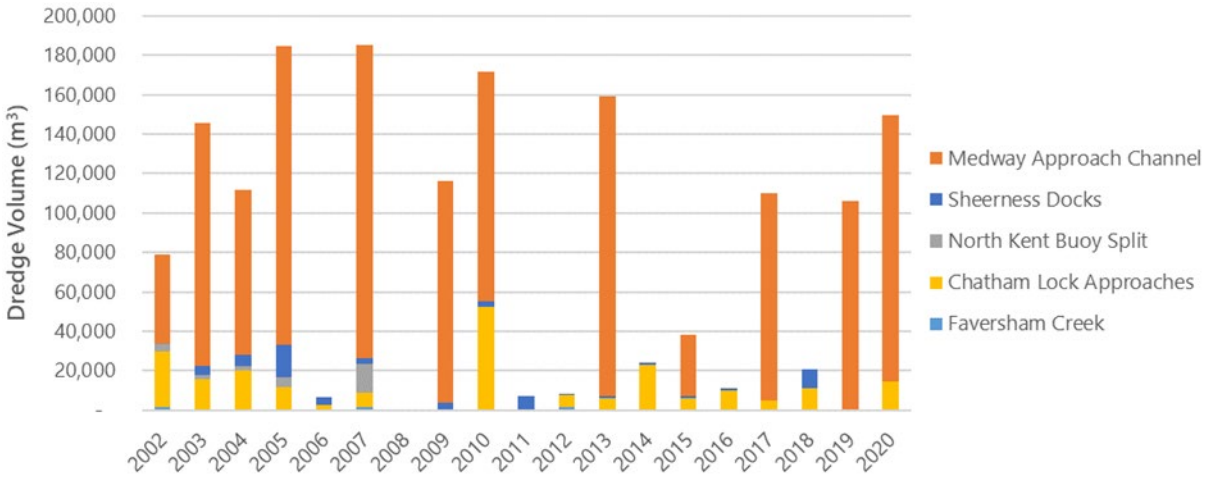


**Figure 6. Dredge volumes for areas maintained by Peel Ports Medway**

Third party dredge operations also occur around the many docks, jetties, marinas, pontoons, anchorages and slipways which are used by a range of commercial and recreational estuary users. These smaller port and harbour facilities require regular maintenance dredging to remove recently deposited material, and to ensure the safety of navigation and berthing.

Total annual dredge volumes for third parties between 2002 and 2020 (inclusive) range from 4,449 to 126,475 $m^3$, averaging approximately 43,849 $m^3$ per year. The majority of third-party dredging is undertaken within the Medway, both in terms of number of dredge areas and dredge volume. The vast majority is dredged using WID, with periodic use of TSHD for a small number of significant dredges (some of which would be considered a capital project). Further information regarding maintenance dredge activities in the Medway is included in the MDP Baseline Document (ABPmer, 2021). Potentially affected water bodies

## 2.2 Potentially affected water bodies

To determine which water bodies would potentially be affected by ongoing maintenance dredging and disposal activities, all surface and groundwater water bodies located within 5 km of the dredge areas and licensed marine disposal sites within and outside of the Medway were recorded. On this basis, the following water bodies were screened in:

- Medway transitional water body (ID: GB530604002300);
- Swale transitional water body (ID: GB530604011500);
- Thames Lower transitional water body (ID: GB530603911401);
- Thames Coastal North coastal water body (ID: GB640603690000);
- Thames Coastal South coastal water body (ID: GB640604640000);
- North Kent Swale Chalk groundwater body (ID: GB40601G501700);
- North Kent Tertiaries groundwater body (ID: GB40602G500200); and
- North Kent Medway Chalk groundwater body (ID: GB40601G500300).

Given the nature of activities (i.e. maintenance dredging and disposal within transitional water bodies), it is considered unlikely that there would be a significant non-temporary effect on the North Kent Swale Chalk groundwater water body, which lies beneath the southern bank of the Swale, the North Kent Tertiaries groundwater body which similarly lies beneath the southern bank of the Swale and some of the Medway Estuary, and the North Kent Medway Chalk groundwater body, which lies beneath the banks of the Medway and some of the intertidal areas within. Therefore, groundwater water bodies have been screened out of the assessment and will not be discussed further as maintenance dredging and disposal activities are unlikely to result in any adverse effects (e.g. saline intrusion).

Numerous riverine (freshwater) water bodies drain into the transitional and coastal water bodies around the Medway Estuary and The Swale. These water bodies have been screened out of this WFD compliance assessment as maintenance dredging and disposal activities are unlikely to result in adverse effects (e.g. riverine water bodies are beyond the normal tidal limit (NTL) or behind a sluice/weir).

There are no waterbodies within close proximity to the South Falls (TH070) and Inner Gabbard (TH052) disposal sites. The nearest is the Essex coastal body (ID: GB650503520001) which is over 10 km west. Considering the distance to any waterbodies, the disposal of dredge arisings at these sites is screened out of further assessment in relation to this WFD compliance assessment.

Table 1 provides a summary of water body status (based on 2019 interim classifications) for the transitional and coastal water bodies screened into the assessment. All five water bodies are currently failing to achieve GS; all water bodies have a chemical status of fail, while all have an ecological potential of moderate. In terms of chemical status, the priority hazardous substances Polybrominated diphenyl ethers (PBDE) and Mercury and its compounds were reported as 'fail' for all five water bodies, with Benzo(ghi)perylene and Tributyltin compounds also failing in several water bodies. The overall, ecological and chemical status/potential is determined by the "one-out, all-out" principle, whereby the poorest individual parameter classification defines the assessment level. Therefore, if any parameter is assessed as less than good (e.g. moderate), then the status for that water body is reported at that level.

**Table 1. WFD water body summary table**

| Water Body Name | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
|---|---|---|---|---|---|
| Water Body ID | GB530604002300 | GB530604011500 | GB530603911401 | GB640603690000 | GB640604640000 |
| Water Body Type | Transitional | Transitional | Transitional | Coastal | Coastal |
| Water Body Area | 56.565 $km^2$ | 29.055 $km^2$ | 201.037 $km^2$ | 42.683 $km^2$ | 77.081 $km^2$ |
| Hydromorphological Designation | HMWB | HMWB | HMWB | HMWB | HMWB |
| Protected Area Designations | Birds Directive; Bathing Waters Directive; Shellfish Waters Directive; Nitrates Directive. | Birds Directive; Shellfish Waters Directive. | Birds Directive; Habitats and Species Directive; Shellfish Waters Directive; Bathing Waters Directive; Nitrates Directive. | Birds Directive; Habitats and Species Directive; Shellfish Waters Directive. | Birds Directive; Shellfish Waters Directive. |
| Overall Status | Moderate | Moderate | Moderate | Moderate | Moderate |
| Ecological Status/Potential | Moderate | Moderate | Moderate | Moderate | Moderate |
| Chemical Status | Fail | Fail | Fail | Fail | Fail |
| Parameters Not At Good Status | Mitigation Measures Assessment (Moderate or less); Dissolved Inorganic Nitrogen (moderate); Dichlorvos (Priority) (fail); Polybrominated diphenyl ethers (PBDE) (fail); Benzo(g-h-i)perylene (fail); Mercury and Its Compounds (fail); Tributyltin Compounds (fail). | Mitigation Measures Assessment (Moderate or less); Dissolved Inorganic Nitrogen (moderate); Polybrominated diphenyl ethers (PBDE) (fail); Mercury and Its Compounds (fail). | Mitigation Measures Assessment (Moderate or less); Angiosperms (moderate); Dissolved Inorganic Nitrogen (Moderate); Cypermethrin (Priority hazardous) (fail); Polybrominated diphenyl ethers (PBDE) (fail); Benzo(g-h-i) perylene (fail); Mercury and Its Compounds (fail); Tributyltin Compounds (fail). | Mitigation Measures Assessment (Moderate or less); Dissolved Inorganic Nitrogen (moderate); Polybrominated diphenyl ethers (PBDE) (fail); Mercury and Its Compounds (fail). | Mitigation Measures Assessment (Moderate or less); Dissolved Inorganic Nitrogen (moderate); Polybrominated diphenyl ethers (PBDE) (fail); Benzo(g-h-i) perylene (fail); Mercury and Its Compounds (fail). |

| Water Body Name | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
|---|---|---|---|---|---|
| Higher Sensitivity Habitats | Intertidal seagrass (0.29 ha);<br>Saltmarsh (783.75 ha). | Saltmarsh (483.63 ha). | Intertidal seagrass (189.55 ha); Polychaete reef (274.75 ha);<br>Saltmarsh (426.94 ha). | Intertidal seagrass (0.04 ha);<br>Polychaete reef (120.56 ha);<br>Saltmarsh (8.54 ha). | Polychaete reef (621.26 ha). |
| Lower Sensitivity Habitats | Cobbles, gravel and shingle (1.83 ha);<br>Intertidal soft sediment (4,136.74 ha);<br>Rocky shore (15.28 ha);<br>Subtidal soft sediments (3,489.79 ha). | Cobbles, gravel and shingle (0.05 ha);<br>Intertidal soft sediment (3,101.44 ha)<br>Rocky shore (47.55 ha);<br>Subtidal soft sediments (944.65 ha). | Cobbles, gravel and shingle (139.15 ha);<br>Intertidal soft sediment (7,777.04 ha);<br>Rocky shore (0.46 ha);<br>Subtidal soft sediments (13,017.53 ha). | Intertidal soft sediments (111.81 ha);<br>Subtidal soft sediments (7,643.61 ha). | Cobbles, gravel and shingle (8.38 ha);<br>Intertidal soft sediment (230.35 ha);<br>Rocky shore (0.05 ha);<br>Subtidal soft sediments (3,776.18 ha). |
| Phytoplankton Status | Good | High | Good | Good | Good |
| History of Harmful Algae | Not Monitored | No | Yes | Not Monitored | Not Monitored |

Source: Environment Agency 2021, Catchment Data Explorer (Available from: https://environment.data.gov.uk/catchment-planning/; Accessed October 2021)

## 2.3 Protected areas

The WFD and Water Framework Regulations require that activities are also in compliance with other relevant retained EU legislation, such as the Habitats Directive (92/43/EEC as amended), Birds Directive (2009/147/EC), Ramsar Convention, Bathing Water Directive (2006/7/EC), Nitrates Directive (91/676/EEC), Urban Waste Water Treatment Directive (91/271/EEC) and the provisions of the Shellfish Waters Directive (2006/113/EC) (now repealed and integrated into the WFD).

### 2.3.1 Nature Conservation Designations

The Conservation of Habitats and Species Regulations 2017 (as amended) transpose the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) into English law. Article 3 of the Habitats Directive (92/43/EEC as amended) requires the establishment of a European network of important high-quality conservation sites known as Special Areas of Conservation (SAC) that will contribute to conserving habitats and species identified in Annexes I and II of the Directive. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). In accordance with Article 4 of the Birds Directive (2009/147/EC), Special Protection Areas (SPA) are strictly protected sites classified for rare and vulnerable birds (Annex I of the Directive), and for regularly occurring migratory species. Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The nature conservation interests of the Medway and surrounding area are of high importance with large sea expanses and adjacent coastlines having been designated as nationally and internationally protected sites. There are 14 internationally designated sites which overlap or are in the vicinity of maintenance dredge areas and/or disposal sites (Figure 7), including Special Protection Areas (SPAs), Ramsar Sites and Special Areas of Conservation (SACs); namely:

- Benfleet and Southend Marshes SPA and Ramsar;
- Essex Estuaries SAC;
- Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar;
- Margate and Long Sands SAC;
- Medway Estuary and Marshes SPA and Ramsar;
- Outer Thames Estuary SPA;
- Southern North Sea SAC;
- Thames Estuary and Marshes SPA and Ramsar; and
- The Swale SPA and Ramsar.

The location of these designated sites in relation to the maintenance dredge and disposal areas is considered in more detail in the Information to Inform an Appropriate Assessment and Marine Conservation Zone Assessment that is included in Appendix C of the MDP Baseline Document.

