3FMProject

Bringing
Dublin Port
To 2040

Environmental Impact Assessment Report

# Chapter 9

## Water Quality and Flood Risk Assessment

Volume 2 Part 3

COMHLACHT CHALAFORT ÁTHA CLIATH
DUBLIN PORT COMPANY

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A TETRA TECH COMPANY

Third & Final
Masterplan
Project

# 9 WATER QUALITY & FLOOD RISK ASSESSMENT

This Chapter assesses the potential impact of the 3FM Project on water quality within the receiving environment (Section 9.1). Existing water quality in the vicinity of the proposed development is established based on available water quality information. The likely significant effects of the project on water quality are determined and measures to reduce, avoid and prevent these likely significant effects are proposed where they are necessary.

In addition, a Flood Risk Assessment (FRA) has been carried out for the proposed development in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (Section 9.2). The potential effects of the development on flooding are also considered as part of this assessment.

This assessment is based on the project description detailed in Chapter 5 and has been prepared in accordance with the European Commission's Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017) and the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

## 9.1 Water Quality

### 9.1.1 Assessment Methodology

Baseline water quality within the receiving environment has been established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive 2000/60/EC (WFD) and supporting environmental standards and the Marine Strategy Framework Directive (MSFD) Good Environmental Status (GES). Recent high frequency monitoring data, collected during the Alexandra Basin Redevelopment (ABR) Project, and the Master Plan 2 (MP2) Project has also been considered.

The National Marine Planning Framework (NMPF) includes water quality polices which are intended to ensure compliance with the MSFD and WFD. The key environmental descriptors in terms of GES relevant to water quality are listed as the minimisation of human-induced eutrophication (GES Descriptor 5) and concentrations of contaminants at levels not giving rise to pollution effects (GES Descriptor 8).

Water Quality Policy 1 of the NMPF is particularly relevant to the 3FM Project and states that: *"Proposals that may have significant adverse impacts upon water quality, including upon habitats and species beneficial to water quality, must demonstrate that they will, in order of preference and in accordance with legal requirements; avoid, minimise, or mitigate significant adverse impacts."* The NMPF requires that proposals should be compliant with and contribute to the aims and objectives of the WFD, and associated River Basin Management Plans, and also ensuring the achievement of the objectives of the MSFD, i.e. GES particularly in the context of GES Descriptor 5, eutrophication and GES Descriptor 7, contaminants.

An assessment has therefore been made of the 3FM Project to determine the likelihood for significant impacts on water quality, in the context of the WFD and the MSFD using criteria for rating significance and magnitude set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*" (NRA, 2008). The significance of impact on surface water quality likely to occur during the construction and operation phases of the development is determined using a predominantly qualitative methodology, supported where appropriate by

quantitative assessment. The assessment is a consideration of a combination of receptor sensitivity (Table 9.1) and the potential magnitude of the impact on the water environment (Table 9.2), in order to determine significance (Table 9.3).

The approach to assessing the significance of impacts comprises assigning each impact to one of the four categories of magnitude as outlined in Table 9.2 and enables different characteristics to be assessed based upon the same scale.

The significance determination and assessment of the potential likely environmental effects of each component of the 3FM Project has been made based on the matrix presented in Table 9.3 and in Table 9.4.

To conclude the assessment, mitigation measures are proposed to reduce, avoid and prevent these likely significant effects, where appropriate. This enables a "with mitigation" assessment to be made of any residual impact as a result of the construction and operational phases of the 3FM Project and/or in combination with other existing or approved projects in the vicinity of Dublin Port.

Table 9.1 Criteria for Rating Receptor Sensitivity (NRA, 2008)

| Value (Sensitivity) | Typical Descriptors |
|---|---|
| **Extremely High** | ***Attribute has a high quality or value on an international scale.*** Examples: River, Wetland or surface water body ecosystem designated by EU legislation. I.e. designated under the Habitats, Birds, Shellfish, Bathing Water or Freshwater Fish, Drinking Water or Nitrate Directives. |
| **Very High** | ***Attribute has a high quality or value on a regional or national scale.*** Examples: river, wetland or surface water body ecosystem designated by national legislation (NHA status); regionally important potable water source supplying >2500 homes; nationally important amenity site for wide range of leisure activities; Quality Class A water bodies (Biotic Index Q4, Q5); flood plain protecting more than 50 residential or commercial properties from flooding. |
| **High** | ***Attribute has a high quality or value on a local scale.*** Examples: salmon fishery; locally important potable water source supplying >1000 homes; Quality Class B water bodies (Biotic Index Q3-4); flood plain protecting 5 to 50 residential or commercial properties from flooding; locally important amenity site for wide range of leisure activities. |
| **Medium** | ***Attribute has a medium quality or value on a local scale.*** Examples: coarse fishery; local potable water source supplying >50 homes; Quality Class C water bodies (Biotic Index Q3, Q2-3); flood plain protecting between 1 and 5 residential or commercial properties from flooding. |
| **Low** | ***Attribute has a low quality or value on a local scale.*** Examples: locally important amenity site for small range of leisure activities; local potable water source supplying <50 homes, Quality Class D water bodies (Biotic Index Q2, Q1); flood plain protecting 1 residential or commercial property from flooding; amenity site used by small numbers of local people. |

Table 9.2 Criteria for Rating the Magnitude of Impact (NRA, 2008)

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| Large Adverse | Results in loss of attribute and /or quality and integrity of attribute | Loss or extensive change to a water body or water dependent habitat. |
| | | Increase in predicted peak flood level >100mm. |
| | | Extensive loss of fishery |
| | | Extensive reduction in amenity value |
| | | Potential high risk of pollution to water body from routine run-off |
| Moderate Adverse | Results in impact on integrity of attribute or loss of part of attribute | Increase in predicted peak flood level >50mm |
| | | Partial loss of fishery |
| | | Potential medium risk of pollution to water body from routine run-off |
| | | Partial reduction in amenity value |
| Minor Adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Increase in predicted peak flood level >10mm |
| | | Minor loss of fishery |
| | | Potential low risk of pollution to water body from routine run-off |
| | | Slight reduction in amenity value |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Negligible change in predicted peak flood level<br>Negligible loss of amenity value<br>Negligible loss of fishery |

Table 9.3 Criteria for Rating the Significance of Environmental Impacts (NRA 2008)

| Importance of Attribute | Magnitude of Impact | | | |
|---|---|---|---|---|
| | Negligible | Minor | Moderate | Large |
| Extremely High | Imperceptible | Significant | Profound | Profound |
| Very High | Imperceptible | Significant / Moderate | Profound / Significant | Profound |
| High | Imperceptible | Moderate / Slight | Significant / Moderate | Severe / Significant |
| Medium | Imperceptible | Slight | Moderate | Significant |
| Low | Imperceptible | Imperceptible | Slight | Slight / Moderate |

Table 9.4 Defining Impact Significance (NRA, 2008)

| Impact Level | Attribute Importance | | | | |
|---|---|---|---|---|---|
| | Extremely High | Very High | High | Medium | Low |
| Profound | Any permanent impact on attribute | Permanent impact on significant proportion of attribute | | | |
| Significant | Temporary impact on significant proportion of attribute | Permanent impact on small proportion of attribute | Permanent impact on significant proportion of attribute | | |
| Moderate | Temporary impact on small proportion of attribute | Temporary impact on significant proportion of attribute | Permanent impact on small proportion of attribute | Permanent impact on significant proportion of attribute | |
| Slight | | Temporary impact on small proportion of attribute | Temporary impact on significant proportion of attribute | Permanent impact on small proportion of attribute | Permanent impact on significant proportion of attribute |
| Imperceptible | | | Temporary impact on small proportion of attribute | Temporary impact on significant proportion of attribute | Permanent impact on small proportion of attribute |

### 9.1.2 Receiving Water Environment and Water Quality Simulations

A desk-based assessment of surface water bodies and quality in the vicinity of the 3FM Project application area was conducted. The sources of the water body and quality information include:

- Water Framework Directive water body status information arising from the Water Framework Directive monitoring programme. Water Quality in Ireland Report 2016 - 2021 (2022) supported by water quality information available on the EPAs online Water Framework Directive Application (www.catchments.ie);
- Protected areas datasets including:
  - bathing water quality information outlined in the EPA's most recent bathing water quality report, Bathing Water Quality in Ireland, A Report for the Year 2023 (EPA, 2024a);
  - information on Nutrient Sensitive Areas as outlined in the EPA's most recent Urban Waste Water Treatment in 2022 Report (EPA, 2023); and
  - the existing Register of Protected Areas (under Article 6 of the Water Framework Directive) for water dependent habitats and species in the SAC and SPA networks held by the EPA.
- Heavily Modified Water Body (HMWB) designation;
- Department of Environment, Community and Local Government - Marine Strategy Framework Programme of Measures Summary Report (2016);
- Water Quality in 2023 – An Indicators Report (EPA, 2024b);
- Marine Institute water quality monitoring data for Liffey Estuary Lower and Dublin Bay 2015 – 2018;
- Marine Institute macroinvertebrate ecological quality status (EQS) assessments in Dublin Bay 2012 - 2021 to fulfil requirements of the Water Framework Directive (WFD);
- Site specific water quality monitoring data was made available by Dublin Port Company's (DPC) Monitoring Programme (ongoing for the ABR Project and MP2 Project), these data are reported in DPC's annual environmental returns/baseline state of the environment reporting.

#### 9.1.2.1 Water Framework Directive Water Bodies within the Study Area

For the purposes of monitoring and assessing the quality of surface waters, all rivers, lakes, coastal inter-basins, estuaries, and coastal waters (within one nautical mile of the shoreline) have been divided into management units called "water bodies". The condition of each water body must be reported to the European Commission in the form of ecological status and chemical status. Groundwater bodies are similarly delineated with status identified.

Surface water bodies are grouped into sub-catchments for the purposes of water management, of which there are 583 nationally. These are further grouped into catchment management units of which there are 46 based on the hydrometric areas used by public authorities. As illustrated in Figure 9-1, the 3FM Project, including its capital dredging elements, will take place within the Liffey Estuary and the existing licenced offshore dump site in Dublin Bay will be used for the disposal of Class 1 dredged material (Uncontaminated: no biological effects

likely) arising from the capital dredging. The landward components of the Project on the Poolbeg Peninsula are located within the sub basin of the Dodder_050 river water body on the south side of the Liffey Estuary whilst the footprint of the SPAR on the north side of the Liffey estuary is located within the sub basin of the Tolka_060 river water body. However, in reality these project locations will drain naturally to the Liffey Estuary Lower or Dublin Bay given the locations adjacent to the coast and remote from the downstream extent of these river water bodies. The works are therefore located within four surface water bodies: 'Liffey Estuary Lower' transitional water body (EA_090_0300), 'Dublin Bay' coastal water body (EA_090_0000), the Dodder_050 river water body and the Tolka_060 river water body. The 'Liffey Estuary Upper' (EA_090_0400) and the 'Tolka Estuary' (EA_090_0200) transitional water bodies are situated upstream of the works.