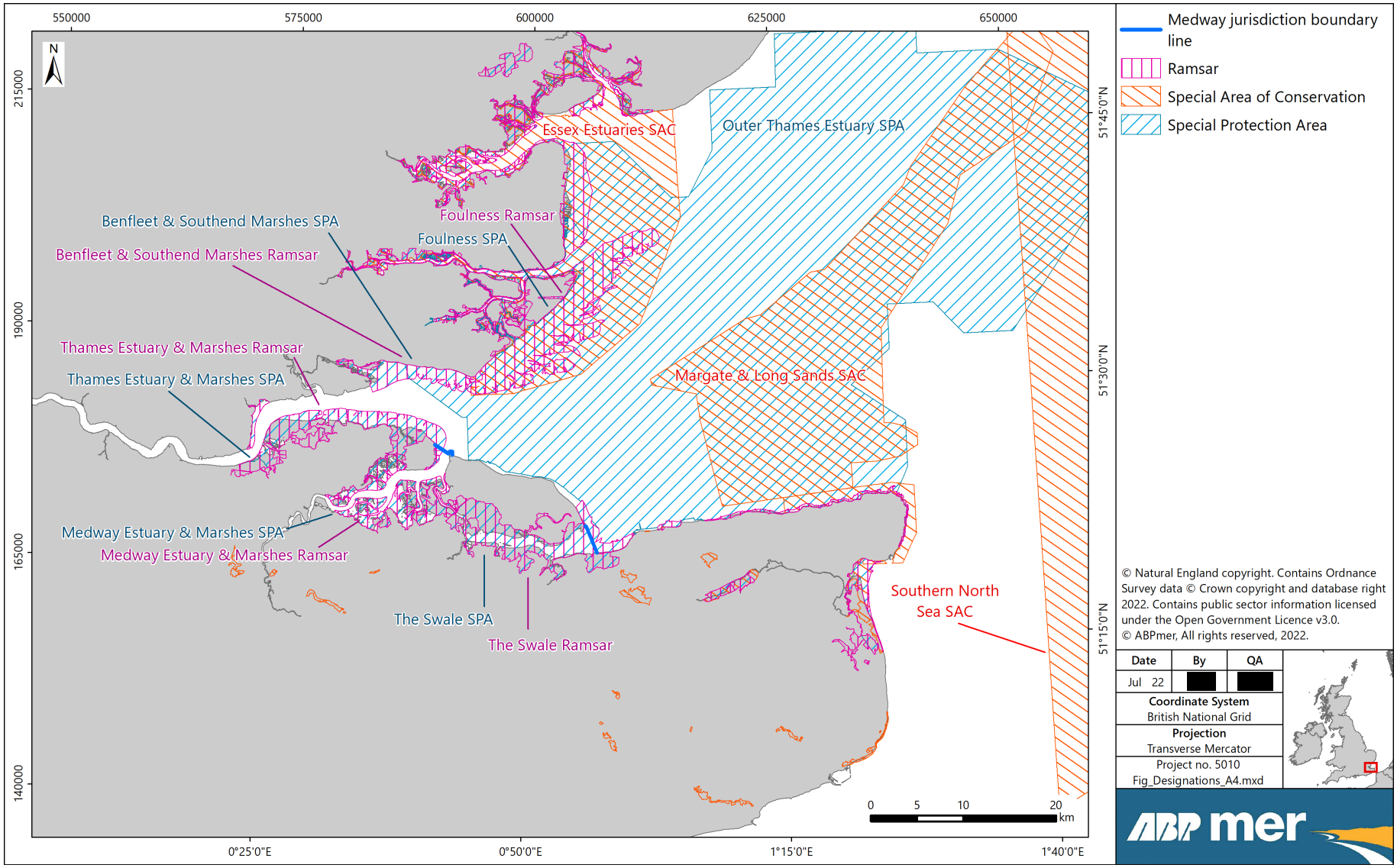


**Figure 7** **European/Ramsar designated sites within the study area**

### 2.3.2 Bathing Water Directive

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. The revised Bathing Water Directive focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the 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 Bathing Water Directive was repealed at the end of 2014 and 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 UK Government's target under the revised Bathing Water Directive is to achieve 'sufficient' for all bathing waters, as described under the Bathing Water Regulations 2013[4] (as amended) which transposes the revised Bathing Water Directive into UK law.

The closest designated bathing water to dredge areas within the study area is Sheerness, located approximately 1 km east of the Medway Approach Channel (Figure 8). West Beach, Whitstable bathing water is located at the mouth of The Swale, while numerous bathing waters are located along the coast of the Isle of Sheppey and the northern bank of the Thames Estuary. Water quality classifications for the period 2016 to 2019[5] are presented in Table 2.

**Table 2. Bathing waters classifications in study area (2016-2019)**

| Bathing Water | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|
| Sheerness | Excellent | Excellent | Excellent | Excellent |
| Minster Leas | Excellent | Excellent | Excellent | Excellent |
| Leysdown | Good | Excellent | Good | Excellent |
| West Beach, Whitstable | Excellent | Good | Good | Good |
| Tankerton | Excellent | Excellent | Excellent | Excellent |
| Herne Bay Central | Good | Good | Good | Good |
| Herne Bay | Excellent | Excellent | Excellent | Excellent |
| Leigh Bell Wharf | Sufficient | Sufficient | Poor | Sufficient |
| Southend Chalkwell | Good | Good | Sufficient | Good |
| Southend Westcliff Bay | Excellent | Excellent | Excellent | Excellent |
| Southend Three Shells | Good | Good | Excellent | Excellent |
| Southend Jubilee | Good | Good | Good | Good |
| Southend Thorpe Bay | Excellent | Excellent | Excellent | Excellent |
| Shoeburyness | Excellent | Excellent | Excellent | Excellent |
| Shoebury East | Excellent | Excellent | Excellent | Excellent |

Source: Environment Agency's Bathing Water Quality (https://environment.data.gov.uk/bwq/profiles; Accessed September 2021)

[4] Replaced by The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 on 31 January 2020.

[5] Note, bathing waters were not sampled during the bathing season in 2020 due to the COVID-19 pandemic and safety concerns for Environment Agency officers.

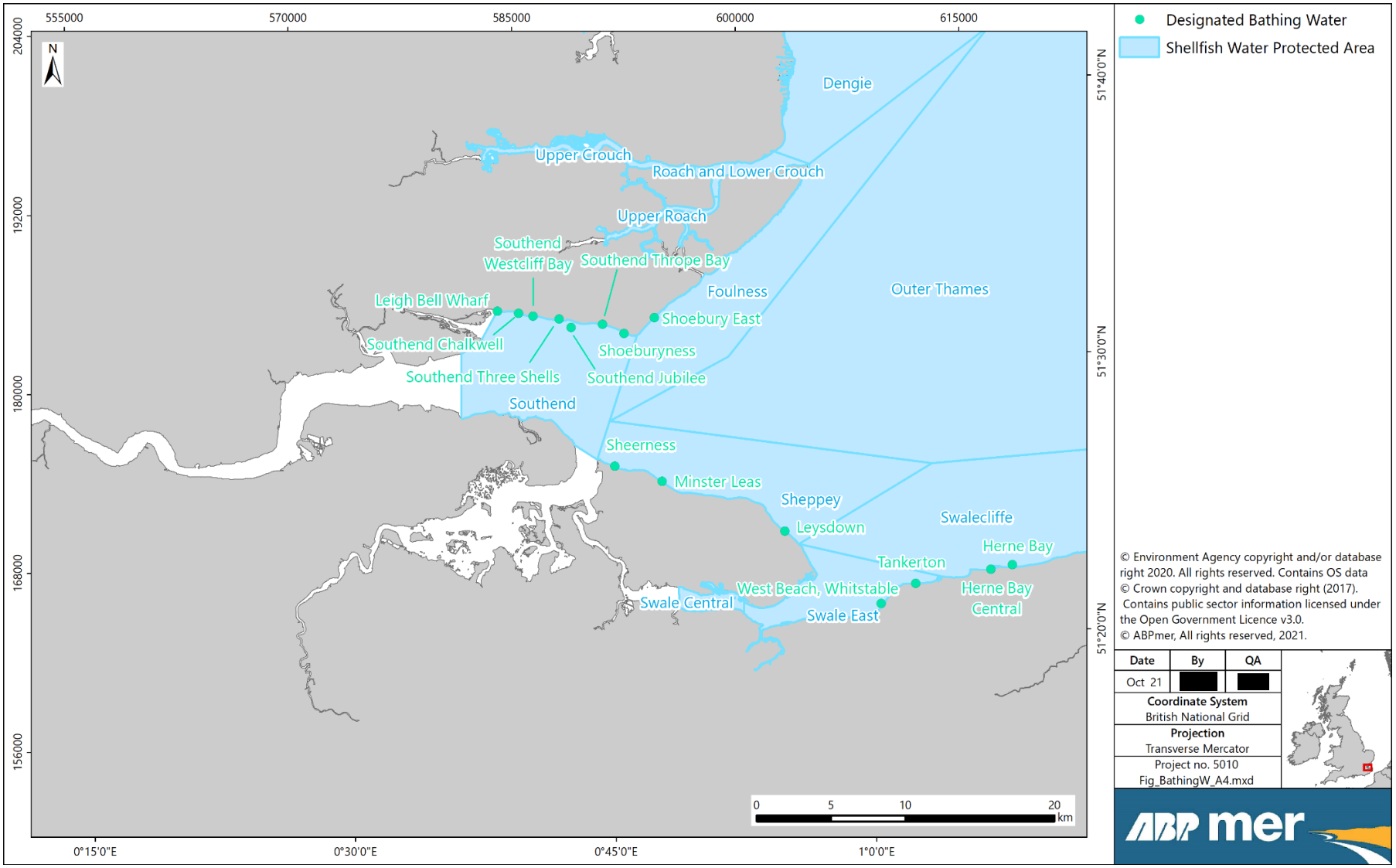


**Figure 8. Designated Bathing Waters and Shellfish Water Protected Areas within the study area**

### 2.3.3 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 the Environment Agency (in England) to 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 requires the Environment Agency to assess compliance against this standard to monitor microbial pollution (75% of samples taken within any period of 12 months below the microbial standard and sampling/analysis in accordance with the Directions).

There are several Shellfish Water Protected Areas situated within or in the vicinity of maintenance dredging and disposal activities for the Medway (Defra, 2016; see Figure 8). These are as follows:

- Foulness;
- Southend;
- Outer Thames;
- Swale Central;
- Swale East;
- Sheppey; and
- Swalecliffe

Sheppey, Southend and Swale East directly overlap with maintenance dredge areas (Figure 8).

Table 3 presents details of classification zones located within the Thames Estuary and Swale bivalve mollusc production areas. These classification zones are designated for *Cerastoderma edule* (Common edible cockle), *Crassostrea gigas* (Pacific oyster), *Mytilus* spp. (*Mytilus edulis* (blue mussel), *Mytilus galloprovincialis* (Mediterranean mussel) and hybrids), *Ostrea edulis* (Native oyster) and/or *Ensis* spp. (Razor clams). These zones were classified as Class A, Class B, Class B (Long-term; B-LT), Class C or Seasonal A/B for 2020/21. The EU legislation, retained post-Brexit, determining the classification of shellfish waters within the UK is EC Regulation 2019/627, namely Articles 53 (Class A), 54 (Class B) and 55 (Class C). The classification of shellfish waters determines the level of treatment required before molluscs can be placed on the market.

**Table 3. Bivalve mollusc classification for 2020/2021**

| Production Area | Classification Zone | Species | Class |
|---|---|---|---|
| Thames Estuary | Maplin West | *C. edule* | Seasonal A/B (Class A season 1 June – 31 October, reverting to Class B at all other times) |
| | Maplin Central | *C. edule* | Class A |
| | Maplin East | *C. edule* | Seasonal A/B (Class A season 1 June – 31 October, reverting to Class B at all other times) |
| | East of Southend Pier | *C. gigas* | Class B |
| | Leigh Foreshore | *C. edule* | Class C |
| | | *Mytilus spp.* | |
| | Phoenix | *C. edule* | Class A |
| | Barrow Deep | *O. edulis* | Seasonal A/B (Class A season 1 December – 30 September, reverting to Class B at all other times) |

| Production Area | Classification Zone | Species | Class |
|---|---|---|---|
| | Black Deep | *Ensis spp.* | Class A |
| | East Barrows | *C. edule* | Class B (Preliminary) |
| | West Barrows (Zone 9) | *C. edule* | Class B (Preliminary) |
| | Barrows (Zone 12) | *C. edule* | Class B (Preliminary) |
| | Southend Flats | *C. edule* | Class C |
| | | *Mytilus spp.* | |
| | West of Southend Pier | *C. gigas* | Class B (Long-term) |
| | East Cant, Middle and Scrapsgate – TECFO Area 13 (modified) | *C. edule* | Class C (Preliminary) |
| | West Cant and Scrapsgate – TECFO Area 13 (modified) | *C. edule* | Class B (Long-term) |
| | North Sheppey | *Mytilus spp.* | Class B (Long-term) |
| Swale | Swale Causeway | *C. gigas* | Class B (Long-term) |
| | | *O. edulis* | |
| | Swale Inner North | *C. gigas* | Class B (Long-term) |
| | Swale Inner South | *C. gigas* | Class B (Long-term) |
| | Swale Outer | *C. gigas* | Class B (Long-term) |
| | | *C. edule* | Class C (Preliminary) |

Source: Food Standards Agency (https://www.food.gov.uk/business-guidance/shellfish-classification; Accessed September 2021)

### 2.3.4 Nitrates Directive

The Nitrates Directive (91/676/EEC), which is implemented in England by the Nitrate Pollution Prevention Regulations 2008 (S.I. 2008/2349) (the 2008 Regulations)[6], 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.

Three surface nitrate vulnerable zones (NVZs) surround the north section of the Medway Estuary, namely:

- Coastal Streams to Lower Thames NVZ;
- Tidal Medway Drain A NVZ; and
- Tidal Medway Drain B NVZ.

### 2.3.5 Urban Waste Water Treatment Directive

The Urban Waste Water Treatment (England and Wales) Regulations 1994 (as amended) transpose the Urban Waste Water Treatment Directive (91/271/EEC) into English law. The Urban Waste Water Treatment Directive (91/271/EEC) 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

[6] Certain provisions of the 2018 Regulations have been amended by the Nitrate Pollution Prevention (Amendment) and Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) (Amendment) Regulations 2013.

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. There are several Bathing Water and Shellfish Water sensitive areas located within the study area[7].

## 2.4 Sediment quality

There are no formal quantitative EQS for the concentration of contaminants in sediments, although the WFD has introduced optional standards for a small number of priority (hazardous) substances. The Centre for Environment, Fisheries and Aquaculture Science (Cefas) has prepared a series of Guideline Action Levels to assist in the assessment of dredged material (and its suitability for disposal to sea). In general, contaminant levels in dredged material below Cefas Guideline Action Level 1 (AL1) are of no concern and are unlikely to influence the licensing decision. However, dredged material with contaminant levels above Cefas Guideline Action Level 2 (AL2) is generally considered unsuitable for disposal at sea.

Dredged material with contaminant levels between AL1 and AL2 may require further consideration before a decision can be made. The Cefas Guideline Action Levels should not be viewed as pass/fail thresholds. However, these guidelines provide an appropriate context for consideration of contaminant levels in sediments and are used as part of a 'weight of evidence' approach to assessing dredged material by the MMO as part of the marine licensing process and by Peel Ports Medway when it undertakes any maintenance dredging under its own powers or evaluates any third party applications to dredge.

Over the last 20 years, sediment samples have been collected from various locations within the Medway to consider suitability of dredging and disposal activities. In general, contaminant concentrations in sediment samples collected from the Medway Estuary were below Cefas Guideline AL1 (i.e. metals, organotins, polychlorinated biphenyls (PCBs) and poly aromatic hydrocarbons (PAHs)). Contaminant concentrations with the Medway Approach Channel are low. There are a few exceedances of Cefas Guideline AL2 (e.g. mercury and arsenic). However, as mercury and arsenic in the majority of other sample sites was found to be below Cefas Guideline AL1 (or marginally exceeding Cefas Guideline AL1), it is suggested that these are isolated hot-spots. Sediment samples from within more southerly locations, such as The Swale and the Faversham and Oare creeks, however, indicate that elevated and more widespread levels of contamination may be present at some locations (as opposed to hot-spots within the Medway Estuary). Indeed, wider environment sediment sampling in these areas in 2012 confirmed that these areas are characterised by elevated levels of certain contaminants. Decisions on dredging activities in these areas, therefore, already take into account the existing widespread distribution of these contaminants.

Sediment quality data from samples collected by Peel Ports Medway in 2012 cover the area of Saltpan Reach, River Medway and Hoo Island, The Swale and Faversham and Oare Creeks and are presented in Table 4 to Table 6. Figure 9 to Figure 13 show the location of the samples. This is not the full extent of sediment sampling and analysis that has been undertaken in the study area but is the most recent and complete set of data for the majority of the Medway.

Further details of historic sediment sampling within the Medway Approach Channel, Medway Estuary and Swale Estuary is available in the Medway MDP Baseline Document (ABPmer, 2021).

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/796755/sensitive-areas-map-kent-south-london.pdf (Accessed August 2021).