There are also several rivers that discharge into the Liffey Estuary and Dublin Bay; principally the Liffey itself along with the Dodder, Camac, Poddle and Tolka. The Royal Canal and the Grand Canal also discharge to the Liffey. In addition, several small streams flow from the surrounding areas directly into Dublin Bay.

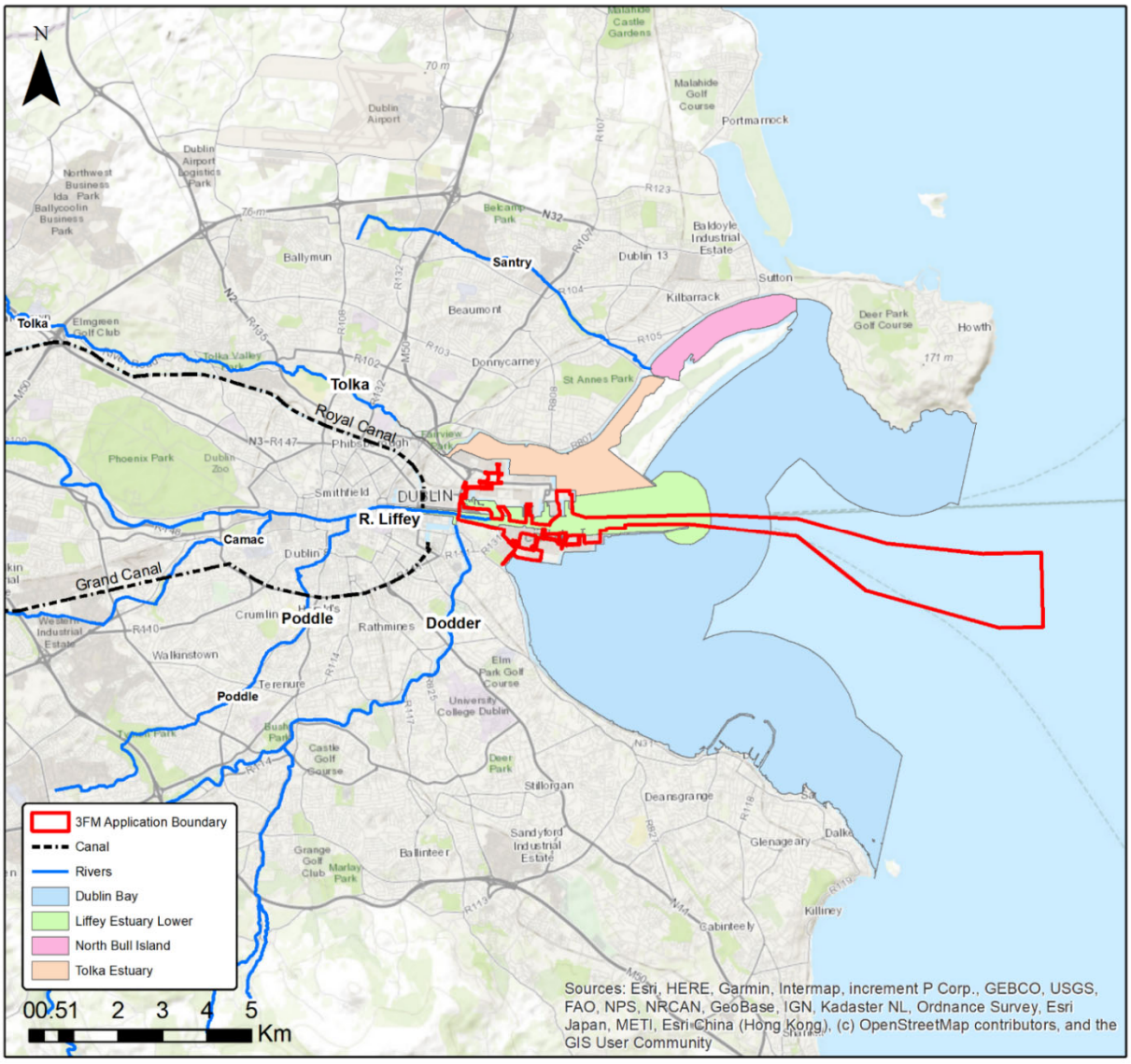


Figure 9-1 Site Location in the Context of the Wider Surface Water Environment

The 3FM Project lies within the 'Dublin Urban' groundwater body (EA-G-008). This water body has achieved and maintained 'good' status in each WFD Monitoring Cycle from 2007-2012 to 2016-2021. All these waterbodies are grouped into the 'Liffey and Dublin Bay Catchment' (HA09) of the Irish River Basin District.

Due to the nature of the 3FM Project and the relatively limited scale of geotechnical activities in the application area, there are no likely significant water quality effects on groundwater expected and these have therefore not been assessed further in this Chapter. This is supported by the assessment presented in Chapter 8 which addresses Soils, Geology and Hydrogeology.

#### 9.1.2.2 Water Framework Directive Water Body Status

Directive 2000/60/EC establishing a framework for community action in the field of water policy (the Water Framework Directive), and transposing regulations, establishes a legal framework for the protection, improvement and sustainable management of rivers, lakes, transitional waters (estuaries), coastal waters (to a distance of one nautical mile) and groundwater.

The fundamental objectives of the WFD are to maintain "high status" of surface waters where it exists, prevent deterioration in the existing status of waters, and achieve at least "good status" in relation to all waters by 2021 unless subject to extended deadlines. A water body must achieve both good 'ecological status' and good 'chemical status' before it can be considered to be at good overall status. An assessment of the risks to the achievement of these objectives for water bodies has been undertaken by the EPA through the extensive characterisation of water bodies and the key pressures acting upon them. This facilitates the development of a programme of measures to allow the achievement of the WFD objectives.

The Programme of Measures (POM) outlines the steps that will be taken to meet WFD objectives as applicable to each water body. This POM is contained within an overarching River Basin Management Plan (RBMP). These measures will require implementation at strategic level but also at regional and local level through the establishment of Regional Integrated Catchment Management Programmes. Whilst none of the water bodies within the proposed 3FM Project area have been included amongst those areas prioritised for action in the current River Basin Management Plan for Ireland 2018 - 2021 (DHPLG, 2018), it is noted that measures required to ensure compliance with existing legislation will be implemented during this river basin management cycle.

Environmental Quality Standards (EQSs) for classifying surface water status are established in the European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (SI No. 272 of 2009), as amended. These regulations set standards for biological quality elements, physico-chemical conditions supporting biological elements (including general conditions and specific pollutants), priority substances and priority hazardous substances.

As shown in Figure 9-2 the 'ecological status' of a water body is established according to compliance with the EQSs for biological quality elements, physico-chemical conditions supporting biological elements, relevant pollutants and hydromorphological quality elements. The 'chemical status' of a water body is established according to compliance with the EQSs for priority substances and priority hazardous substances.

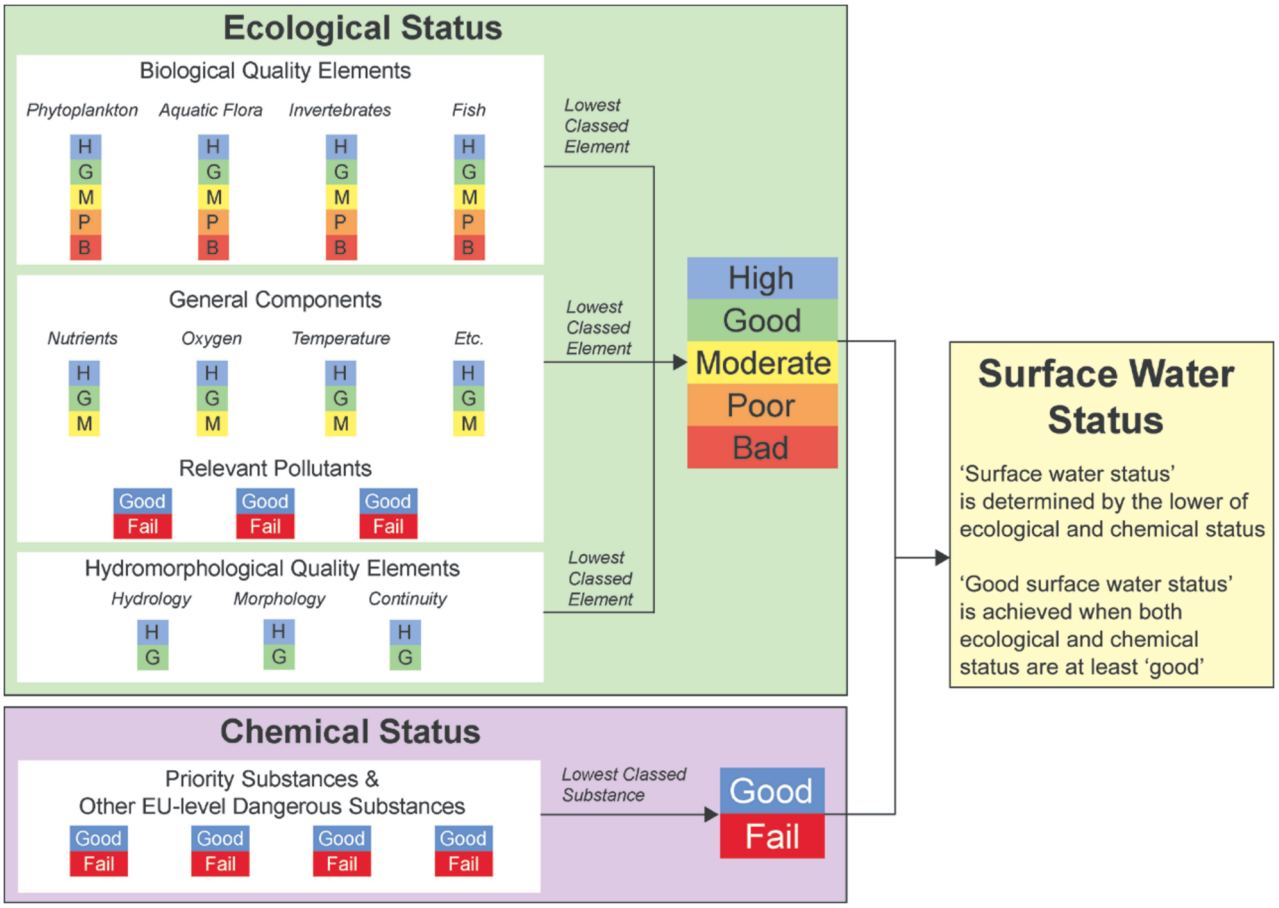


Figure 9-2 Elements of the Water Framework Directive Status

In addition to achieving good ecological and chemical status, a water body must achieve compliance with standards and objectives specified for protected areas, which include areas designated by the Bathing Water Directive; the Urban Waste Water Treatment Directive; the Shellfish Waters Directive; the Habitats Directive and the Birds Directive. Waters bodies that are compliant with WFD standards, but that contain protected areas that are non-compliant with protected area standards are downgraded to 'less than good' status.