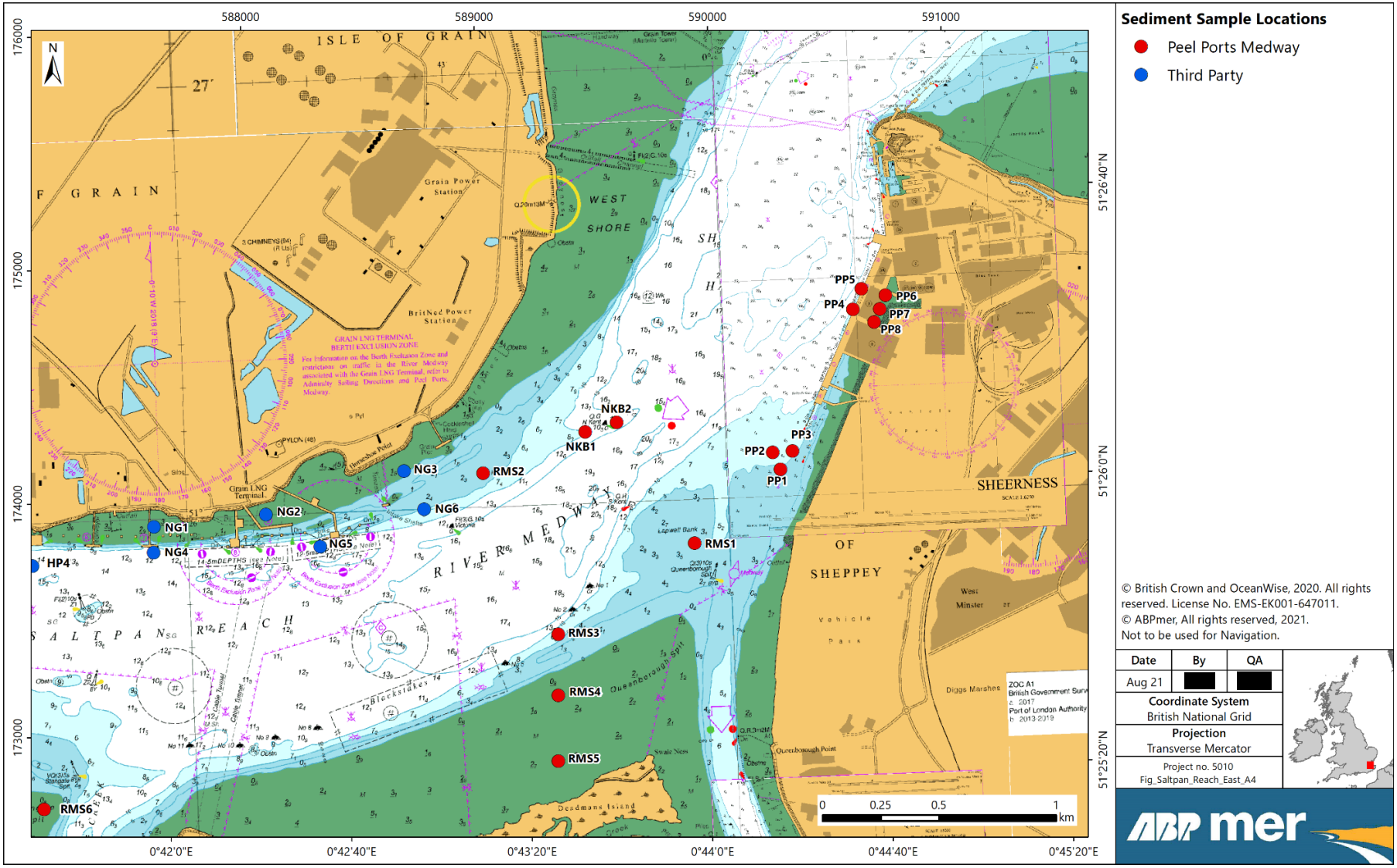


**Figure 9. 2012 Sampling locations within the Medway mouth**

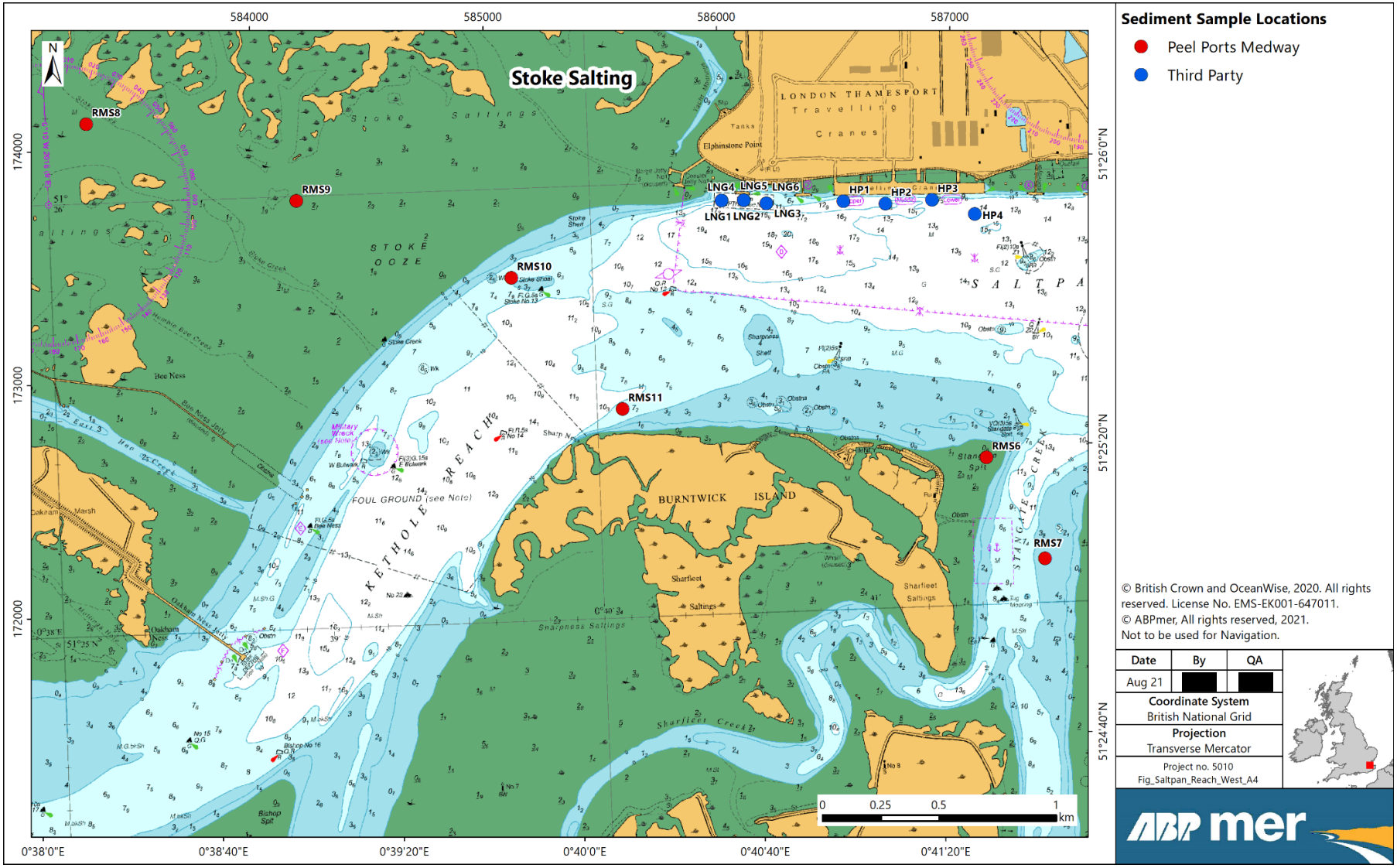


**Figure 10. 2012 sampling locations within the Medway Estuary**

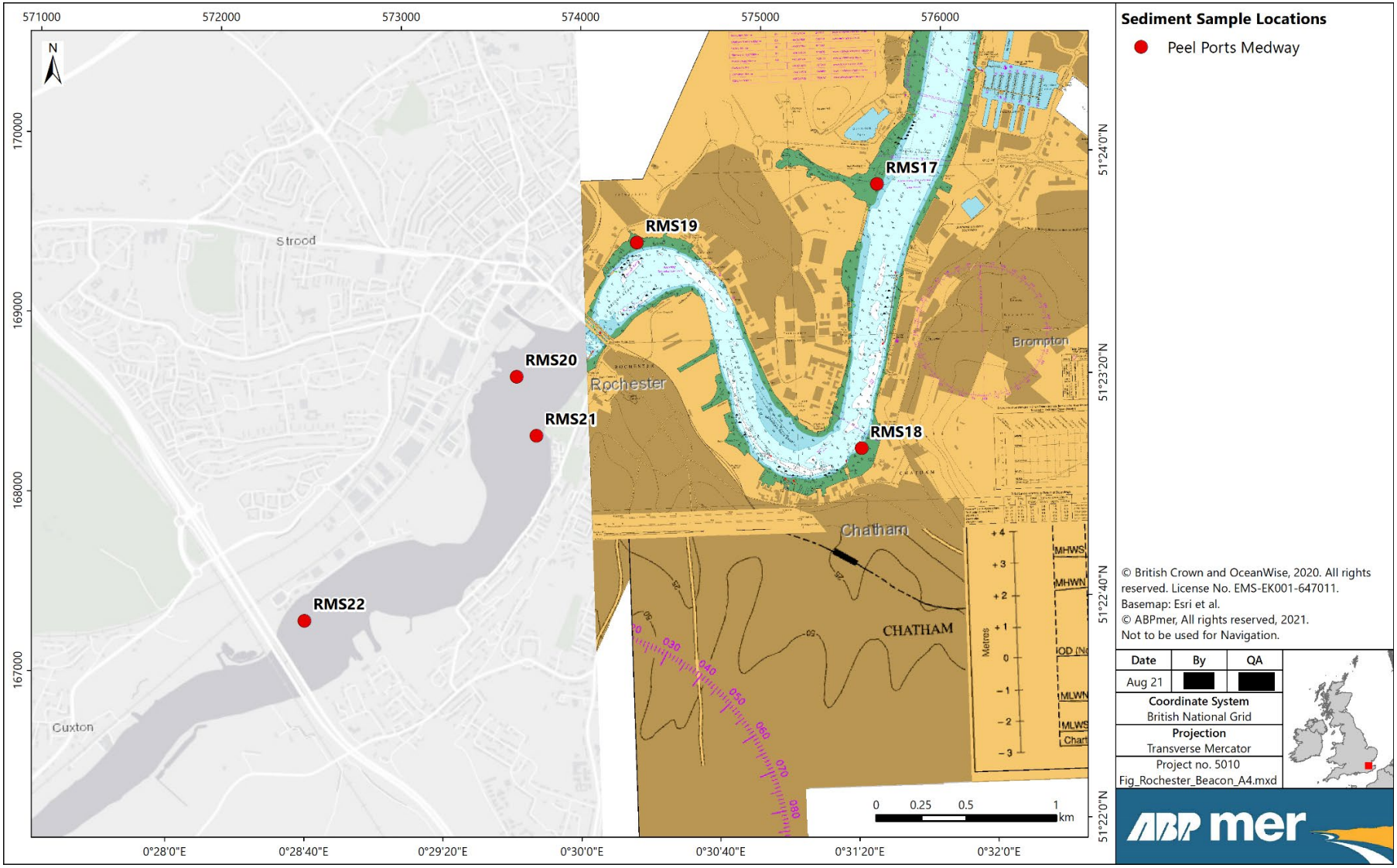


**Figure 11. 2012 sampling locations within the Chatham and Medway River areas**

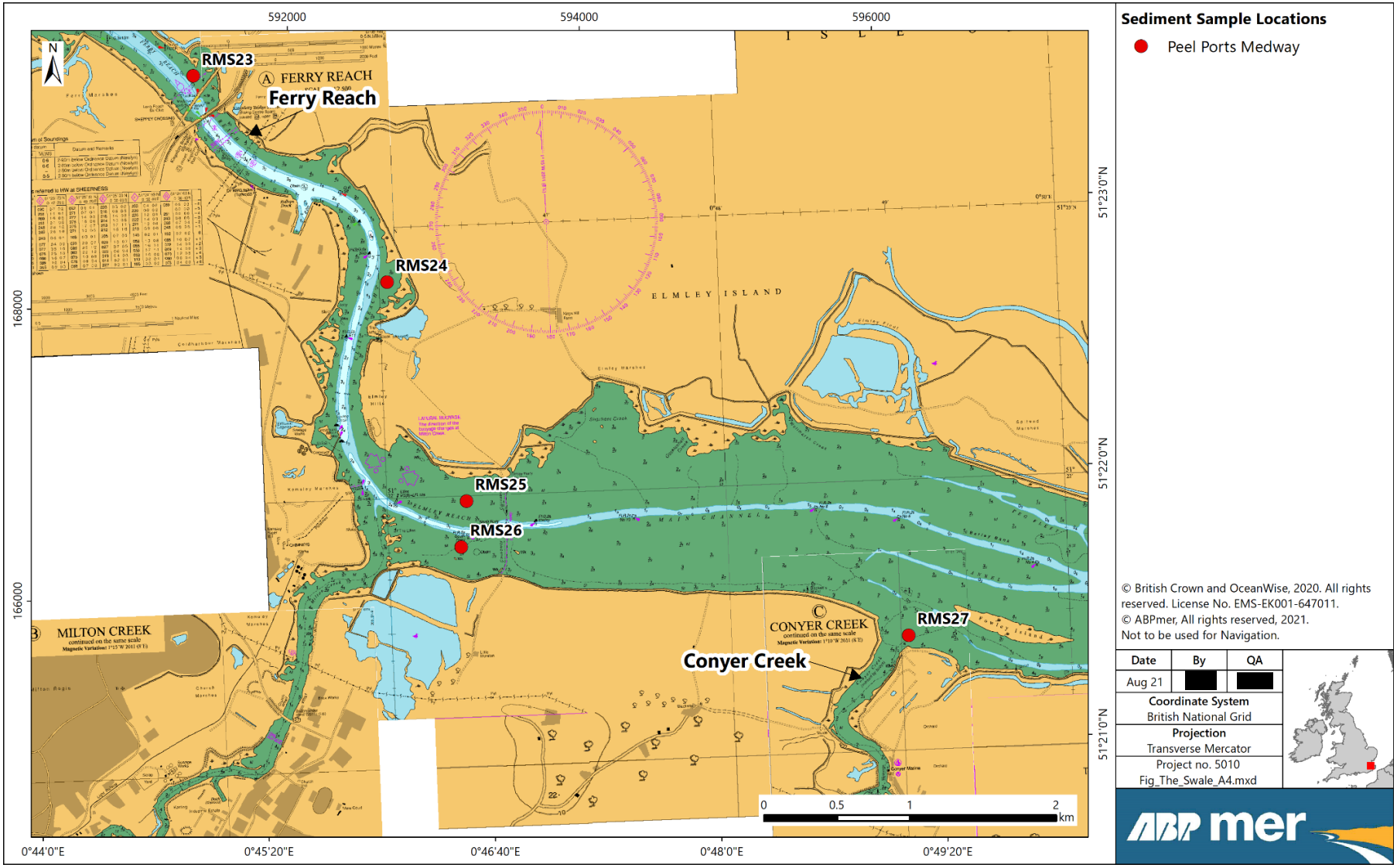


**Figure 12. 2012 sampling locations in the Ferry Reach and Conyer Creek area**

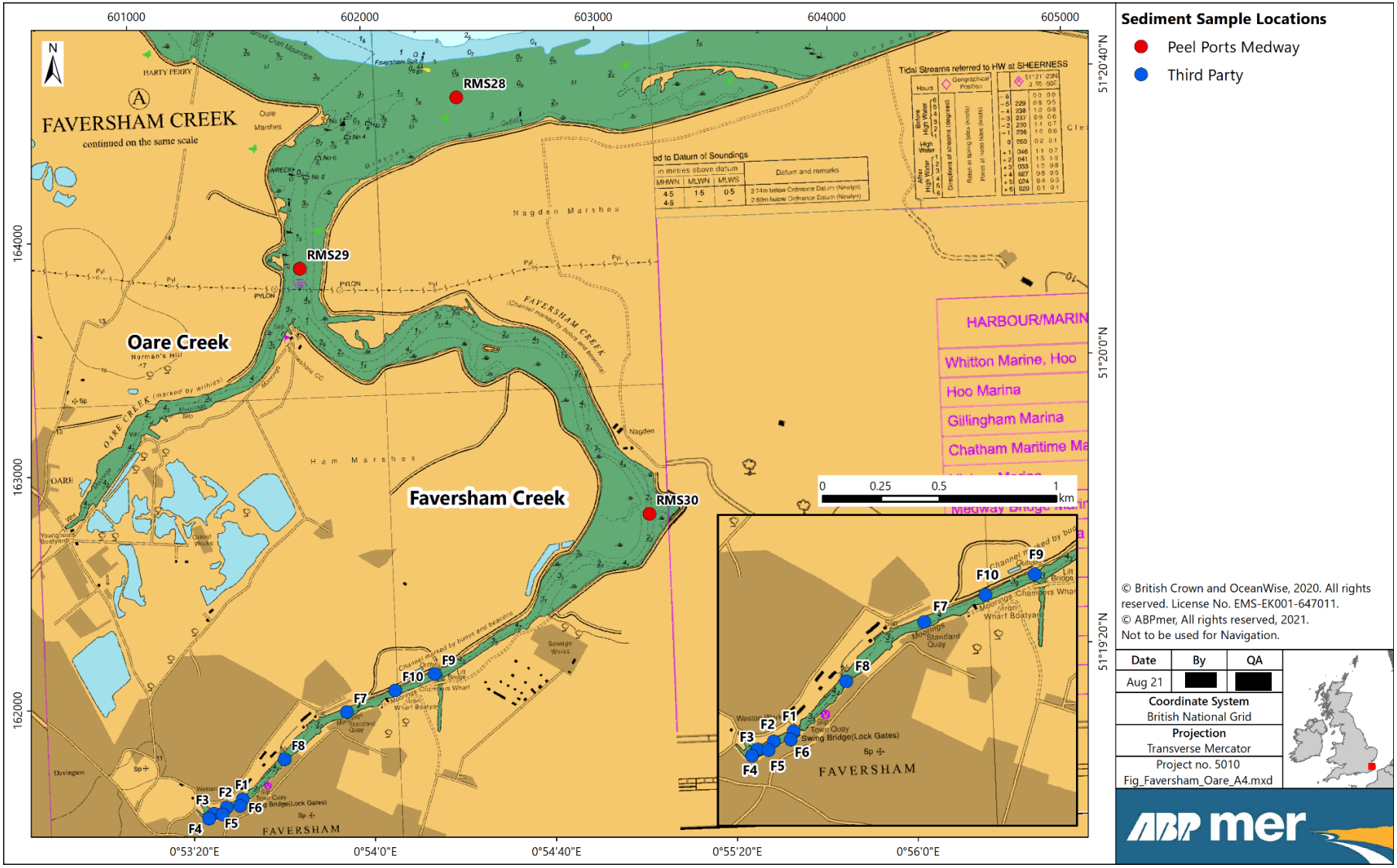


**Figure 13. 2012 sampling locations in the Faversham and Oare Creek areas**

## 2.5 Water quality

Metal and organotin concentrations have been measured by the Environment Agency within the River Medway located near the mouth of the Medway Estuary and close to maintenance dredging operations at Sheerness Docks, Isle of Grain and the Medway Approach Channel (North Kent Buoy, SO-E0000204) (Table 7). Metal concentrations are generally only available up to 2012, however, mercury concentrations are available from 2017 to 2021, and Tributyl tin (TBT) concentrations are available from 2012 to 2016. Metal concentrations reported over these periods were typically below respective annual average (AA) and/or maximum allowable concentration (MAC) environmental quality standards (EQS) as described under the WFD (Standards and Classification) Directions (England and Wales) 2015.

**Table 4. Trace metal and organotin concentrations from sediment samples collected from the River Medway and The Swale (2012)**

| Laboratory Sample No. | Figure ID | Total Solids (%) | Trace Metals and Organotins (mg/kg dry weight) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | As | Cd | Cr | Cu | Hg | Ni | Pb | Zn | DBT | TBT |
| **Cefas Guideline AL1** | | | **20** | **0.4** | **40** | **40** | **0.3** | **20** | **50** | **130** | **0.1** | **0.1** |
| **Cefas Guideline AL2** | | | **100** | **5** | **400** | **400** | **3** | **200** | **500** | **800** | **1** | **1** |
| Site 1 | RMS1 | 70.2 | 11 | 0.1 | 83.4 | 46.4 | 0.1 | 30.8 | 37.1 | 93.3 | <0.004 | <0.004 |
| Site 2 | RMS2 | 75.3 | 9.6 | 0.1 | 163 | 156 | 0 | 106 | 15.2 | 63 | <0.004 | <0.004 |
| Site 3 | RMS3 | 59.7 | 18 | 0.4 | 176 | 156 | 0.5 | 82.7 | 81.4 | 191 | 0.052 | 0.006 |
| Site 4 & 5 | RMS4 and 5 | 54.1 | 14.9 | 0.2 | 185 | 234 | 0.2 | 96.3 | 39.1 | 146 | <0.006 | <0.006 |
| Site 6 | RMS6 | 52.7 | 15.5 | 0.1 | 151 | 146 | 0.2 | 80.9 | 40 | 126 | <0.006 | <0.006 |
| Site 7 | RMS7 | 56.9 | 63.7 | 0.2 | 206 | 83.7 | 24.5 | 114 | 243 | 214 | <0.005 | <0.005 |
| Site 8 & 9 | RMS8 and 9 | 53 | 14.6 | 0.1 | 113 | 61.8 | 0.2 | 53.7 | 41.6 | 125 | <0.006 | <0.006 |
| Site 10 | RMS10 | 59.5 | 11.7 | 0.1 | 94.5 | 66.6 | 0.1 | 34.5 | 33.3 | 96.7 | <0.005 | <0.005 |
| Site 11 | RMS11 | 69.5 | 30.7 | 0.1 | 224 | 136 | 0 | 124 | 26.3 | 116 | <0.004 | <0.004 |
| Site 12 | RMS12 | 43.5 | 14.6 | 0.2 | 119 | 72.4 | 0.2 | 57.1 | 45.7 | 132 | <0.006 | 0.009 |
| Site 13 | RMS13 | 93.7 | 104 | 0.2 | 286 | 243 | 0.2 | 172 | 113 | 371 | <0.003 | <0.003 |
| Site 14 | RMS14 | 55.1 | 29.3 | 0.6 | 101 | 84.5 | 0.8 | 49.7 | 102 | 211 | 0.018 | 0.005 |
| Site 15 | RMS15 | 36.5 | 16.9 | 0.3 | 166 | 129 | 0.3 | 94.8 | 60.6 | 216 | 0.026 | 0.01 |
| Site 16 | RMS16 | 48.8 | 14.5 | 0.2 | 192 | 129 | 0.4 | 115 | 55.9 | 170 | 0.018 | 0.02 |
| Site 17 | RMS17 | 46.9 | 16.1 | 0.3 | 173 | 139 | 0.4 | 91.4 | 65.9 | 216 | 0.026 | 0.01 |
| Site 18 | RMS18 | 47.1 | 15.4 | 0.3 | 168 | 87.7 | 0.3 | 75.9 | 72.5 | 204 | 0.026 | 0.02 |
| Site 19 | RMS19 | 45.5 | 21.9 | 0.6 | 163 | 123 | 0.5 | 81.6 | 94.8 | 277 | 0.052 | 0.03 |
| Site 20 | RMS20 | 41.1 | 15.6 | 0.3 | 139 | 110 | 0.4 | 68.9 | 66.4 | 191 | 0.026 | 0.02 |
| Site 21 | RMS21 | 56.6 | 10 | 0.4 | 226 | 156 | 0.1 | 173 | 25.5 | 163 | <0.006 | 0.007 |
| Site 22 | RMS22 | 48.5 | 22.1 | 0.2 | 111 | 66.7 | 0.4 | 55.8 | 91.3 | 140 | <0.006 | <0.006 |
| Site 23 | RMS23 | 54.3 | 17.5 | 0.2 | 154 | 193 | 0.2 | 76.4 | 50.7 | 163 | 0.016 | <0.005 |
| Site 24 | RMS24 | 50.1 | 24.6 | 0.7 | 128 | 82.9 | 0.8 | 59.4 | 82.9 | 214 | <0.006 | <0.006 |
| Site 25 | RMS25 | 46.6 | 14.6 | 0.2 | 99 | 56.1 | 0.2 | 45.3 | 48.4 | 142 | <0.007 | <0.007 |
| Site 26 | RMS26 | 56.8 | 16.5 | 0.2 | 111 | 60.1 | 0.2 | 45 | 47.5 | 137 | 0.013 | <0.005 |
| Site 27 | RMS27 | 55.2 | 25.4 | 0.9 | 203 | 205 | 0.7 | 99 | 69.7 | 217 | 0.026 | 0.005 |
| Site 28 | RMS28 | 53.2 | 13.5 | 0.1 | 155 | 104 | 0.1 | 68.4 | 33.2 | 114 | <0.006 | <0.006 |
| Site 29 | RMS29 | 40.8 | 30.9 | 0.2 | 184 | 215 | 3.1 | 89 | 145 | 206 | 0.026 | 0.04 |
| Site 30 | RMS30 | 43.5 | 21.3 | 0.3 | 119 | 59.7 | 0.3 | 48.3 | 54.5 | 156 | 0.026 | 0.03 |
| **Key** | | | **Below AL1** | | **Above AL1, Below AL2** | | | | **Above AL2** | | | |

**Table 5. Polychlorinated biphenyl (PCB) concentrations from sediment samples collected from the River Medway and The Swale (2012)**

| Laboratory Sample No. | Figure ID | PCBs (µg/kg dry weight) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #18 | #28 | #31 | #44 | #47 | #49 | #52 | #66 | #101 | #105 | #110 | #118 | #128 |
| Cefas Guideline AL1 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cefas Guideline AL2 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Site 1 | RMS1 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 2 | RMS2 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 3 | RMS3 | - | 1 | - | - | - | - | 0 | - | 1 | - | - | 1 | - |
| Site 4 & 5 | RMS4 and 5 | - | 0 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 6 | RMS6 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 7 | RMS7 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 8 & 9 | RMS8 and 9 | - | 0 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 10 | RMS10 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 11 | RMS11 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 12 | RMS12 | - | 1 | - | - | - | - | 0 | - | 0 | - | - | 0 | - |
| Site 13 | RMS13 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 14 | RMS14 | - | 3 | - | - | - | - | 7 | - | 4 | - | - | 4 | - |
| Site 15 | RMS15 | - | 1 | - | - | - | - | 1 | - | 1 | - | - | 1 | - |
| Site 16 | RMS16 | - | 1 | - | - | - | - | 1 | - | 1 | - | - | 1 | - |
| Site 17 | RMS17 | - | 1 | - | - | - | - | 1 | - | 1 | - | - | 1 | - |
| Site 18 | RMS18 | - | 1 | - | - | - | - | 2 | - | 1 | - | - | 1 | - |
| Site 19 | RMS19 | - | 2 | - | - | - | - | 3 | - | 2 | - | - | 2 | - |
| Site 20 | RMS20 | - | 1 | - | - | - | - | 2 | - | 1 | - | - | 1 | - |
| Site 21 | RMS21 | - | 0 | - | - | - | - | 1 | - | 0 | - | - | <0.1 | - |
| Site 22 | RMS22 | - | <0.1 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 23 | RMS23 | - | 1 | - | - | - | - | <0.1 | - | 0 | - | - | 0 | - |
| Site 24 | RMS24 | - | 1 | - | - | - | - | 1 | - | 1 | - | - | 1 | - |
| Site 25 | RMS25 | - | 1 | - | - | - | - | 0 | - | 0 | - | - | 0 | - |
| Site 26 | RMS26 | - | 2 | - | - | - | - | 1 | - | 0 | - | - | 0 | - |
| Site 27 | RMS27 | - | 1.8 | - | - | - | - | 7 | - | 3 | - | - | 4 | - |
| Site 28 | RMS28 | - | 0 | - | - | - | - | <0.1 | - | <0.1 | - | - | <0.1 | - |
| Site 29 | RMS29 | - | 2 | - | - | - | - | 61 | - | 171 | - | - | 150 | - |
| Site 30 | RMS30 | - | 2 | - | - | - | - | 1 | - | 1 | - | - | 1 | - |

| Laboratory Sample N°. | Figure ID | #138 | #141 | #149 | #151 | #153 | #156 | #158 | #170 | #180 | #183 | #187 | #194 | ΣICES 7 PCBs | Σ25 PCBs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cefas Guideline AL1 | | - | - | - | - | - | - | - | - | - | - | - | - | 10 | 20 |
| Cefas Guideline AL2 | | - | - | - | - | - | - | - | - | - | - | - | - | - | 200 |
| Site 1 | RMS1 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 2 | RMS2 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 3 | RMS3 | 1 | - | - | - | 1 | - | - | - | 0 | - | - | - | - | - |
| Site 4 & 5 | RMS4 and 5 | 0 | - | - | - | 0 | - | - | - | 0 | - | - | - | - | - |
| Site 6 | RMS6 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 7 | RMS7 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 8 & 9 | RMS8 and 9 | 0 | - | - | - | 0 | - | - | - | <0.2 | - | - | - | - | - |
| Site 10 | RMS10 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 11 | RMS11 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 12 | RMS12 | 0 | - | - | - | 1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 13 | RMS13 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 14 | RMS14 | 3 | - | - | - | 3 | - | - | - | 2 | - | - | - | - | - |
| Site 15 | RMS15 | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - |
| Site 16 | RMS16 | 1 | - | - | - | 1 | - | - | - | <0.2 | - | - | - | - | - |
| Site 17 | RMS17 | 1 | - | - | - | 1 | - | - | - | <0.2 | - | - | - | - | - |
| Site 18 | RMS18 | 1 | - | - | - | 1 | - | - | - | <0.3 | - | - | - | - | - |
| Site 19 | RMS19 | 2 | - | - | - | 2 | - | - | - | 1 | - | - | - | - | - |
| Site 20 | RMS20 | 1 | - | - | - | 0.1 | - | - | - | 1 | - | - | - | - | - |
| Site 21 | RMS21 | 0 | - | - | - | 0 | - | - | - | 0 | - | - | - | - | - |
| Site 22 | RMS22 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 23 | RMS23 | 0 | - | - | - | 1 | - | - | - | 0 | - | - | - | - | - |
| Site 24 | RMS24 | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - |
| Site 25 | RMS25 | 0 | - | - | - | 1 | - | - | - | 0 | - | - | - | - | - |
| Site 26 | RMS26 | 0 | - | - | - | 1 | - | - | - | 0 | - | - | - | - | - |
| Site 27 | RMS27 | 4 | - | - | - | 3 | - | - | - | 2 | - | - | - | - | - |
| Site 28 | RMS28 | <0.1 | - | - | - | <0.1 | - | - | - | <0.1 | - | - | - | - | - |
| Site 29 | RMS29 | 142 | - | - | - | 124 | - | - | - | 24 | - | - | - | - | - |
| Site 30 | RMS30 | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - |

**Table 6. Polycyclic aromatic hydrocarbon (PAH) concentrations and total hydrocarbon content (THC) from sediment samples collected from the River Medway and The Swale (2012)**

| Laboratory Sample N°. | Figure ID | PAHs (mg/kg dry weight) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ACENAPH | ACENAPT | ANTHRAC | BAA | BAP | BBF | BENZGHI | BEP | BKF | C1N | C1PHEN |
| Cefas Guideline AL1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Cefas Guideline AL2 | | - | - | - | - | - | - | - | - | - | - | - |
| Site 1 | RMS1 | <0.003 | 0.017 | 0.04 | 0.2 | 0.177 | 0.168 | 0.084 | - | 0.08 | - | - |
| Site 2 | RMS2 | <0.002 | <0.002 | <0.002 | 0.002 | 0.003 | <0.01 | <0.01 | - | <0.01 | - | - |
| Site 3 | RMS3 | 0.013 | 0.032 | 0.047 | 0.15 | 0.233 | 0.274 | 0.195 | - | 0.106 | - | - |
| Site 4 & 5 | RMS4 and 5 | 0.011 | 0.028 | 0.036 | 0.171 | 0.207 | 0.2 | 0.139 | - | 0.106 | - | - |
| Site 6 | RMS6 | 0.005 | 0.017 | 0.022 | 0.079 | 0.121 | 0.146 | 0.096 | - | 0.056 | - | - |
| Site 7 | RMS7 | 0.048 | 0.108 | 0.201 | 0.42 | 0.646 | 0.689 | 0.413 | - | 0.265 | - | - |
| Site 8 & 9 | RMS8 and 9 | 0.009 | 0.017 | 0.029 | 0.094 | 0.13 | 0.139 | 0.105 | - | 0.072 | - | - |
| Site 10 | RMS10 | 0.009 | 0.015 | 0.023 | 0.076 | 0.106 | 0.124 | 0.08 | - | 0.046 | - | - |
| Site 11 | RMS11 | <0.002 | <0.002 | <0.002 | 0.006 | 0.007 | 0.013 | 0.01 | - | <0.01 | - | - |
| Site 12 | RMS12 | 0.027 | 0.072 | 0.078 | 0.325 | 0.445 | 0.453 | 0.291 | - | 0.196 | - | - |
| Site 13 | RMS13 | <0.002 | 0.003 | 0.008 | 0.018 | 0.024 | 0.029 | 0.019 | - | 0.01 | - | - |
| Site 14 | RMS14 | 0.025 | 0.099 | 0.096 | 0.277 | 0.577 | 0.618 | 0.399 | - | 0.243 | - | - |
| Site 15 | RMS15 | 0.018 | 0.051 | 0.064 | 0.274 | 0.426 | 0.453 | 0.313 | - | 0.173 | - | - |
| Site 16 | RMS16 | 0.031 | 0.057 | 0.099 | 0.341 | 0.489 | 0.523 | 0.332 | - | 0.204 | - | - |
| Site 17 | RMS17 | 0.029 | 0.053 | 0.1 | 0.4 | 0.545 | 0.542 | 0.391 | - | 0.265 | - | - |
| Site 18 | RMS18 | 0.066 | 0.109 | 0.186 | 0.647 | 0.871 | 0.832 | 0.586 | - | 0.436 | - | - |
| Site 19 | RMS19 | 0.039 | 0.104 | 0.137 | 0.527 | 0.799 | 0.794 | 0.562 | - | 0.391 | - | - |
| Site 20 | RMS20 | 0.014 | 0.057 | 0.095 | 0.585 | 0.595 | 0.506 | 0.337 | - | 0.29 | - | - |
| Site 21 | RMS21 | 0.03 | 0.041 | 0.061 | 0.261 | 0.306 | 0.288 | 0.185 | - | 0.16 | - | - |
| Site 22 | RMS22 | 0.045 | 0.071 | 0.465 | 0.975 | 0.863 | 0.717 | 0.376 | - | 0.409 | - | - |
| Site 23 | RMS23 | 0.012 | 0.022 | 0.039 | 0.125 | 0.863 | 0.191 | 0.376 | - | 0.098 | - | - |
| Site 24 | RMS24 | 0.038 | 0.12 | 0.175 | 0.426 | 0.728 | 0.722 | 0.504 | - | 0.331 | - | - |
| Site 25 | RMS25 | 0.012 | 0.023 | 0.029 | 0.111 | 0.166 | 0.184 | 0.139 | - | 0.09 | - | - |
| Site 26 | RMS26 | 0.012 | 0.023 | 0.105 | 0.202 | 0.239 | 0.217 | 0.159 | - | 0.102 | - | - |
| Site 27 | RMS27 | 0.02 | 0.068 | 0.077 | 0.255 | 0.484 | 0.507 | 0.37 | - | 0.23 | - | - |
| Site 28 | RMS28 | 0.009 | 0.013 | 0.017 | 0.065 | 0.091 | 0.1 | 0.079 | - | 0.049 | - | - |
| Site 29 | RMS29 | 0.148 | 0.151 | 0.801 | 1.38 | 1.62 | 1.4 | 0.818 | - | 0.842 | - | - |
| Site 30 | RMS30 | 0.046 | 0.057 | 0.114 | 0.629 | 0.69 | 0.638 | 0.402 | - | 0.314 | - | - |