Based on monitoring information and data from 2016 to 2021, the current WFD status classification of transitional and coastal water bodies potentially affected by the 3FM Project is illustrated in Figure 9-3.

The WFD status classification between 2007 and 2021 is shown in Table 9.5 for each of these water bodies. In summary the Liffey Estuary Lower transitional water body has most recently been reported as "moderate" in 2021, and no change in status since the previous monitoring cycle. The Tolka Estuary transitional water body has most recently been reported as "poor" in 2021, a drop in status from 'moderate' in the previous monitoring cycle. The Dublin Bay coastal water body was reported as "good" in the 2016-2021 WFD monitoring cycle, a status which it has maintained since 2009. The Liffey Estuary Upper was reported as "good" in the 2016-2021 cycle, and this is an improvement from 'moderate' since the previous cycle.

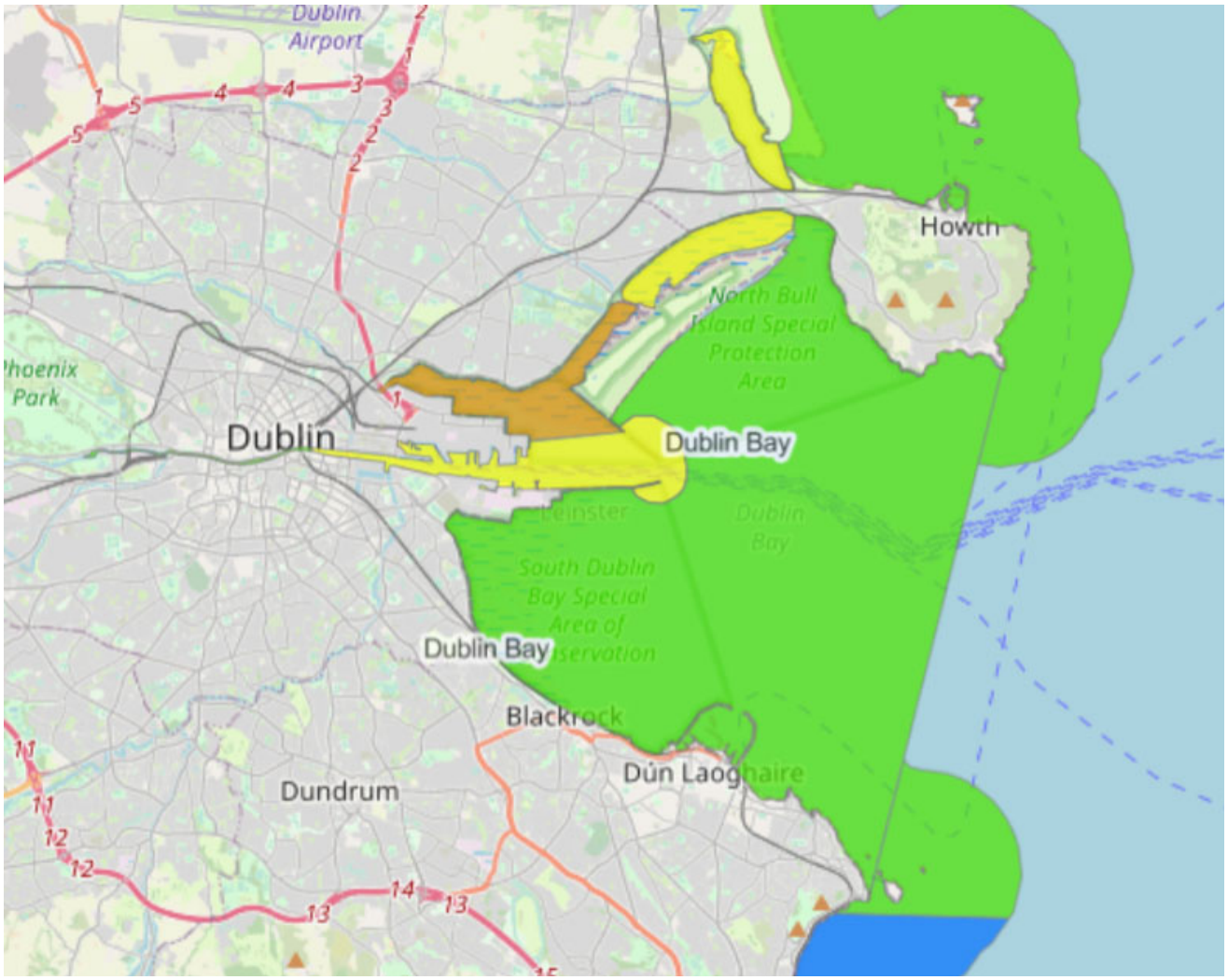


Figure 9-3 Water Framework Directive Water Body Status – Reported 2022

Table 9.5 WFD Status (2007-2021)

| WFD Status 2007-2021 | Liffey Estuary Lower | Liffey Estuary Upper | Tolka Estuary | Dublin Bay | Tolka_060 | Dodder_50 |
|---|---|---|---|---|---|---|
| | EA_090_0300 | EA_090_0400 | EA_090_0200 | EA_090_0000 | IE_EA_09T011150 | IE_EA_09D010900 |
| ***Overall WFD Status (2007-2009)*** | Moderate | Poor | Moderate | Moderate | Unassigned | Poor |
| ***Overall WFD Status (2010-2012 - Interim)*** | Good | Moderate | Moderate | Good | Unassigned | Moderate |
| ***Overall WFD Status (2010-2015)*** | Moderate | Moderate | Moderate | Good | Unassigned | Moderate |
| ***Overall WFD Status (2016-2021)*** | Moderate | Good | Poor | Good | Poor | Moderate |

A further breakdown of the ecological and chemical elements used to determine status for the 2016-2021 WFD cycles is shown in Table 9.6.

Biological elements measured in the Liffey Estuary Lower water body are all at "moderate" status. Although the supporting oxygenation and nutrient conditions are “high” and “good” respectively, and the relevant pollutants “pass” their environmental quality standards, the overall Ecological Status is therefore “moderate.”

The Liffey Estuary Upper has shown further improvement with all biological and supporting chemistry elements measured achieving “good” status.

Biological elements reported for the Tolka Estuary in the 2016-2021 cycle, and the supporting chemistry have achieved “moderate” status. However, due to high biomass and extensive coverage of green algae on the mudflats, the overall Ecological Status, and thus WFD Quality Status, is given as “poor”. The overall WFD status (2016-2021) of the Tolka_060 is “poor” status. The 2016-2021 Ecological Status of the Tolka_060 is also “poor”. The Overall WFD Status of Dodder_050 is “moderate” status for the period 2010-2021 having improved condition for that in the 2007-2009 cycle when it was classified at “poor” status.

The overall WFD status (2016-2021) of the Tolka_060 river water body is “poor”. The 2016-2021 Ecological Status of the Tolka_060 is also “poor”. The Overall WFD Status of Dodder_050 is “moderate” status for the period 2010-2021 having improved condition for that in the 2007-2009 cycle when it was classified at “poor” status.

Biological and supporting chemistry elements monitored in the Dublin Bay coastal water body range from “good“ to “high“ status. Overall Ecological Status is therefore “good” and unchanged from the previous monitoring cycle. In terms of chemical status two Poly Aromatic Hydrocarbons (PAHs) in Dublin Bay that are exceeding the environmental quality standards, benzo[a]pyrene and benzo[ghi]perylene, however these are failing across all water bodies monitored and are considered to be persistent ubiquitous substances. Ubiquitous substances are characterised by their ability to persist in the environment for many years, in some cases decades, even after their production has ceased or been greatly reduced. The list of ubiquitous substances includes, mercury and its compounds, PBDEs (brominated fire retardants), PAHs (polyaromatic hydrocarbons) and tributyltin (TBT) compounds.

Given the widespread pervasive nature of these compounds and the relatively low EQS concentrations, exceedances of EQSs in water bodies are common. Reducing concentrations of these substances in water bodies is extremely challenging. In presenting information on chemical status, results can be presented with and without ubiquitous substances. This is done to ensure that improvements achieved with other substances, which can be addressed through local and national programmes of measures, are not obscured by including uPTBs. Assessment of chemical status in this way does not exempt Ireland from taking additional measures, including at international level, to reduce or eliminate discharges and emissions of uPTBs.

Table 9.6 WFD Status Breakdown (2016-2021)

| WFD Status 2016-2021 | | | Liffey Estuary Lower | Liffey Estuary Upper | Tolka Estuary | Dublin Bay | Tolka_060 | Dodder_050 |
|---|---|---|---|---|---|---|---|---|
| | | | EA_090_0300 | EA_090_0400 | EA_090_0200 | EA_090_0000 | IE_EA_09T011150 | IE_EA_09D010900 |
| Ecological Status | Biological Status | Phytoplankton Status | Moderate | Good | Moderate | High | Not Available | Not Available |
| | | Other Aquatic Floras Status | Not Available | Not Available | Not Available | Good | Not Available | Moderate |
| | | Invertebrate Status | Moderate | Not Available | Moderate | Good | Not Available | Moderate |
| | | Fish Status | Not Available | Not Available | Not Available | Not Available | Not Available | Moderate |
| | Supporting Chemistry Conditions | Oxygenation Conditions | High | Good | Moderate | Good | Pass | Pass |
| | | Nutrients Condition | Good | Good | Moderate | High | Good | Pass |
| | | Relevant Pollutants | Pass | Not Available | Not Available | Pass | Not Available | Not Available |
| | Hydromorphological Quality Element | Hydrology, Morphology, Continuity | Not Available | Moderate | Good | Good | Not Available | Not Available |
| | **Ecological Status (2016 – 2021)** | | **Moderate** | **Good** | **Poor** | **Good** | **Poor** | **Moderate** |
| Chemical Status | Priority substances and other EU-level dangerous substances | | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| | **Chemical Status (2016 – 2021)** | | **Good** | **Not Available** | **Not Available** | Failing to achieve good | **Not Available** | Pass |
| **Overall WFD Quality Status 2016 - 2021** | | | **Moderate** | **Good** | **Poor** | **Good** | **Poor** | **Moderate** |

This assessment of likely significant effects on water quality has been undertaken having regard to the necessity to comply with the WFD, and by doing so ensuring that the 3FM Project does not prevent the achievement of the WFD objectives for these water bodies in subsequent RBMP cycles. A WFD Compliance Assessment has been undertaken for the water bodies affected and is included under separate cover. The key focus of the assessment was to ensure that the 3FM Project will not result in a deterioration in the current WFD status of the water bodies within the study area, based on the 2016-2021 WFD monitoring programme as reported by the EPA, and also to ensure that the project does not compromise the achievement of the WFD objectives for the improvement in the overall status of these water bodies. The assessment also considers the protected areas linked to the water bodies in question and ensures that the protected area objectives are also unaffected. The scoping stage of the WFD compliance assessment has concluded that there were a number of components and activities associated with the Project that represented a risk to the WFD status and objectives and therefore were scoped into the assessment. The relevant quality elements contributing to the overall status were considered and how each potential impact could affect these. The overall conclusion of the WFD compliance assessment is that there will be no risk of deterioration in status or the prevention of the achievement of the objectives for the relevant water bodies nor will the protected area objectives be compromised.

#### 9.1.2.3 Protected Areas

A significant proportion of the area of Dublin Bay and adjacent coastline is protected under existing EU legislation requiring special protection due to the sensitivity to pollution or particular environmental importance. All of the areas requiring special protection in the Irish River Basin District have been identified by EPA, mapped and listed in a national register of protected areas (required under Article 6 of the WFD). The register of protected areas includes:

- areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- areas designated for the protection of economically significant aquatic species, i.e. Freshwater Fish and Shellfish;
- bodies of water designated as recreational waters, including areas designated as bathing waters;
- nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive; as well as
- areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites (Special Protection Areas (SPAs); and Special Areas of Conservation (SACs)).

These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation. Protected areas within the Dublin Port and Dublin Bay area include areas of Bathing Water, Nutrient Sensitive Waters and Natura 2000 sites.

### *Bathing Waters*

The Bathing Water Directive (2006/7/EC) came into force in March 2006, and was transposed into Irish law by the Bathing Water Quality Regulations, 2008, as amended. The previous 1976 Directive was repealed with effect from 31 December 2014. Since 2014, the annual water quality classification (rating) of a beach or lake has been based on water quality results covering a four-year period rather than a single previous season's data. Water quality at beaches and lakes is classified as Excellent; Good, Sufficient or Poor (Table 9.7). This approach is common across all EU Member States and there is a requirement to ensure that bathing waters are of 'Sufficient' standard or better. Any 'Poor' bathing water requires a programme of adequate management measures to be implemented. A minimum of 16 samples are required for formal annual assessment.

Table 9.7 Annual Assessment Criteria for Bathing Waters

| Parameter | Excellent | Good | Sufficient |
|---|---|---|---|
| E. coli (Freshwater) | 500* | 1000* | 900** |
| E. coli (Coastal) | 250* | 500* | 500** |
| Intestinal enterococci (freshwater) | 200* | 400* | 330** |
| Intestinal enterococci (Coastal) | 100* | 200* | 185** |

*based on 95-percentile value **based on 90-percentile value

The regulated bathing areas identified in the immediate vicinity of the 3FM Project are Dollymount Strand, Sandymount Strand, and Seapoint. The most recent bathing water classification is for 2023, and Dollymount Strand has been classified as Good; Sandymount Strand has been classified as Poor; and Seapoint has been classified as Excellent (Figure 9-4).

The main sources of pollution resulting in the Poor classification in Sandymount Strand are misconnections and sewage overflows which contaminate streams flowing to the bathing water, dog fouling left on the beach, and birds. The Dublin Bay Bathing Water Taskforce (chaired by Dublin City Council) was established in 2019 to help identify and fix pollution sources impacting on bathing water quality in Dublin Bay, including Sandymount Strand. Programs to identify and fix misconnections are ongoing by the local authority. Uisce Éireann has made significant improvements to the wastewater network and work is ongoing to address urban wastewater pressures.

The results for individual samples at all sites in the vicinity of the 3FM Project monitored during 2023 are shown in Table 9.8. They show that the great majority of sample results indicated Excellent quality.

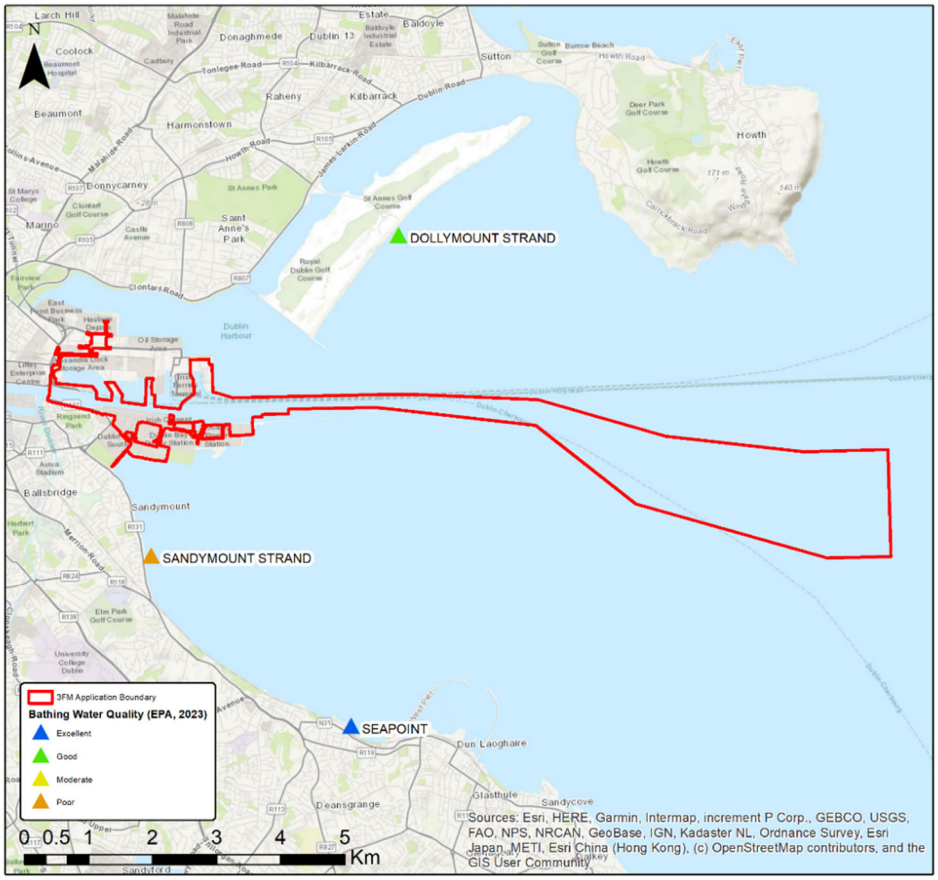


Figure 9-4 Bathing Water Status in the Dublin Area 2023 (EPA, 2024)

Table 9.8 Summary Status of Samples during the 2023 Monitoring Season

| Sample Date | Dollymount Strand | Sandymount | Seapoint |
|---|---|---|---|
| 22/05/2023 | E | E | |
| 25/05/2023-30/05/2023 | | | E |
| 06/06/2023 | E | E | E |
| 12/06/2023 | G | E | E |
| 18/06/2023-20/06/2023 | G | E | E |
| 26/06/2023-28/06/2023 | E | G | E |
| 03/07/2023 | E | E | E |
| 10/07/2023-11/07/2023 | E | | E |
| 17/07/2023 | E | E | E |
| 23/07/2023-24/07/2023 | E | E | E |
| 30/07/2023-31/07/2023 | G | S | E |
| 01/08/2023 | P | S | |
| 07/08/2023-08/08/2023 | E | E | E |
| 14/08/2023-15/08/2023 | E | E | E |
| 20/08/2023-21/08/2023 | | E | E |
| 28/08/2023-29/08/2023 | E | G | E |
| 03/09/2023-04/09/2023 | E | E | E |
| 11/09/2023 | E | G | E |

***Key: Blue: Excellent; Green: Good; Yellow: Sufficient: Orange: Poor***

### *Nutrient Sensitive Waters*

The Urban Waste Water Treatment Regulations 2001, as amended, which transpose the Urban Wastewater Treatment Directive (91/271/EEC) into Irish law and update the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations 1994, as amended, list nutrient sensitive waters in the Third Schedule.

The Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon has been designated as a nutrient sensitive area (

Figure 9-5). Ringsend WWTP currently discharges in the Lower Liffey Estuary and is in the List of Priority Urban Areas (EPA, 2024c) where treatment must improve to resolve national environmental priorities. Upgrade of the treatment plant is proposed for completion by 2025.