| Laboratory Sample N°. | Figure ID | C2N | C3N | CHRYSEN | DBENZAH | FLUORAN | FLUOREN | INDPYR | NAPTH | PERYLEN | PHENANT | PYRENE | THC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cefas Guideline AL1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 100 |
| Cefas Guideline AL2 | | - | - | - | - | - | - | - | - | - | - | - | - |
| Site 1 | RMS1 | - | - | 0.186 | 0.024 | 0.209 | <0.01 | 0.076 | 0.034 | - | 0.055 | 0.191 | - |
| Site 2 | RMS2 | - | - | <0.003 | <0.05 | <0.04 | <0.01 | <0.01 | <0.03 | - | <0.01 | 0.007 | - |
| Site 3 | RMS3 | - | - | 0.167 | 0.04 | 0.254 | 0.029 | 0.172 | 0.094 | - | 0.127 | 0.244 | - |
| Site 4 & 5 | RMS4 and 5 | - | - | 0.173 | 0.031 | 0.243 | 0.021 | 0.129 | 0.077 | - | 0.122 | 0.228 | - |
| Site 6 | RMS6 | - | - | 0.091 | 0.02 | 0.133 | 0.015 | 0.09 | 0.044 | - | 0.081 | 0.121 | - |
| Site 7 | RMS7 | - | - | 0.459 | 0.097 | 0.632 | 0.068 | 0.351 | 0.126 | - | 0.324 | 0.823 | - |
| Site 8 & 9 | RMS8 and 9 | - | - | 0.102 | 0.02 | 0.159 | 0.018 | 0.1 | 0.085 | - | 0.102 | 0.147 | - |
| Site 10 | RMS10 | - | - | 0.081 | 0.016 | 0.135 | 0.015 | 0.071 | 0.049 | - | 0.092 | 0.123 | - |
| Site 11 | RMS11 | - | - | 0.008 | <0.05 | 0.009 | <0.01 | <0.01 | <0.03 | - | 0.015 | 0.01 | - |
| Site 12 | RMS12 | - | - | 0.356 | 0.066 | 0.524 | 0.046 | 0.245 | 0.162 | - | 0.275 | 0.484 | - |
| Site 13 | RMS13 | - | - | 0.019 | <0.05 | 0.028 | <0.01 | 0.018 | <0.03 | - | 0.016 | 0.03 | - |
| Site 14 | RMS14 | - | - | 0.339 | 0.086 | 0.426 | 0.038 | 0.333 | 0.136 | - | 0.218 | 0.696 | - |
| Site 15 | RMS15 | - | - | 0.283 | 0.065 | 0.459 | 0.033 | 0.263 | 0.133 | - | 0.183 | 0.46 | - |
| Site 16 | RMS16 | - | - | 0.371 | 0.071 | 0.637 | 0.05 | 0.284 | 0.227 | - | 0.349 | 0.623 | - |
| Site 17 | RMS17 | - | - | 0.427 | 0.078 | 0.727 | 0.04 | 0.328 | 0.106 | - | 0.327 | 0.932 | - |
| Site 18 | RMS18 | - | - | 0.392 | 0.123 | 1.04 | 0.069 | 0.51 | 0.159 | - | 0.435 | 1.08 | - |
| Site 19 | RMS19 | - | - | 0.546 | 0.12 | 0.805 | 0.057 | 0.496 | 0.145 | - | 0.301 | 0.921 | - |
| Site 20 | RMS20 | - | - | 0.578 | 0.075 | 1.01 | 0.027 | 0.314 | 0.102 | - | 0.272 | 0.88 | - |
| Site 21 | RMS21 | - | - | 0.302 | 0.04 | 0.577 | 0.027 | 0.182 | 0.123 | - | 0.218 | 0.523 | - |
| Site 22 | RMS22 | - | - | 0.963 | 0.121 | 1.43 | 0.156 | 0.358 | 0.117 | - | 0.517 | 1.18 | - |
| Site 23 | RMS23 | - | - | 0.143 | 0.121 | 0.212 | 0.022 | 0.358 | 0.134 | - | 0.121 | 0.195 | - |
| Site 24 | RMS24 | - | - | 0.498 | 0.109 | 0.713 | 0.065 | 0.436 | 0.22 | - | 0.359 | 0.822 | - |
| Site 25 | RMS25 | - | - | 0.124 | 0.027 | 0.195 | 0.021 | 0.131 | 0.116 | - | 0.111 | 0.18 | - |
| Site 26 | RMS26 | - | - | 0.202 | 0.033 | 0.387 | 0.017 | 0.156 | 0.102 | - | 0.138 | 0.343 | - |
| Site 27 | RMS27 | - | - | 0.345 | 0.075 | 0.422 | 0.04 | 0.328 | 0.155 | - | 0.24 | 0.565 | - |
| Site 28 | RMS28 | - | - | 0.072 | 0.015 | 0.12 | 0.013 | 0.074 | 0.069 | - | 0.067 | 0.111 | - |
| Site 29 | RMS29 | - | - | 1.64 | 0.226 | 2.07 | 0.187 | 0.731 | 0.144 | - | 1.33 | 1.7 | - |
| Site 30 | RMS30 | - | - | 0.681 | 0.1 | 1.14 | 0.058 | 0.372 | 0.127 | - | 0.489 | 1.01 | - |
| Key | | | Below AL1 | | | | Above AL1, Below AL2 | | | | | Above AL2 | |

**Table 7. Concentration range, mean and number of water samples collected between 2007 and 2021 by the Environment Agency for metals and organotins from sampling point name: North Kent Buoy, SO-E0000204)**

| Parameter | Unit | EQS[1] | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Arsenic | µg/l | 25 (AA) | 1.6 – 1.7<br>$\bar{x}$ = 1.625 (*n* = 4) | 1.5 – 3.4<br>$\bar{x}$ = 2.05 (*n* = 4) | - | 2 (*n* = 1) | 1.4 – 1.9<br>$\bar{x}$ = 1.7 (*n* = 4) |
| Cadmium | µg/l | 0.2 (AA) | <0.04 – 0.041<br>$\bar{x}$ = | <0.04 (*n* = 4) | <0.04 – 0.095<br>$\bar{x}$ = 0.0545 (*n* = 4) | <0.04 – 0.054<br>$\bar{x}$ = 0.044 (*n* = 4) | <0.04 – 0.0455<br>$\bar{x}$ = 0.0417 (*n* = 4) |
| Chromium (VI) | µg/l | 0.6 (AA);<br>32 (MAC) | <0.5 – 2.8<br>$\bar{x}$ = 1.185 (*n* = 4 | <0.5 (*n* = 4) | - | <0.5 (*n* = 1) | <0.5 (*n* = 4) |
| Copper | µg/l | 3.76 (AA) | 1.32 – 5.15<br>$\bar{x}$ = 2.2925 (*n* = 4) | 1 – 5.29<br>$\bar{x}$ = 2.2925 (*n* = 4) | - | 1.22 (*n* = 1) | 1.03 – 2.15<br>$\bar{x}$ = 1.34 (*n* = 4) |
| Lead | µg/l | 1.3 (AA);<br>14 (MAC) | 0.057 – 0.762<br>$\bar{x}$ = 0.255 (*n* = 4) | <0.04 – 0.185<br>$\bar{x}$ = 0.07625 (*n* = 4) | - | <0.04 (*n* = 1) | 0.0413 – 0.0563<br>$\bar{x}$ = 0.04585 (*n* = 4) |
| Mercury | µg/l | 0.07 (MAC) | - | - | - | - | - |
| Nickel | µg/l | 8.6 (AA);<br>34 (MAC) | 1.17 – 1.34<br>$\bar{x}$ = 1.26 (*n* = 4) | 0.93 – 1.47<br>$\bar{x}$ = 1.17 (*n* = 4) | - | 1.25 (*n* = 1) | 1.04 – 1.57<br>$\bar{x}$ = 1.1925 (*n* = 4) |
| Zinc | µg/l | 7.9 (AA) | 3.1 – 8.55<br>$\bar{x}$ = 4.7325 (*n* = 4) | 2.58 – 8.23<br>$\bar{x}$ = 5.175 (*n* = 4) | - | 3.58 (*n* = 1) | 1.6 – 3.91<br>$\bar{x}$ = 2.5375 (*n* = 4) |
| Tributyltin (TBT) | µg/l | 0.0002 (AA);<br>0.0015 (MAC) | - | - | - | - | - |
| **Parameter** | **Unit** | **EQS[1]** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Arsenic | µg/l | 25 (AA) | 1.6 – 2.37<br>$\bar{x}$ = 1.7925 (*n* = 4) | - | - | - | - |
| Cadmium | µg/l | 0.2 (AA) | - | - | - | - | - |
| Chromium (VI) | µg/l | 0.6 (AA);<br>32 (MAC) | <0.5 (*n* = 4) | - | - | - | - |
| Copper | µg/l | 3.76 (AA) | 0.861 – 1.52<br>$\bar{x}$ = 1.23275 (*n* = 4) | - | - | - | - |
| Lead | µg/l | 1.3 (AA);<br>14 (MAC) | 0.042 – 0.0818<br>$\bar{x}$ = 0.06315 (*n* = 4) | - | - | - | - |
| Mercury | µg/l | 0.07 (MAC) | - | - | - | - | - |
| Nickel | µg/l | 8.6 (AA);<br>34 (MAC) | 0.849 – 1.45<br>$\bar{x}$ = 1.22225 (*n* = 4) | - | - | - | - |
| Zinc | µg/l | 7.9 (AA) | 2.66 – 3.57<br>$\bar{x}$ = 2.92 (*n* = 4) | - | - | - | - |
| Tributyltin (TBT) | µg/l | 0.0002 (AA);<br>0.0015 (MAC) | <0.0005 (*n* = 4) | <0.0005 (*n* = 3) | <0.0002 – 0.00039<br>$\bar{x}$ = 0.000248 (*n* = 4) | <0.0002 – 0.00025<br>$\bar{x}$ = 0.000213 (*n* = 4) | <0.0002 – 0.00033<br>$\bar{x}$ = 0.000214 (*n* = 10) |

| Parameter | Unit | EQS[1] | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| Arsenic | µg/l | 25 (AA) | - | - | - | - | - |
| Cadmium | µg/l | 0.2 (AA) | - | - | - | - | - |
| Chromium (VI) | µg/l | 0.6 (AA);<br>32 (MAC) | - | - | - | - | - |
| Copper | µg/l | 3.76 (AA) | - | - | - | - | - |
| Lead | µg/l | 1.3 (AA);<br>14 (MAC) | - | - | - | - | - |
| Mercury | µg/l | 0.07 (MAC) | <0.01 (*n* = 12 | <0.01 (*n* = 12 | <0.01 – 0.0163<br>$\bar{x}$ = 0.010575 (*n* = 12) | <0.01 (*n* = 2) | <0.01 (*n* = 3) |
| Nickel | µg/l | 8.6 (AA);<br>34 (MAC) | - | - | - | - | - |
| Zinc | µg/l | 7.9 (AA) | - | - | - | - | - |
| Tributyltin (TBT) | µg/l | 0.0002 (AA);<br>0.0015 (MAC) | - | - | - | - | - |

Source: Environment Agency,2021

# 3 Scoping

The "Clearing the Water for All" guidance provides a scoping template to record findings and consider potential risks for several key receptors, specifically:

- Hydromorphology;
- Biology (habitats);
- Biology (fish);
- Water quality;
- Protected areas; and
- Invasive non-native species (INNS).

Each receptor is considered in the following sections and summarised in a table. Potential risks that have been scoped into the assessment are highlighted in red and considered within the impact assessment stage, while those scoped out of the assessment are highlighted in green.

## 3.1 Hydromorphology

Hydromorphology is the physical characteristics of estuaries and coasts, including the size, shape and structure of the water body and the flow and quantity of water and sediment. Table 8 presents a summary of hydromorphological considerations and associated risk issues for maintenance dredging and disposal activities. As at least one hydromorphological consideration indicates that a risk could be associated with these ongoing works, this receptor has been scoped into the impact assessment (Section 4).

**Table 8. Hydromorpholgy risk issues in the study area water bodies**

| Hydromorphology Considerations | Hydromorphology Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Consider if your activity could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status? | No (morphology status 'supports good'). Impact assessment not required. | No (morphology status 'supports good'). Impact assessment not required. | No (hydromorphology not assessed). Impact assessment not required. | No (hydromorphology not assessed). Impact assessment not required. | No (hydromorphology not assessed). Impact assessment not required. |
| Consider if your activity could significantly impact the hydromorphology of any water body? | Yes (potential changes in hydrodynamics and morphology). Requires impact assessment. | Yes (potential changes in hydrodynamics and morphology). Requires impact assessment. | Yes (potential changes in hydrodynamics and morphology). Requires impact assessment. | No (indirect impacts to hydromorphology unlikely for this water body). Impact assessment not required. | No (indirect impacts to hydromorphology unlikely for this water body). Impact assessment not required. |
| Consider if your activity is in a water body that is heavily modified for the same use as your activity? | Yes (reason for hydromorphological designation is 'navigation, ports and harbours'). Requires impact assessment. | No (reason for hydromorphological designation is 'flood prevention'). Impact assessment not required. | Yes (reason for hydromorphological designation is 'navigation, ports and harbours'). Requires impact assessment. | Yes (reason for hydromorphological designation is 'navigation, ports and harbours'). Requires impact assessment. | No (reason for hydromorphological designation is 'coastal protection'). Impact assessment not required. |

## 3.2 Biology (habitats)

It is necessary to consider the impact of the physical footprint of an activity on nearby marine and coastal habitats. This specifically refers to habitats of higher sensitivity (e.g. intertidal seagrass, maerl and saltmarsh) and lower sensitivity (e.g. cobbles, gravel and shingle, subtidal rock reef and intertidal soft sediments like sand and mud). Table 9 presents a summary of biology (habitats) considerations and associated risk issues for maintenance dredging and disposal activities. As the biology (habitats) considerations indicate that a risk could be associated with these ongoing works, this receptor has been scoped into the assessment (Section 4).