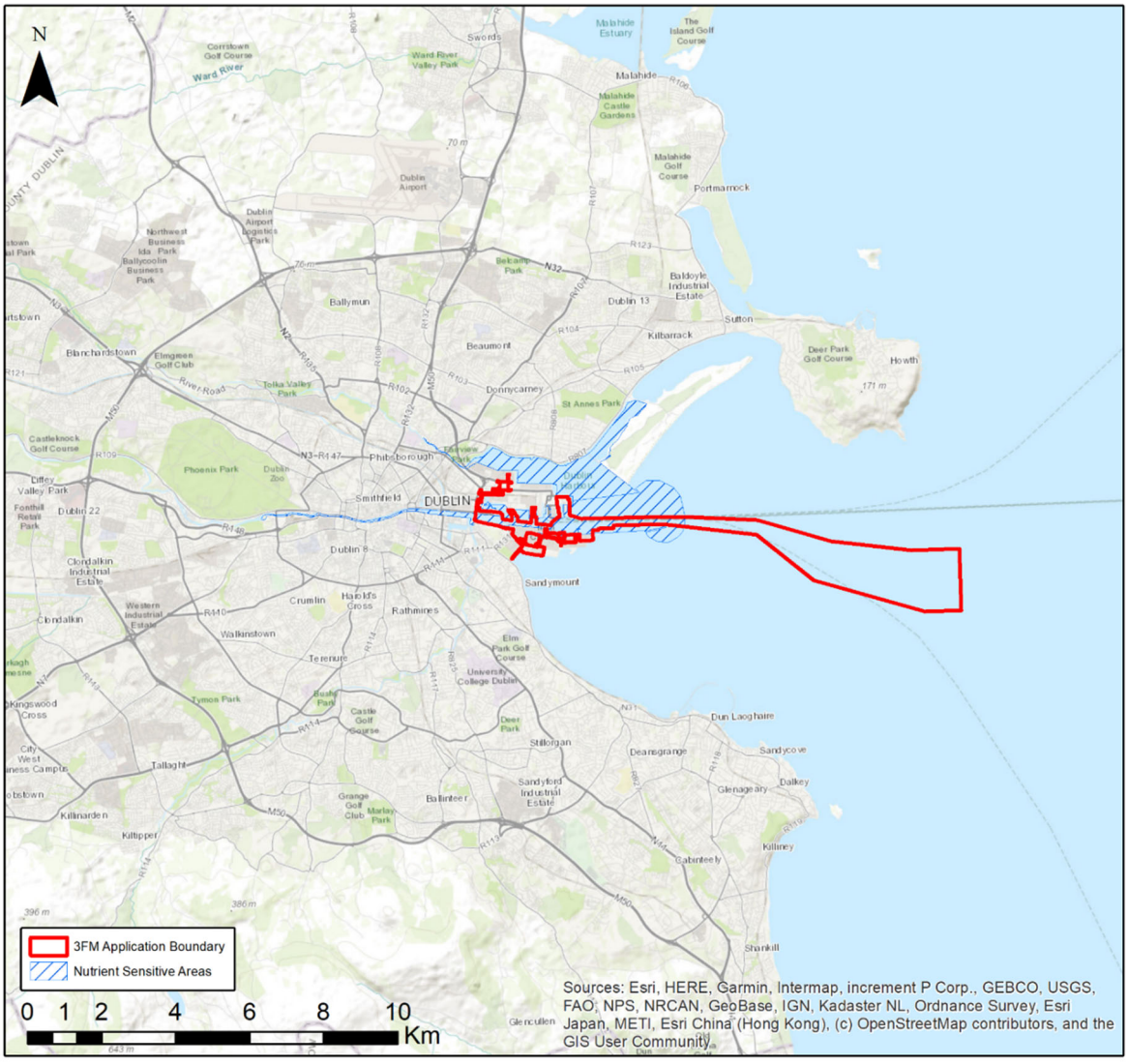


Figure 9-5 Nutrient Sensitive Areas

### *Natura 2000 Protected Areas*

Natura 2000 is a European network of important ecological sites. The EU Habitats Directive (92/43/EEC) places an obligation on Member States of the EU to establish the Natura 2000 network. The network is made up of Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC), and SACs, established under the Habitats Directive itself.

As illustrated in Figure 9-6, the 3FM Project does not fall within any Natura 2000 site (i.e. SPA or SAC). The licensed dumping area is within the Rockabill to Dalkey SAC which is designated for the marine Annex I qualifying interest reefs, and the Annex II species *Phocoena phocoena* (harbour porpoise). The potential of likely significant effects from the 3FM Project has been assessed in Chapter 7 Biodiversity, Flora and Fauna. It should also be noted that, separately and distinctly, potential effects on Natura 2000 or “European” sites have been considered extensively in the Screening for Appropriate Assessment and Natura Impact Statement submitted with the application for development consent in respect of the 3FM Project.

For the reasons set out in the Appropriate Assessment Screening Report and Natura Impact Statement, the 3FM Project will not have any adverse effects on the qualifying interests of any European site. The water quality assessment contained in this chapter of the EIAR demonstrates that the development will not cause significant effects on water dependent protected species and habitats, bathing waters, nutrient sensitive waters. Where necessary, water quality modelling and evaluation against relevant standards, has been undertaken.

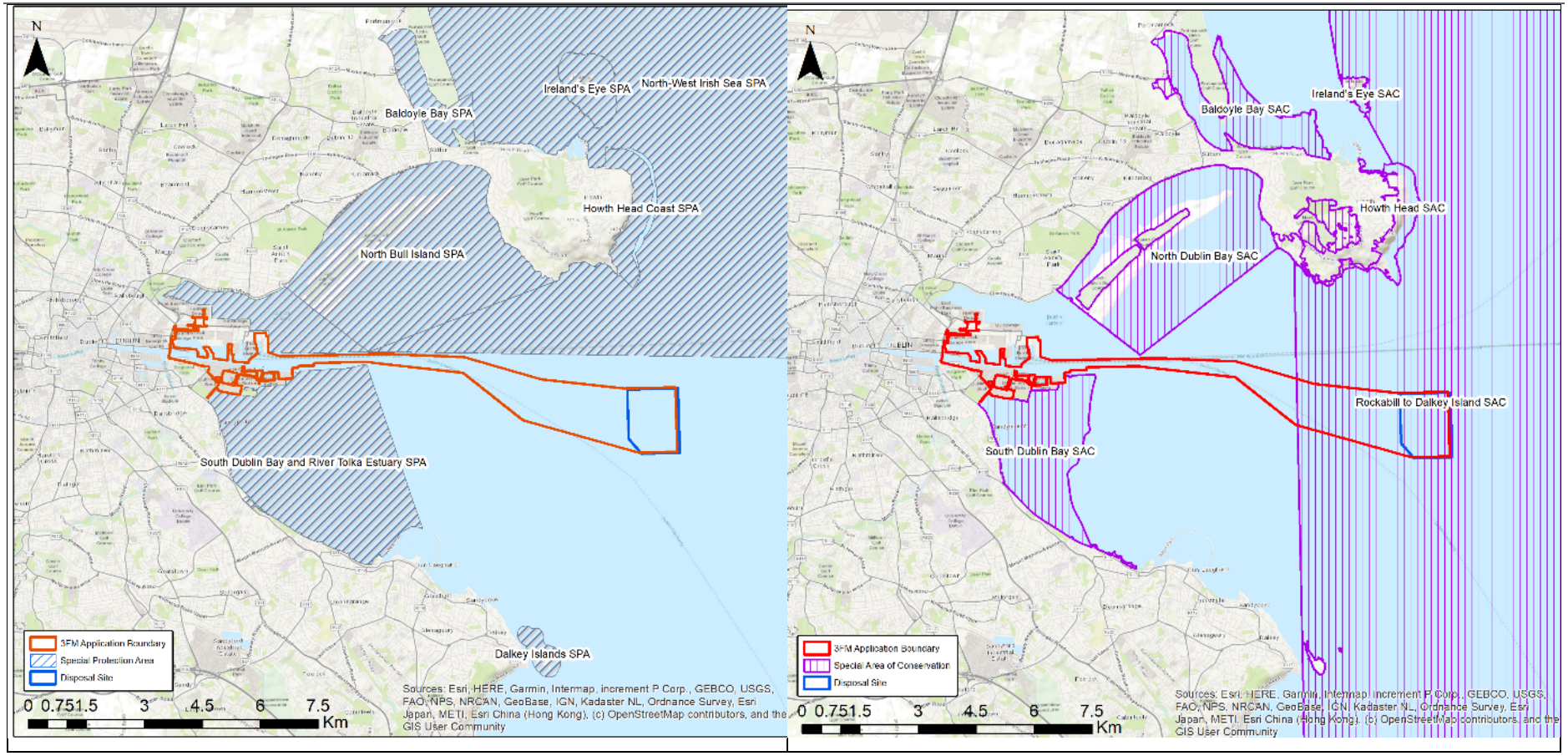


Figure 9-6 Natura 2000 Designated Sites

#### 9.1.2.4 Heavily Modified Water Body Designation

Heavily modified water bodies are bodies of surface water which have been substantially changed in their hydromorphological character for the purposes of a specified use. The hydromorphological condition of water bodies has commonly been significantly modified by human intervention for various specified uses, such as for navigation, land drainage, hydroelectric power generation and water supply. The environmental objectives for HMWBs recognise that the extent of the modifications mean that the conditions are not consistent with those required for Good Ecological Status, and that the impacts cannot be fully mitigated without impacting on the specified use.

The specified uses, and the criteria for designation, are set out in Article 4(3) of the Directive. A waterbody can be designated as a HMWB if:

a. the changes to the hydromorphological characteristics of that body which would be necessary for achieving Good Ecological Status would have significant adverse effects on:
    i. the wider environment;
    ii. navigation, including port facilities, or recreation;
    iii. activities for the purposes of which water is stored, such as drinking-water supply, power generation or irrigation;
    iv. water regulation, flood protection, land drainage, or
    v. other equally important sustainable human development activities;
b. the beneficial objectives served by the artificial or modified characteristics of the water body cannot, for reasons of technical feasibility or disproportionate costs, reasonably be achieved by other means, which are a significantly better environmental option. Such designation and the reasons for it shall be specifically mentioned in the river basin management plans required under Article 13 and reviewed every six years.

The structures and changes to channel and bed morphology required for a water body to be used for navigation and ports are typical of the type of modifications that result in the designation of a water body as heavily modified.

The Department of Housing, Local Government and Heritage's draft River Basin Management Plan 2022-2027 (RBMP) acknowledges that "Initial evidence indicates that there are more waterbodies that have been heavily modified than has previously been designated to date, both within the specified use categories included in the first cycle, and in some of the other specified use categories not previously considered.

The RBMP also states:

*"It is important to reiterate, that waterbodies with a heavily modified designation are still expected to meet the required standards for all the other water quality elements, with measures to mitigate to the greatest extent possible the hydromorphological impacts also required."*

As highlighted in the Review of Ireland's Heavily Modified Water Body Designations for the Third Cycle River Basin Management Plan (EPA, 2022):

*"Waterbodies that are designated as heavily modified have a WFD environmental objective of Good Ecological Potential rather than Good Ecological Status. The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society needs to be continued. The physical modifications caused by the use need to be mitigated against as far as possible, whilst acknowledging that the specified use needs to be retained. For example, a fish pass designed to best practice standards might be required on an instream barrier to ensure fish passage"*

In the EPA review the designation tests required for the designation of Transitional and Coastal Water bodies as heavily modified, as required under Article 4(3), were applied. The Lower Liffey Estuary retains its designation as Heavily Modified Water Body for the third cycle of the RBMP as it remains substantially changed in terms of its hydromorphology and will not achieve good ecological status due to these changes. The EPA concluded that there are no restoration measures available that would not impact on the specified use, i.e. navigation and ports, and there are no alternative options which are a significantly better environmental option, technically feasible and not disproportionately costly (EPA 2022).

The Lower Liffey Estuary is therefore one of 13 transitional and coastal water bodies that has been designated as heavily modified under the "navigation and urban uses" specified use category.

Waterbodies that are designated as heavily modified have a WFD environmental objective of Good Ecological Potential rather than Good Ecological Status. The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society needs to be continued. The physical modifications caused by the use need to be mitigated against as far as possible, whilst acknowledging that the specified use needs to be retained.

Therefore the designation of the Liffey Estuary Lower as a HMWB means that mitigation measures will need to be applied to address hydromorphological pressures as far as practicable whilst still retaining the specified use of the water body, i.e. navigation and ports.

What good ecological potential will represent in the HMWB designations will be a decision for the EPA, and whilst hydromorphological supporting conditions will be mitigated to the greatest extent possible through the application of mitigation measures, HMWBs will still be expected to meet the required standards for other water quality elements.

#### 9.1.2.5 Marine Strategy Framework Directive Environmental Status

The Marine Strategy Framework Directive (MSFD) (2008/56/EC) was formally adopted by the European Union in June 2008 and is transposed into Irish law by the European Communities (Marine Strategy Framework) Regulations 2011, as amended. The overarching aim of the Directive is to protect Europe's marine waters by applying an ecosystem-based approach to the management of human activities while enabling the sustainable use of the marine environment for present and future generations. The Directive establishes a legal framework for the development of marine strategies designed to achieve Good Environmental Status (GES) in the marine environment by the year 2020. The marine strategy involves defining GES, setting environmental targets and indicators, implementing monitoring programmes for ongoing assessment, and developing and implementing programmes of measures to achieve or maintain GES.

GES is defined as '*the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.'*

The assessment of GES is undertaken by reference to qualitative descriptors which define overarching objectives in respect of key socio-economic or ecological aspects of the marine environment. These specifically require the consideration of the following:

- biodiversity;
- non-indigenous species;
- Commercial fish and shellfish;
- food webs;
- human-induced eutrophication;
- sea-floor integrity;
- alteration of hydrographical conditions;
- contaminants in water and biota
- contaminants in seafood;
- marine litter; and
- the introduction of energy including underwater noise.

An Initial Assessment (constituting a comprehensive review of the physical, chemical and biological characteristics of the marine area, as well as the human pressures acting upon it) was undertaken (DHLGH, 2013)). A comprehensive set of environmental targets and associated indicators was developed resulting in 25 revised environmental targets as outlined in Ireland's Article 17 update to Ireland's Marine Strategy Part 1: Assessment (Article 8), Determination of Good Environmental Status (Article 9) and Environmental Targets (Article 10) (DHLGH, 2020). These revised targets align more closely with the requirements of the Birds and Habitats Directives, the Water Framework Directive, the Common Fisheries Policy. These are being used to demonstrate that GES has been achieved or is being maintained in accordance with the objectives of the MSFD. Almost half of the 11 qualitative descriptors for determining Good Environmental Status (GES) have fully achieved GES:

- non-indigenous species;
- human-induced eutrophication;
- alteration of hydrographical conditions;
- contaminants in water and biota
- contaminants in seafood

For marine litter and the introduction of energy both of these descriptors have fully achieved GES for the primary criteria assessed but lack of data and methodologies has prevented assessment of other primary criteria. Three have also partially achieved GES (Biodiversity, Commercial Fish and Shellfish and Sea Floor Integrity) due to different results for key elements assessed within descriptors. The environmental status of marine food webs in Ireland is currently unknown.

An updated monitoring programme has been established by the Department of Housing, Local Government and Heritage, and the Marine Institute to gather and provide scientific data and information for associated assessments, to determine if our marine waters are achieving or maintaining Good Environmental Status (GES) (DHLGH, 2021). The information is also used to identify changes in the environmental quality of Ireland's maritime area over time, to track the progress in achieving environmental targets, and to examine the effectiveness of measures designed to improve environmental outcomes. The programme of measures, first developed in 2015, has also been updated (DHLGH, 2022) which established 152 measures, built on existing national, European and International policy frameworks.

The achievement of GES supports the objectives of Marine Spatial Planning (MSP) and in particular, of the National Marine Planning Framework (NMPF). The environment policies in the NMPF have been split into nine categories largely aligned to the MSFD GES descriptors including water quality with a number of water quality policies and environmental targets aligned with the MSFD GES descriptors, eutrophication and contaminants at levels not giving rise to pollution effects (DHLGH, 2021). The assessment of the status of the marine environment and the determination of the characteristics of GES, including threshold values and environmental targets, inform decisions about how to use marine resources sustainably.

To date, the extent of achievement of GES has not been established for individual water bodies, therefore this water quality assessment relies on the WFD water quality assessment, including protected areas, to ensure that the 3FM Project will not compromise the achievement of the objectives of the MSFD.

#### 9.1.2.6 EPA Water Quality in 2023: An indicators Report

In 2024 the EPA published the Water Quality in 2023, An indicators Report. The intention of the report is to keep decision makers and the public informed by providing timely, scientifically sound information on water quality using a series of water quality indicators. Of the nine indicators in this publication three relate to Transitional and Coastal Waters located in close proximity to the 3FM Project;

- Nitrogen in Transitional and Coastal Waters,
- Phosphorus in Transitional and Coastal Waters.
- Nutrient Inputs to the Marine Environment

***Nitrogen in Transitional and Coastal Waters***

Nitrogen is generally considered the primary limiting nutrient in coastal ecosystems, meaning that the concentration of this nutrient can limit the growth of algae and aquatic plants. Increases in nitrogen can lead to elevated growth of phytoplankton and/or macroalgae. Levels of Dissolved Inorganic Nitrogen (DIN) are

monitored in winter when levels are expected to be at their seasonal maximum due to the absence of any significant plant or algal growth.

The EPA have defined salinity-dependent thresholds for DIN in transitional and coastal waters, and there is an environmental quality standard for coastal waters. These assessment thresholds range from ≤2.6 mg N/l at a salinity of 0 to ≤0.25 mg N/l at a salinity of 34.5 and are used to assess water quality of transitional and coastal waters around Ireland. Dissolved inorganic nitrogen concentrations above the assessment threshold indicate the presence of elevated nitrogen levels from anthropogenic sources. The indicator uses the median winter DIN concentration for the period 2021–2023 to assess number of exceedances against the assessment threshold.

The EPA 2023 Indicators Report has reviewed trends in some coastal and transitional water bodies. Liffey Estuary Lower, Liffey Estuary Upper, Tolka Estuary and Dublin Bay have been included in this analysis. The report indicates that the Median DIN concentration trend between 2012 and 2023 has changed in the Liffey Estuary Upper and Liffey Estuary Lower with an upward trend in winter DIN concentrations however the median concentrations recorded in the 2021 to 2023 monitoring period were still 49% to 15% below the threshold. The Tolka Estuary recorded median winter DIN concentrations in the 2021 – 2023 monitoring period of between 1% to 50% above the threshold. Dublin Bay has experienced a significant reduction in winter DIN levels, a trend which has been continuing since 2012, and the median winter DIN concentrations are more than 50% lower than the threshold.

### *Phosphorus in Transitional and Coastal Waters*

Phosphorus is important in transitional systems because it is limiting in lower salinity waters. Salinity-dependent thresholds have been defined for phosphorus in transitional and coastal waters and there is an environmental quality standard for transitional waters (S.I. 272, 2009). The assessment threshold is 0.060 mg P/l for fresh to intermediate salinity waters and ranges from 0.059–0.040 mg P/l for intermediate to full salinity waters. Phosphorus concentrations above these thresholds can indicate excess phosphorus being transported to surface waters due to anthropogenic activity. Levels of Molybdate Reactive Phosphorus (MRP) are monitored in winter when levels are expected to be at their seasonal maximum due to the absence of any significant plant or algal growth. Winter (January–March) phosphorus exceedances give an indication of available nutrients without the influence of biological activity, which mainly occurs during the summer growth period.

The report indicates that the Median MRP concentration trend between 2012 and 2023 has remained stable for Liffey Lower Estuary, the Tolka Estuary and Dublin Bay. It also reports that the Liffey Estuary Lower, the Tolka Estuary and Dublin Bay have experienced no exceedances in the Winter MRP threshold with concentrations between 15% and 49% lower than the MRP Standard.

In this water quality assessment consideration has been given to potential effects of the development on these nutrient related environmental indicators.

### *Nutrient Inputs to the Marine Environment*

Nutrient inputs to the marine environment, expressed as loadings, from 19 major rivers are monitored to provide an indicator of the loss of nutrients from land-based sources. High loadings of nutrients, both nitrogen and phosphorus, can have significant impacts on our marine ecosystems. The nutrient loads are calculated based on nutrient concentrations, measured 12 times a year, and river flow, which is monitored continuously.

The loadings are reported on a national basis, and nitrogen loads to the marine environment were slightly lower in 2023 compared to 2022 but were similar to 2021 and 2020, indicating no improvement over the last four years. Phosphorus loads to the marine environment were slightly higher in 2023 compared to 2022 but again indicate little change over recent years. The largest contributions of both nutrients come from catchments in the south east of the country. The Liffey catchment contributes less, which is consistent with the nitrogen and phosphorus concentrations in transitional and coastal waters in the vicinity of the 3FM Project as outlined above.

#### 9.1.2.7 Marine Institute Monitoring

The Marine Institute has carried out monitoring since 2012 to determine macroinvertebrate ecological quality status (EQS) in coastal and transitional waters around the Irish Coast in order to fulfil requirements of the Water Framework Directive (WFD). As part of this programme sampling is carried out once every three years in the Dublin Bay coastal waterbody (Figure 9-7), and the status of the benthos in the bay is calculated using the Invertebrate Quality Index (IQI).

Monitoring of Dublin Bay in 2022 determined that sediments comprised of muddy and fine sand or very fine sands. Gravels tended to contribute an insignificant part of the sediment. Total organic matter is low and as expected for this sediment type. Furthermore, the benthic communities identified in Dublin Bay were characteristic of the shallow muddy fine sand sediments sampled. In the ten benthic sampling events since 2012, the benthic macro-invertebrate EQS has been classed as Good or better on all occasions (Table 9.9).

The Marine Institute states that benthic monitoring carried out in Dublin Bay clearly shows that the condition of the benthos is broadly consistent from year-to-year. The IQI is a versatile metric capable of determining impact on benthic macro-invertebrates resulting from organic enrichment, chemical contamination as well as physical disturbance (i.e., smothering). The Marine Institute therefore further concluded that the effects of dredging (both loading and spoil disposal) appear to be contained within the areas in question and do not appear to be impacting the wider seabed invertebrate communities in Dublin Bay.