**Table 9. Biology (Habitats) risk issues in the study area water bodies**

| Biology (Habitats) Considerations | Biology (Habitats) Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Is the footprint of the activity 0.5 $km^2$ or larger? | Yes (dredge area >0.5 $km^2$). Requires impact assessment. | No (dredge area <0.5 $km^2$). Impact assessment not required | Yes (dredge area >0.5 $km^2$). Requires impact assessment. | No (dredge areas not within water body). Impact assessment not required. | No (dredge areas not within water body). Impact assessment not required. |
| Is the footprint of the activity 1% or more of the water body's area? | No (footprint <1% water body area). Impact assessment not required. | No (footprint <1% water body area). Impact assessment not required. | No (footprint <1% water body area). Impact assessment not required. | No (dredge areas not within water body). Impact assessment not required. | No (dredge areas not within water body). Impact assessment not required. |
| Is the footprint of the activity within 500 m of any higher sensitivity habitat? | Yes (saltmarsh within <500 m of the Medway dredge and disposal locations). Requires impact assessment. | Yes (saltmarsh within <500 m of the Faversham Creek dredge location). Requires impact assessment. | No (there are no higher sensitivity habitats within <500 m of the Medway Approach Channel). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. |
| Is the footprint of the activity 1% or more of any lower sensitivity habitat? | No (footprint <1% lower sensitivity habitat). Impact assessment not required. | No (footprint <1% lower sensitivity habitat). Impact assessment not required. | No (footprint <1% lower sensitivity habitat). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. |

## 3.3 Biology (fish)

Activities occurring within an estuary could impact on normal fish behaviour such as movement, migration or spawning. Table 10 presents a summary of biology (fish) considerations and associated risk issues for maintenance dredging and disposal activities. As the biology (fish) considerations indicate that a risk could be associated with these ongoing works, this receptor has been scoped into the assessment (Section 4).

**Table 10. Biology (fish) risk issues in the study area water bodies**

| Biology (Fish) Considerations | Biology (Fish) Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Consider if your activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary? | Yes. Guidance suggests "Continue with questions". | Yes. Guidance suggests "Continue with questions". | Yes. Guidance suggests "Continue with questions". | Yes. Guidance suggests "Continue with questions". | Yes. Guidance suggests "Continue with questions". |
| Consider if your activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)? | Yes (potential changes in noise levels and suspended sediment concentrations). Impact assessment required. | Yes (potential changes in noise levels and suspended sediment concentrations). Impact assessment required. | Yes (potential changes noise levels and suspended sediment concentrations). Impact assessment required. | No (biological quality element 'fish' not assessed for coastal water bodies; dredge areas not within water body). Impact assessment not required. | No (biological quality element 'fish' not assessed for coastal water bodies; maintenance dredging and disposal unlikely to affect migratory fish). Impact assessment not required. |
| Consider if your activity could cause entrainment or impingement of fish? | No (entrainment risk considered minimal). Impact assessment not required. | No (entrainment risk considered minimal). Impact assessment not required. | No (entrainment risk considered minimal). Impact assessment not required. | No (entrainment risk considered minimal). Impact assessment not required. | No (entrainment risk considered minimal). Impact assessment not required. |

## 3.4 Water quality

Consideration should be made regarding whether phytoplankton status and harmful algae could be affected by the proposed works, as well as identifying the potential risks of using, releasing or disturbing chemicals. Table 11 presents a summary of water quality considerations and associated risk issues for maintenance dredging and disposal activities. As at least one water quality consideration indicates that a risk could be associated with these ongoing works, this receptor has been scoped into the impact assessment (Section 4).

**Table 11. Water quality risk issues in the study area water bodies.**

| Water Quality Considerations | Water Quality Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)? | Yes. Requires impact assessment. | Yes. Requires impact assessment. | Yes. Requires impact assessment. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. |
| Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad? | No (phytoplankton status is currently good). Impact assessment not required. | No (phytoplankton status is currently high). Impact assessment not required. | No (phytoplankton status is currently good). Impact assessment not required. | No (phytoplankton status is currently good). Impact assessment not required. | No (phytoplankton status is currently good). Impact assessment not required. |
| Consider if your activity is in a water body with a history of harmful algae? | No (history of harmful algae not monitored). Impact assessment not required. | No (no known history of harmful algae). Impact assessment not required. | Yes (history of harmful algae). Requires impact assessment. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (history of harmful algae not monitored). Impact assessment not required. |

| Water Quality Considerations | Water Quality Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if the chemicals are on the Environmental Quality Standards Directive (EQSD) list? | Yes (potential for contaminants in sediments to be disturbed during works). Requires impact assessment. | Yes (potential for contaminants in sediments to be disturbed during works). Requires impact assessment. | Yes (potential for contaminants in sediments to be disturbed during works). Requires impact assessment. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. |
| If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if it disturbs sediment with contaminants above Cefas Action Level 1? | | | | | |
| If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the Environmental Quality Standards Directive (EQSD) list? | No (not applicable). Impact assessment not required. | No (not applicable). Impact assessment not required. | No (not applicable). Impact assessment not required. | No (not applicable). Impact assessment not required. | No (not applicable). Impact assessment not required. |

## 3.5 Protected areas

Consideration should be made regarding whether WFD protected areas are at risk from your activity, including SACs and SPAs (Natura 2000 sites), as well as bathing waters, shellfish waters and nutrient sensitive areas. Table 12 presents a summary of protected area considerations and associated risk issues for maintenance dredging and disposal activities. As the protected areas considerations indicate that a risk could be associated with these ongoing works, this receptor has been scoped into the impact assessment (Section 4).

**Table 12. Protected area risk issues in the study area water bodies**

| Protected Area Considerations | Protected Area Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Consider if your activity is within 2 km of any WFD protected area? | Yes (overlap with nature conservation designated sites and Shellfish Water Protected Areas). Impact assessment required. | Yes (overlap with nature conservation designated sites and Shellfish Water Protected Areas). Impact assessment required. | Yes (overlap with nature conservation designated sites, Shellfish Water Protected Areas, nearby Bathing Waters). Impact assessment required. | No (dredge and disposal areas not within water body). Impact assessment not required. | No (dredge and disposal areas not within water body). Impact assessment not required. |

## 3.6 Invasive non-native species (INNS)

Consideration should be made regarding whether there is a risk the activity could introduce or spread INNS. Risks of introducing or spreading INNS include materials or equipment that have come from, had use in or travelled through other water bodies, as well as activities that help spread existing INNS, either within the immediate water body or other water bodies. Table 13 presents a summary of INNS considerations and associated risk issues for maintenance dredging and disposal activities. As the INNS considerations indicate that a risk could be associated with these ongoing works, this receptor has been scoped into the impact assessment (Section 4).

**Table 13. Invasive non-native species (INNS) risk issues in the study area water bodies**

| INNS Considerations | INNS Risk Issue(s) | | | | |
|---|---|---|---|---|---|
| | Medway | Swale | Thames Lower | Thames Coastal North | Thames Coastal South |
| Consider if your activity could introduce or spread INNS? | Yes (potential for introduction or spread of INNS). Requires impact assessment. | Yes (potential for introduction or spread of INNS). Requires impact assessment. | Yes (potential for introduction or spread of INNS). Requires impact assessment. | Yes (potential for introduction or spread of INNS). Requires impact assessment. | Yes (potential for introduction or spread of INNS). Requires impact assessment. |

# 4 Impact Assessment

An impact assessment should be conducted for each receptor identified during the scoping stage as being at risk from an activity. The following receptors have been scoped into the impact assessment:

- Hydromorphology;
- Biology (habitats);
- Biology (fish);
- Water quality;
- Protected areas; and
- Invasive non-native species (INNS).

Each of these WFD parameters has been evaluated in order to determine whether the proposed activities might cause deterioration in the status of the relevant water body (defined as a non-temporary effect on status at water body level), or an effect that prevents the water body from meeting its WFD objectives.

## 4.1 Hydromorphology

Maintenance dredging within the Medway (to the currently permitted depths under the marine licences held by stakeholders in the area) and disposal at sea have been undertaken to support the port infrastructure present in the study area for many years. It is important to note that dredge campaigns are only completed as necessary to ensure safe navigation based on pre-dredge surveys and monitoring. Some maintenance dredging activities within the Medway can be carried out by Peel Ports Medway under its own powers and do not require a marine licence. In addition, small scale third party maintenance dredging is licenced directly by Peel Ports Medway rather than the MMO through the marine licensing regime. Peel Ports Medway follows the same approach and principles as the MMO does in determining dredge licence applications (i.e. taking account of existing permitted depths, volumes/quantities and dredge and disposal methods etc.) when it undertakes any maintenance dredging under its own powers as well as in the evaluation of any third party applications to dredge within the Statutory Harbour Authority area.

The Thames Coastal North and Thames Coastal South coastal water bodies are outside of dredge and disposal areas and are thus considered unlikely to be impacted by changes brought about from maintenance dredging in the Medway, Swale and Thames Lower transitional water bodies.

The dredge footprint within the approach channel and dock systems of the Medway result in localised changes to seabed bathymetry. These cause a change in the local geometry, which in turn marginally increase the Medway's tidal volume. However, there is no change in tidal prism as all the dredge areas are subtidal. The scale of these changes is considered to be negligible and will not modify the way the tide propagates through the Medway, in terms of the shape of the tidal curve, water levels and tidal range. Changes to flows following maintenance dredging will also be negligible in magnitude and extent, confined to the close proximity of the dredge, and will not result in a change in the hydrodynamic working of the estuary system.

Overall, maintenance dredging is considered unlikely to result in any significant changes in hydromorphology or associated coastal and flood protection. The works are, therefore, not expected to lead to a deterioration of the assessed hydromorphological elements within the Medway, Swale or Thames Lower transitional waterbodies, or the Thames Costal North or Thames Coastal South coastal water bodies, nor prevent these water bodies from meeting their WFD objectives.

## 4.2 Biology (habitats)

Coastal saltmarsh areas (higher sensitivity habitats) are located within 500 m of the dredge and disposal sites throughout the Medway Estuary, forming distinct islands throughout the estuarine system[8]. Saltmarsh is also present south of the Isle of Grain (e.g. LNG Jetty 8/10) and the Faversham Creek area in The Swale.

Impacts arising from resuspension of sediment are expected to be negligible and well within the natural variability of the system and, therefore, will have no impact on coastal saltmarsh in the wider area. The dredge activities which occur in the Thames Lower transitional water body are limited to dredging of a proportion of the Medway Approach Channel. This area is more than 500 m from any higher sensitivity habitats and thus has been screened out of this impact assessment.

There is also extensive coastal saltmarsh within the Swale transitional waterbody (and distinct swathes around the Isle of Sheppey), however, these are not located within the maintenance dredge or disposal areas and, therefore, would be limited to indirect disturbance through suspension of sediments and smothering. It is considered unlikely that maintenance dredging would result in significant impacts to these higher sensitivity habitats in the context of naturally high suspended sediment concentrations within and around the Medway and Swale Estuaries.

It should also be noted that maintenance dredging within the approach channel (to the currently permitted depths under Marine Licences L/2018/00185/1, and L/2019/00092/1 for WID), the discrete dock areas (under licences such as L/2019/00043/1 and L/2018/00269/1) and disposal at sea have been undertaken to support maintenance dredging in the Medway and associated dock systems for many years.

In conclusion, these ongoing works are not expected to lead to a deterioration of the assessed biological (habitats) elements within the Medway, Thames Lower or Swale transitional water bodies, nor prevent these water bodies from meeting their WFD objectives.

## 4.3 Biology (fish)

The main impact pathway in which fish may be affected by maintenance dredging is from elevated underwater noise levels. Elevated noise and vibration levels caused by the action of the dredger could potentially disturb fish by causing physiological damage and/or inducing adverse behavioural reactions and masking (Hawkins *et al*., 2015). Noise impacts on fish are restricted to behavioural changes through avoidance, which are limited to a localised area around the dredger for most species. As the dredger vessel is moving, fish are not physically constrained; they will be able to move away from the source of the noise and return once dredging activity has ceased. Furthermore, levels of underwater noise generated by dredgers (over the low frequencies to which fish are sensitive) are similar to vessels that are already regularly occurring in the Medway.

Fish within the Medway and surrounding water bodies are considered to be well adapted to living in an area with variable and often high suspended sediment loads. Any changes to suspended sediment concentrations (SSC) will be largely limited to the immediate vicinity of the maintenance dredge area. Changes in SSC beyond the immediate vicinity of the maintenance dredge areas will be temporary, short-lived and transient in nature.

[8] https://magic.defra.gov.uk/magicmap.aspx (Accessed September 2021).

The resultant changes in dissolved oxygen (DO) will also be negligible and short-lived, with tidal exchange quickly replenishing the oxygen supply. It is considered that there is a low probability that levels will fall below the standards set by the WFD. The increase in dissolved concentrations of contaminants from the redistribution of sediment-bound chemical contaminants during dredging is also expected to be low, representing only a small percentage of background concentrations and is unlikely to cause an exceedance of EQSs alone or in combination with background concentrations (see Section 4.4). Overall, fish are not considered to be sensitive to the magnitude of changes in water quality that are predicted during maintenance dredging and the proposed dredging will, therefore, not result in significant displacement or a barrier to migratory fish.