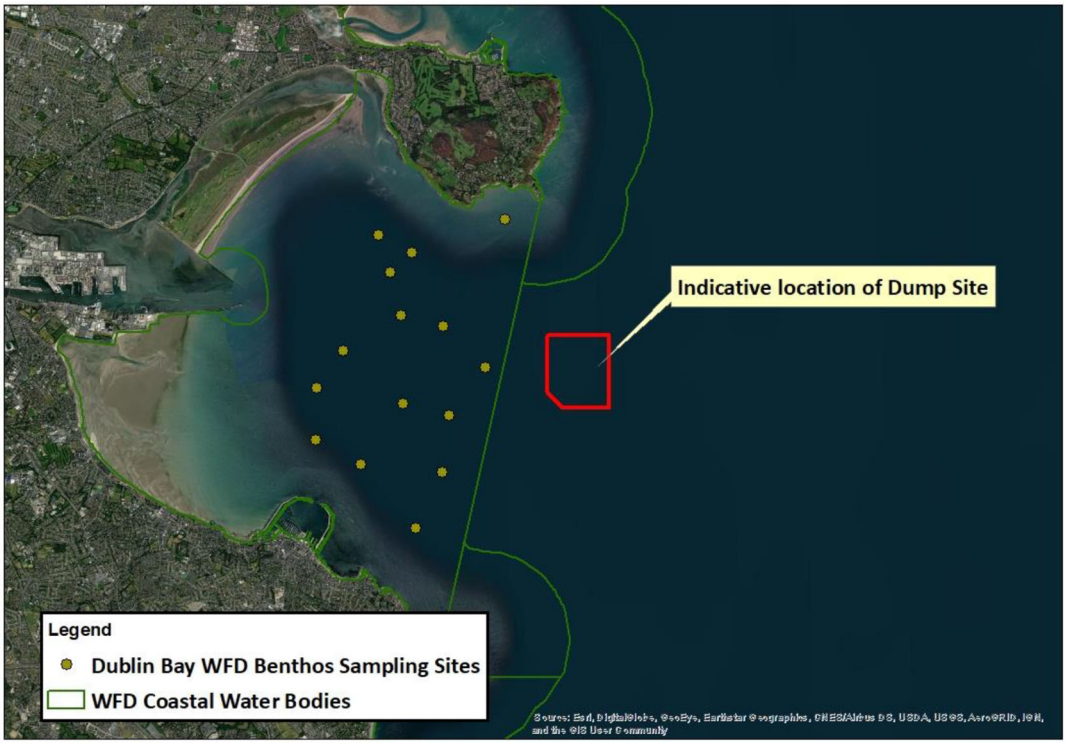


Figure 9-7 Dublin Bay Water Framework Directive benthos Sampling points (n=15). General location of spoil site is also provided

Table 9.9 WFD (IQI) benthos scores Dublin Bay. 2012-2023

| | 2012 | 2014 | 2015 | 2016 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|
| IQI - Score | 0.765 | 0.664 | 0.717 | 0.747 | 0.753 | 0.708 | 0.733 | 0.729 | 0.722 | 0.727 |
| EQS | High | Good | Good | Good | High | Good | Good | Good | Good | Good |

The Marine Institute (MI) also monitors water quality at two locations in Dublin Bay and one location in the Liffey Estuary Lower (Figure 9-8). Available physico-chemical monitoring data from January 2015 to March 2018 have been collated and are summarised in Figure 9-9.

The mean turbidity measured by MI at Dublin Bay stations 1 and 2 is 8 NTU. This is in agreement with measurements made at the coastal monitoring buoys in the ABR Project where mean turbidity at four sites and at three depths ranged from 7.5 to 14.8 NTU. The mean turbidity measured in the Liffey Estuary Lower (based on data from September and November 2018 only) is 21 NTU. This compares with mean turbidity of 2.3 to 6.3 measured at four sites in the Liffey Estuary during the ABR Project. The slightly higher turbidity measured by MI may relate to the time of year when measurements were made at this site (September and November). It also reflects the greater variance in turbidity in the dynamic port area.

Dissolved oxygen levels are 8.9 mg/l at both Dublin Bay sites and slightly lower in the Liffey Estuary at 8.3 mg/l. This compares with average dissolved oxygen levels of 7.8 to 9.0 mg/l measured in the Liffey Estuary by the ABR Project and confirms that dissolved oxygen is typically around saturation levels. This Marine Institute monitoring data provides a baseline of existing turbidity levels and variations giving context for the assessment of potential construction and operational activities.

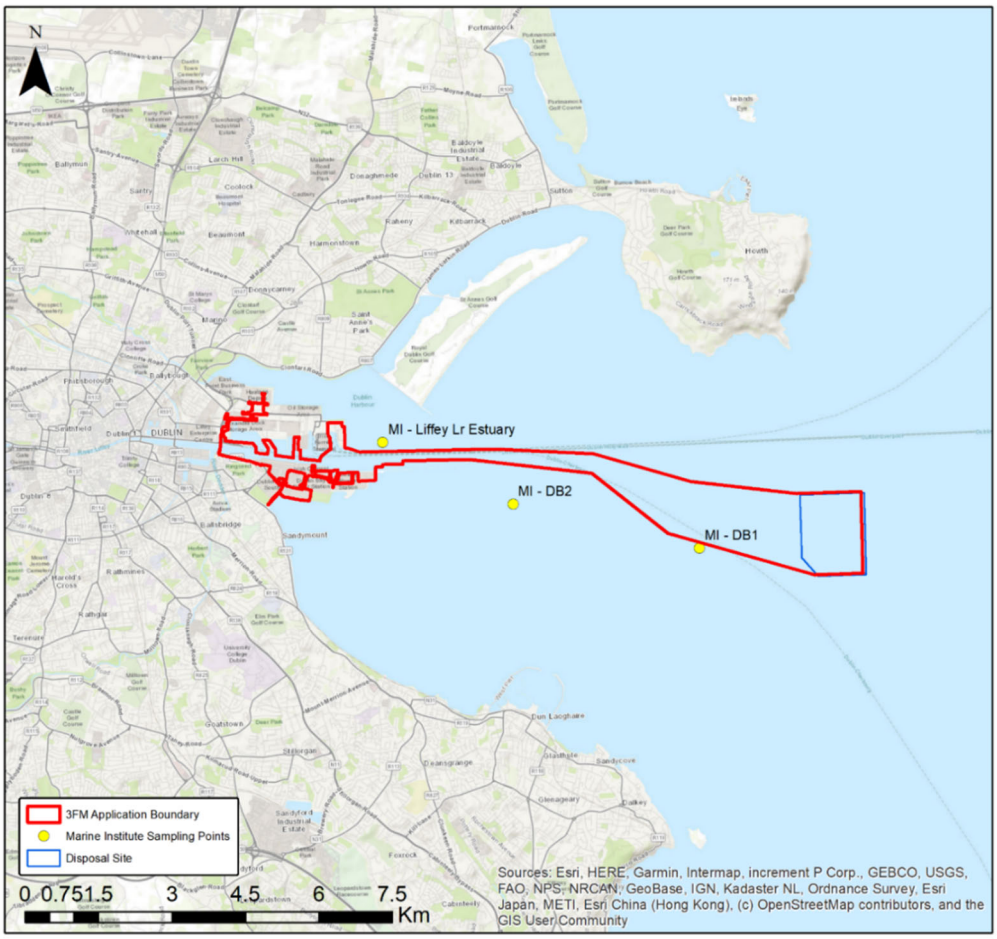


Figure 9-8 Marine Institute Monitoring Locations and the Licenced Dumping Site

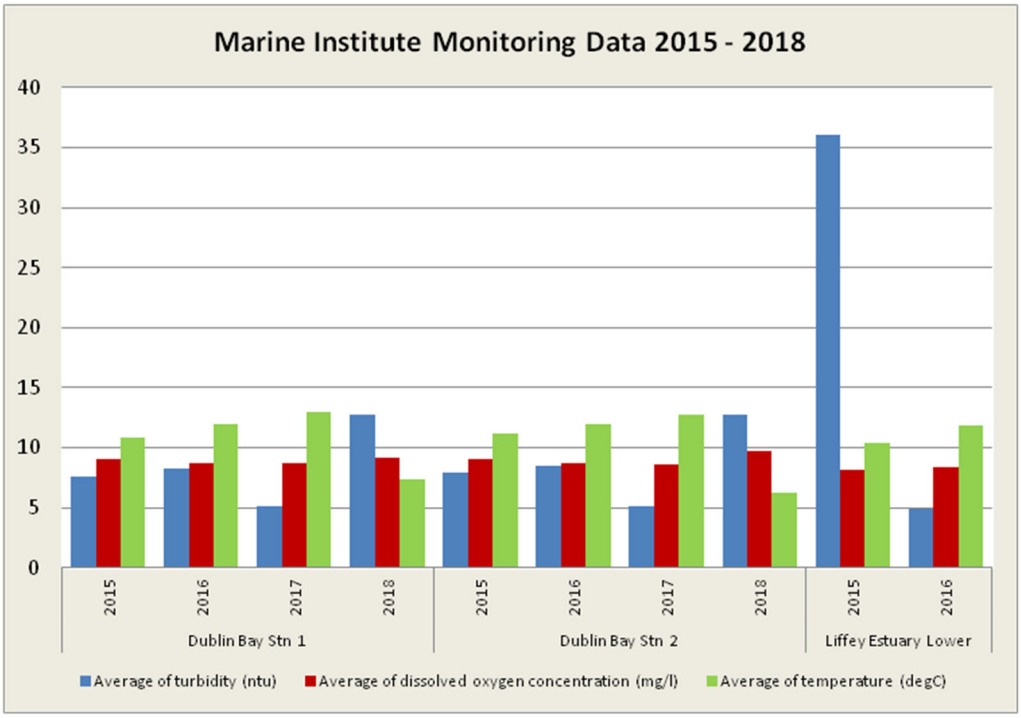


Figure 9-9 Marine Institute Summary Water Quality Data 2015 – 2018

### 9.1.2.8 Dublin Port Company Monitoring Programme (ABR/MP2 Projects)

Dublin Port Company is carrying out extensive monitoring of water quality in Dublin Port and Dublin Bay as part of its ABR Project and MP2 Project.

Monitoring stations have been established in the Port since 2016 to provide detailed information on relevant water quality parameters. The locations of these stations have been agreed with the Planning Authority. They measure real time water quality and continuously relay the data to a shore-based location. Trigger levels that initiate investigations have been set for key water quality indicators to allow a quick response and remedial actions, including the temporary cessation of the works where appropriate.

Monitoring stations were also established in Dublin Bay at the licensed dredge dumping site as required by Dumping at Sea Permit S00024-01 to provide for the protection of the marine environment by way of monitoring the impacts associated with the loading and dumping at sea activity during dredging operations. Continuous real-time turbidity monitoring was carried out from 2017 to 2021 at four stations and at various depths along with tidal current and wave climate.