Furthermore, fish, including migratory species, feed on a range of food items and, therefore, their sensitivity to a temporary change in the availability of a particular food resource is considered to be low. Their high mobility enables them to move freely to avoid areas of adverse conditions and to use other prey resources. Potential impacts on benthic ecology (including fish prey items) are also assessed as insignificant.

It is noted that there is potential for fish to become entrained during the use of TSHD. However, the scale and likelihood of such impacts is considered negligible.

In conclusion, the proposed works are not expected to lead to a deterioration of the assessed fish elements within the Medway, Swale or the Thames Lower transitional water bodies, nor prevent these water bodies from meeting their WFD objectives.

## 4.4 Water quality

The Thames Lower transitional water body has a history of harmful algae. However, impacts arising from resuspension of sediment are expected to be negligible and well within the natural variability of the system and, therefore, will have no impact on phytoplankton in the wider area. Also, dredging activities do not introduce significant quantities of substances such as nutrients to the marine environment, which could result in harmful algal blooms.

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. Sand and coarser grained material will be re-deposited within close proximity to the dredge site whereas fine silts may remain in suspension for a period of days following dredging. Furthermore, any material that settles is very short-lived, most likely only occurring during slack water periods and being re-dispersed as tidal currents increase. In summary, these periods of deposition are transient and the scale of any exposure at any one time is considered to be within the existing natural variability of the system.

Based on sediment samples from 2012, contaminant concentrations in dredge material from the approach channel are generally low and considered suitable for disposal at sea (see Section 2.4, Table 4 to Table 6; reference should also be made to the recently updated Medway MDP Baseline Document; ABPmer, 2021).

The Medway, Swale and Thames Lower transitional water bodies are currently failing chemical status due to the priority hazardous substances 'Polybrominated diphenyl ethers (PBDE)' and 'Mercury and its compounds'. The Medway transitional water body is also failing for 'Benzo(g-h-i)perylene', 'Dichlorvos' and 'Tributyltin compounds'. In addition, the Thames Lower transitional water bodies is failing for 'Cypermethrin' and 'Tributyltin compounds'.

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 maintenance dredging within the study area. Sediment disturbance will be caused at the bed by abrasion pressure from the dredging equipment.

A Microsoft Excel Spreadsheet tool developed by APEM Ltd, referred to as SeDiChem, that was provided by the Environment Agency for another project on the Thames Estuary has been used to support consideration of potential uplift in contaminant concentrations.

In order to apply this tool, a realistic typical scenario of the maintenance dredging operations must be used. Fundamental to the calculations produced by the tool is data on water quality to determine background concentrations. Water quality sampling points in the study area are limited, with only two points located close to the dredge activities with data on the relevant suite of determinands. For the purposes of this assessment, Environment Agency monitoring data at North Kent Buoy (SO-E0000204) in the River Medway was used, located near the mouth of the Medway Estuary and close to maintenance dredging operations at Sheerness Docks, Isle of Grain and the Medway Approach Channel. Sediment contaminant concentrations are also slightly elevated in these areas (Table 4 to Table 6). Water injection dredging (WID) and other forms of agitation dredging are the main techniques used to maintain berthing pockets in the Medway.

Table 14 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. conservative net flow rate of 1,010,880 $m^3$/day based on an average for the Medway Estuary of 11.7 $m^3$/second (Defra, 2002)), maximum incremental SSC (250 mg/l based on maximum value for WID noted in the SSC uplift library within the SeDiChem tool), worst case partition coefficients from suggested literature, and sediment quality from samples collected within the proposed dredge area (maximum concentrations from samples RMS1 to RMS7). As noted above, maximum background water quality concentrations have been inputted based on Environment Agency monitoring data from North Kent Buoy (SO-E0000204) in the River Medway (average for the five most recent years available, see Section 2.5).

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. PBDEs, Benzo[g,h,i]perylene, Mercury and its compounds and TBT compounds), any disturbance of sediments during dredging activities will result in an uplift effectively causing a 'worse failure'. However, the scale of this deterioration is considered to be small and highly localised. As a percentage increase of EQS headroom (i.e. the capacity for the concentration to increase whilst still remaining below the environmental threshold), Mercury and its compounds are likely to be less than 3 %, and TBT less than 5 %. Furthermore, these calculations are based on maximum sediment concentrations and worst case partition coefficients.

There are no records of PBDE concentrations in sediment samples within the maintenance dredge areas for the Medway. However, the Environment Agency have recently identified PBDEs as presenting a widespread issue across transitional and coastal water bodies in England. Given the ubiquitous (widespread and persistent) PBDE failures, occasional and local maintenance dredging and disposal activities in the area are highly unlikely to be the sole or primary cause of such failures.

In conclusion, the ongoing maintenance dredging and disposal activities are not expected to lead to a deterioration of the assessed water quality elements within the Medway, Swale or the Thames Lower transitional water bodies, nor prevent these water bodies from meeting their WFD objectives.

**Table 14. Potential contaminant concentrations as a result of maintenance dredging in the Medway transitional water body based on SeDiChem tool outputs**

| Parameter | Max. Sediment Concentration (mg/kg) | Current WFD Status | Partition Coefficient (l/kg) | EQS (µg/l) | Dissolved Concentration (Background* and Dredging) (µg/l) | Concentration Increase as % of EQS Headroom |
|---|---|---|---|---|---|---|
| Arsenic | 63.70 | High | 40 | 25 (dissolved) | 2.468 | 2.88 % |
| Cadmium | 0.40 | Good | 100 | 0.2 (dissolved) | 0.042 | 1.08 % |
| Chromium | 206.00 | High | 79 | 32 (dissolved) | 1.718 | 3.38 % |
| Copper | 234.00 | High | 3,162 | 3.76 (dissolved) | 1.861 | 1.63 % |
| Lead | 243.00 | Good | 35,481 | 14 (dissolved) | 0.113 | 0.02 % |
| Mercury | 24.50 | Fail | 6,310 | 0.07 (dissolved) | 0.013 | 2.73 % |
| Nickel | 114.00 | Good | 500 | 34 (dissolved) | 1.393 | 0.29 % |
| Zinc | 214.00 | High | 12,589 | 8.8 (dissolved) | 3.837 | 0.17 % |
| Benzo(a) pyrene | 0.65 | Good | 9,120 | 0.027 (total) | - | - |
| Benzo(b) fluoranthene | 0.69 | Good | 20,795 | 0.017 (total) | - | - |
| Benzo(g,h,i) perylene | 0.41 | Fail | 20,369 | 0.00082 (total) | - | - |
| Benzo(k) fluoranthene | 0.27 | Good | 19,859 | 0.017 (total) | - | - |
| Fluoranthene | 0.63 | Good | 1,475 | 0.12 (total) | - | - |
| Tributyltin (TBT) | 0.01 | Fail | 53 | 0.0015 (total) | 0.00030 | 4.12 % |

* Averaged for the five most recent years of data

## 4.5 Protected areas

The dredge and disposal areas directly overlap, or are in the vicinity of, the following international nature conservation designated sites (Figure 7):

- Benfleet and Southend Marshes SPA and Ramsar;
- Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar;
- Thames Estuary and Marshes SPA and Ramsar;
- Medway Estuary and Marshes SPA and Ramsar;
- The Swale SPA and Ramsar;
- Outer Thames Estuary SPA;
- Margate and Long Sands SAC;
- Southern North Sea SAC; and
- Essex Estuaries SAC.

The recently updated Medway MDP Baseline Document (ABPmer, 2021) provides details about these designated sites which protect a range of habitats and species.

The habitats within the direct and indirect footprint of the maintenance dredge areas and disposal sites are routinely disturbed by this longstanding activity. Waterbirds in the Medway and surrounding areas are accustomed to high levels of commercial and recreational vessel activity with the area already subject to regular vessels movements as a result of the associated port and shipping industries. Therefore, the slow movements of the vessels involved in maintenance dredging and disposal are unlikely to cause significant disturbance to most species. Any disturbance that does occur will generally be temporary, infrequent and only cause mild responses in a localised area in the direct vicinity of the dredger. Such responses include increased vigilance, flight responses and localised avoidance.

The potential effects resulting from an increase in SSC and the release of sediment bound contaminants are assessed as negligible. Localised changes in water quality as a result of the presence of increased contaminants within the water column will be temporary and unlikely to be harmful to waterbirds. In addition, the dredging activities are not predicted to have an adverse effect on the benthic and fish prey species of these birds. In recognition that there is limited contemporary sediment quality data available for the wider Medway, Peel Ports Medway is looking to develop a sampling campaign for the Medway and Swale to update the baseline information available on sediment chemistry. Furthermore, best practice pollution prevention guidelines will be followed in line with Marine Licence requirements to minimise the risk of accidental spillages and the risk of introduction of contaminants throughout the dredging process. Adherence to these guidelines will also mean that only materials that are suitable for use in the marine environment will be used, and all equipment, temporary works and debris will be removed from the site on completion of works.

The approach channel dredge area is also within the Sheppey, Outer Thames and Southend Shellfish Water Protected Areas. However, any changes to SSC will be temporary, lasting the period of the dredge works. Overall, the spatial and temporal magnitude of change in SSC is considered to be minor locally and negligible further afield. The potential changes to levels of chemical contaminants in the water and the potential redistribution of sediment-bound chemical contaminants are considered to be insignificant. Thus, in physical terms, the plumes resulting from dredging are expected to have a minimal and very localised effect on water and sediment quality. Overall, considering the highly localised effects of the maintenance dredging on the above nature conservation designated sites and Shellfish Water Protected Areas, these will be also negligible in the context of natural variation of the Medway.

In conclusion, the ongoing maintenance dredging and disposal activities are not expected to lead to a deterioration of the assessed protected area designations within the Medway, Swale or Thames Lower transitional water bodies, nor prevent these water bodies from meeting their WFD objectives.

## 4.6 Invasive non-native species (INNS)

As with most activities which occur in the marine environment, there is a potential risk that maintenance dredging and disposal at sea could result in the introduction or spread of INNS. Non-native species have the potential to be transported into the local area on the hulls of the vessels or in ballast water, if the vessels have operated in other water bodies. This risk is considered low as most dredge and disposal activities, including WID, in the Medway and its approaches result in the movement of material within the same water body and/or marine system. The risk of introducing or transferring INNS is currently managed through the dredge contractor's conditions of contract which stipulate that all equipment needs to be checked, cleaned and dried before moving in to the dredge area. Overall, the risk is, therefore, considered to be minimal and, if necessary, can be managed through a risk-based Biosecurity Plan.

Consequently, the probability of the introduction and spread of INNS from dredging is considered low and it is not expected to lead to a deterioration in status of the study area water bodies, nor prevent these water bodies from meeting their WFD objectives.

# 5 Conclusion

Based upon the information presented within this WFD compliance assessment, it is concluded that maintenance dredging and disposal activities undertaken within the Medway are not likely to have a permanent (i.e. non-temporary) effect on the status of WFD parameters that are significant at water body level. Therefore, deterioration to the current status of the Medway, Swale or Thames Lower transitional water bodies, or the Thames Coastal North or Thames Coastal South coastal water bodies, is not predicted, nor will the maintenance dredge and disposal activities prevent these water bodies achieving their WFD status objectives.

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# 7 Abbreviations/Acronyms

| | |
|---|---|
| AA | Annual Average |
| ABP | Associated British Ports |
| AL1 | Cefas Guideline Action Level 1 |
| AL2 | Cefas Guideline Action Level 2 |
| AWB | Artificial Water Body |
| Cefas | Centre for Environment, Fisheries and Aquaculture Science |
| COVID | Coronavirus |
| DBT | Dibutyltin |
| Defra | Department for Environment, Food and Rural Affairs |
| DO | Dissolved Oxygen |
| EC | European Commission |
| EEC | European Economic Community |
| EQS | Environmental Quality Standard |
| EQSD | Environmental Quality Standards Directive |
| EU | European Union |
| GCS | Good Chemical Status |
| GEP | Good Ecological Potential |
| GES | Good Ecological Status |
| GS | Good Status |
| HMS | Her Majesty's Ship |
| HMWB | Heavily Modified Water Body |
| ID | Identity |
| IECS | International Estuarine and Coastal Specialists Ltd |
| INNS | Invasive Non-Native Species |
| LNG | Liquefied Natural Gas |
| LT | Long-term |
| MAC | Maximum Allowable Concentration |
| MDP | Maintenance Dredge Protocol |
| MMO | Marine Management Organisation |
| NTL | Normal Tidal Limit |
| NVZ | Nitrate Vulnerable Zone |
| OJEU | Official Journal of the European Union |
| PAH | Poly Aromatic Hydrocarbons |
| PBDE | Polybrominated Diphenyl Ether |
| PCB | Polychlorinated Biphenyl |
| PSD | Priority Substances Directive |
| Ramsar | Wetlands of international importance designated under the Ramsar Convention |
| RBMP | River Basin Management Plan |
| SAC | Special Area of Conservation |
| SeDiChem | Sediment Chemistry Data |
| SI | Statutory Instruments |
| SPA | Special Protection Area |
| SSC | Suspended Sediment Concentration |
| TBT | Tributyltin |
| TECFO | Thames Estuary Cockle Fishery Order |
| THC | Total Hydrocarbon Content |
| TSHD | Trailing Suction Hopper Dredging |

| | |
|---|---|
| UK | United Kingdom |
| WFD | Water Framework Directive |
| WID | Water Injection Dredging |

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

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