***Within Dublin Port***

*Monitoring Stations*

Four water quality monitoring stations have been established at locations within the Liffey Estuary (Figure 9-10). The sites chosen represent ambient surface water quality in the Liffey Estuary Lower and in the Tolka Estuary water bodies. The monitoring station at the Tolka Estuary is mounted on an OSIL Inshore 0.6m Monitoring Buoy. At the East Link, Poolbeg Sludge Jetty and North Bank Light stations the monitoring apparatus has been secured to permanent in-river structures. Monitoring data is available for the period 2017 to 2023.

Four parameters are measured at each of the water quality stations (turbidity, temperature, dissolved oxygen and salinity). In addition, water level is measured at the Poolbeg Sludge Jetty station. More recently pH measurement has been added to the suite of parameters recorded. Measurements are made every 15 minutes using a Hydrolab Multiparameter HL4 Sonde with integrated sensors. A secure stilling tube maintains the sonde at a fixed point below the surface and a watertight compartment on the structure houses a data-logger and communications hardware. Data are relayed from the monitoring stations via a 4G connection and web-based telemetry software (ADCON addVANTAGE pRO 6.6) is used to visualize, process and distribute the information.

*Turbidity and Total Suspended Solids*

Turbidity is monitored as a proxy for total suspended solids (TSS) in water due to the ease and frequency with which it can be measured. Turbidity is a measure of the cloudiness or haziness of water caused by material suspended in the water such as soil particles, sediment, or small floating algae. Particles are often small and can remain in suspension in the water for lengthy periods. Turbidity can be caused by natural events such as flooding, algal growth, water currents, wind and wave action as well as human activities.

Turbidity is measured in NTU (Nephelometric Turbidity Units), which is basically a measure of the amount of light scattered by particles in suspension. It is readily measured on site and can be used to give a rapid estimate of the total amount of suspended solids in the water. Measuring the total suspended solids concentration requires taking water samples for filtration, weighing and drying in the laboratory.


Figure 9-10 Water Quality Monitoring Stations in the Dublin Port Area

The relationship between turbidity and suspended solids in water is site-specific. It is influenced by the type of sediment in suspension, its colour, shape and reflectivity. Therefore, a sediment sample from the Liffey at East Link Bridge was taken and used to establish a relationship between turbidity and suspended solids for the Port area. The sediment consisted of sandy silt and suspensions were prepared from this sample to provide turbidity in the range 0 to 150 NTU. Turbidity (NTU) and TSS (mg/l) were measured for 75 suspensions to allow construction of a calibration curve (Figure 9-11).

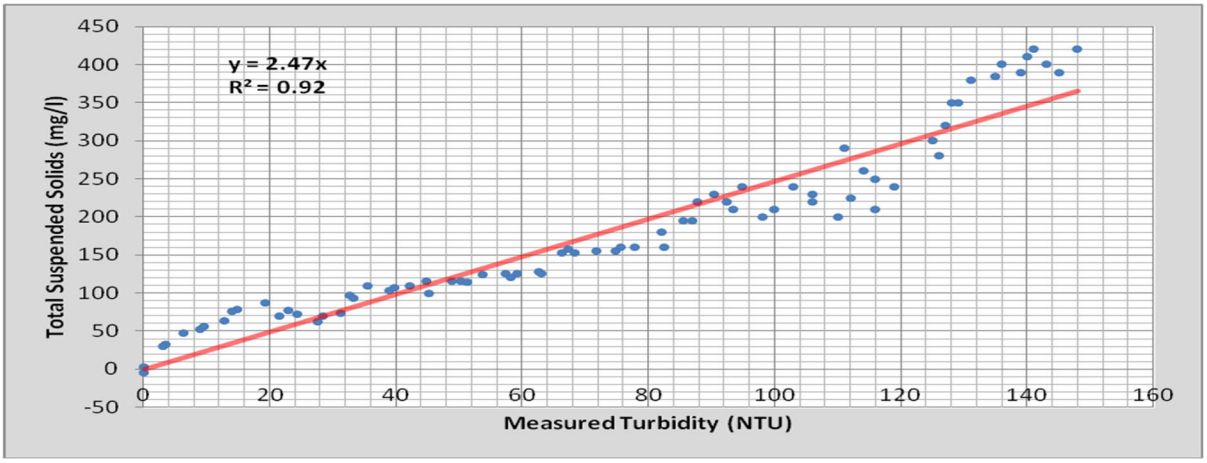


Figure 9-11 Relationship Established between Turbidity and Total Suspended Solids (Inner Liffey Channel)

This relationship can be used to estimate total suspended solids from turbidity readings at the monitoring stations in the Port area. Based on this relationship a factor of 2.5 is used to convert turbidity (units of NTU) to Total Suspended Solids (units of mg/l).

*Dissolved Oxygen, Temperature and Salinity*

The amount of oxygen dissolved in the water is reported as milligrams per litre (mg/l). Aquatic animals breathe using the oxygen dissolved in the water. The level is therefore critically important, particularly for fish. Salmon and trout begin to be affected by low oxygen levels at about 6 mg/l (around 50% saturation), and at dissolved oxygen levels below 1.7 mg/l death of some adult fish is likely. Temperature is one of a number of factors that can affect oxygen levels in water. When freshwater is saturated with oxygen it can hold about 12.7 mg/l of oxygen at a temperature of 5°C; this reduces to 9.1 mg/l at 20°C. High temperatures also promote more rapid microbiological breakdown of organic wastes and this can also use up oxygen in the water.

Other factors, including salinity and atmospheric pressure, can also affect dissolved oxygen levels. For example, seawater holds about 20% less oxygen than freshwater when saturated, and algae produce oxygen during the daylight hours when they are photosynthesising but use it up during darkness when respiring. These factors produce seasonal, daily and tidal rhythms of higher and lower dissolved oxygen levels. Salinity is measured in PSU (practical salinity units). Full seawater has a salinity of about 35 PSU, while freshwater has a value close to zero. As well as influencing the type of animals and plants that occur in the water, salinity affects many aspects of the water's chemistry and physical properties (including the amount of oxygen dissolved in the water as demonstrated above).

Summary statistics for the period 2017 – 2023 are set out in Table 9.10 to Table 9.13 based on individual 15-minute interval measurements at each station. Although maximum and minimum values are given for each parameter these reflect extreme outlier values that are highly unlikely to be representative of general ambient water quality. The percentile values listed give a more robust indication of the true dispersal of the measurements, and clearly most of the measurements (90% of them) lie between the 5 percentile and 95 percentile values listed.

The graphs in Figure 9-12 to Figure 9-15 show the 24-hour average values for turbidity, dissolved oxygen, temperature, and salinity at each of the monitoring stations. The timing of dredging campaigns undertaken between 2017 and 2023 (capital and maintenance dredging) are also shown. Some data gaps occur due to several causes e.g. fouling of instruments, apparatus failure or damage.

Summary statistics show that in general, salinity remains high at all sites. Mean salinities are approximately 32 PSU and 90% of values lie between 25 PSU (5%ile) and 35.5 PSU (95%ile). Occasionally freshwater influences result in lower values, resulting from events such as major rain storms when riverine freshwater inputs increase, or sondes transitioning to surface freshwater layers at particularly low tides.

Table 9.10 Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Eastlink Monitoring Station (2017 – 2023) based on measurements taken at 15 minute intervals

| | Turbidity (NTU) | DO (mg/l) | Salinity (ppt) | Temperature (°C) |
|---|---|---|---|---|
| **Mean** | 2.4 | 7.7 | 32.1 | 11.8 |
| **Max** | 638.0 | 16.3 | 39.7 | 22.2 |
| **Min** | 0.0 | 1.9 | 5.0 | 2.0 |
| **5%-ile** | 0.0 | 5.6 | 28.2 | 6.8 |
| **95 %-ile** | 9.0 | 9.6 | 34.5 | 17.2 |
| **n** | 236112 | 230176 | 230085 | 236356 |

Table 9.11 Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Poolbeg Monitoring Station (2017 – 2023) based on measurements taken at 15 minute intervals

| | Turbidity (NTU) | DO (mg/l) | Salinity (ppt) | Temperature (°C) |
|---|---|---|---|---|
| **Mean** | 6.1 | 8.4 | 31.7 | 12.7 |
| **Max** | 340.0 | 14.2 | 39.7 | 24.9 |
| **Min** | 0.0 | 3.1 | 0.0 | 3.2 |
| **5%-ile** | 0.0 | 6.7 | 25.1 | 7.6 |
| **95 %ile** | 23.0 | 9.8 | 34.9 | 18.0 |
| **n** | 204692 | 209801 | 200765 | 208058 |

Table 9.12 Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Northbank Monitoring Station (2017 – 2023) based on measurements taken at 15 minute intervals

| | Turbidity (NTU) | DO (mg/l) | Salinity (ppt) | Temperature (°C) |
|---|---|---|---|---|
| **Mean** | 3.7 | 8.2 | 32.4 | 12.1 |
| **Max** | 500.0 | 14.2 | 37.8 | 21.7 |
| **Min** | 0.0 | 0.9 | 0.0 | 2.0 |
| **5%-ile** | 0.0 | 6.2 | 26.1 | 6.9 |
| **95 %ile** | 14.0 | 9.9 | 35.5 | 17.3 |
| **n** | 204386 | 203697 | 204918 | 206358 |

Table 9.13 Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity, at Tolka Monitoring Station (2017 – 2023) based on measurements taken at 15 minute intervals

| | Turbidity (NTU) | DO (mg/l) | Salinity (ppt) | Temperature (°C) |
|---|---|---|---|---|
| **Mean** | 5.7 | 8.9 | 31.4 | 12.1 |
| **Max** | 615.8 | 17.2 | 38.1 | 25.2 |
| **Min** | 0.0 | 2.1 | 5.6 | 4.0 |
| **5%-ile** | 0.0 | 7.5 | 26.0 | 6.8 |
| **95 %ile** | 21.5 | 10.4 | 34.9 | 17.3 |
| **n** | 134893 | 141670 | 135905 | 142531 |

Water temperature shows the expected seasonal trend. Average daily temperature peaks during July and August (95%ile 17.2 to 17.3 °C) at East Link, North Bank Light and Tolka Estuary. The temperature at the Poolbeg site is slightly higher (95%ile 18.0 °C) compared to the other three sites. The higher temperatures here probably reflects the influence of the nearby cooling water streams.

The two water quality parameters of greatest significance are turbidity and dissolved oxygen. Figure 9-12 to Figure 9-15 show that turbidity can be very variable. However, turbidity levels are generally low in the Port area. The site recording the highest turbidity in general was Poolbeg, and 95% of values recorded at this site are less than 23 NTU. East Link recorded the lowest turbidity in general, and 95% of all values were less than 9 NTU. Tidal scour, particularly during low spring tides, also influences turbidity, particularly at the shallower monitoring locations (Poolbeg and Tolka Estuary).

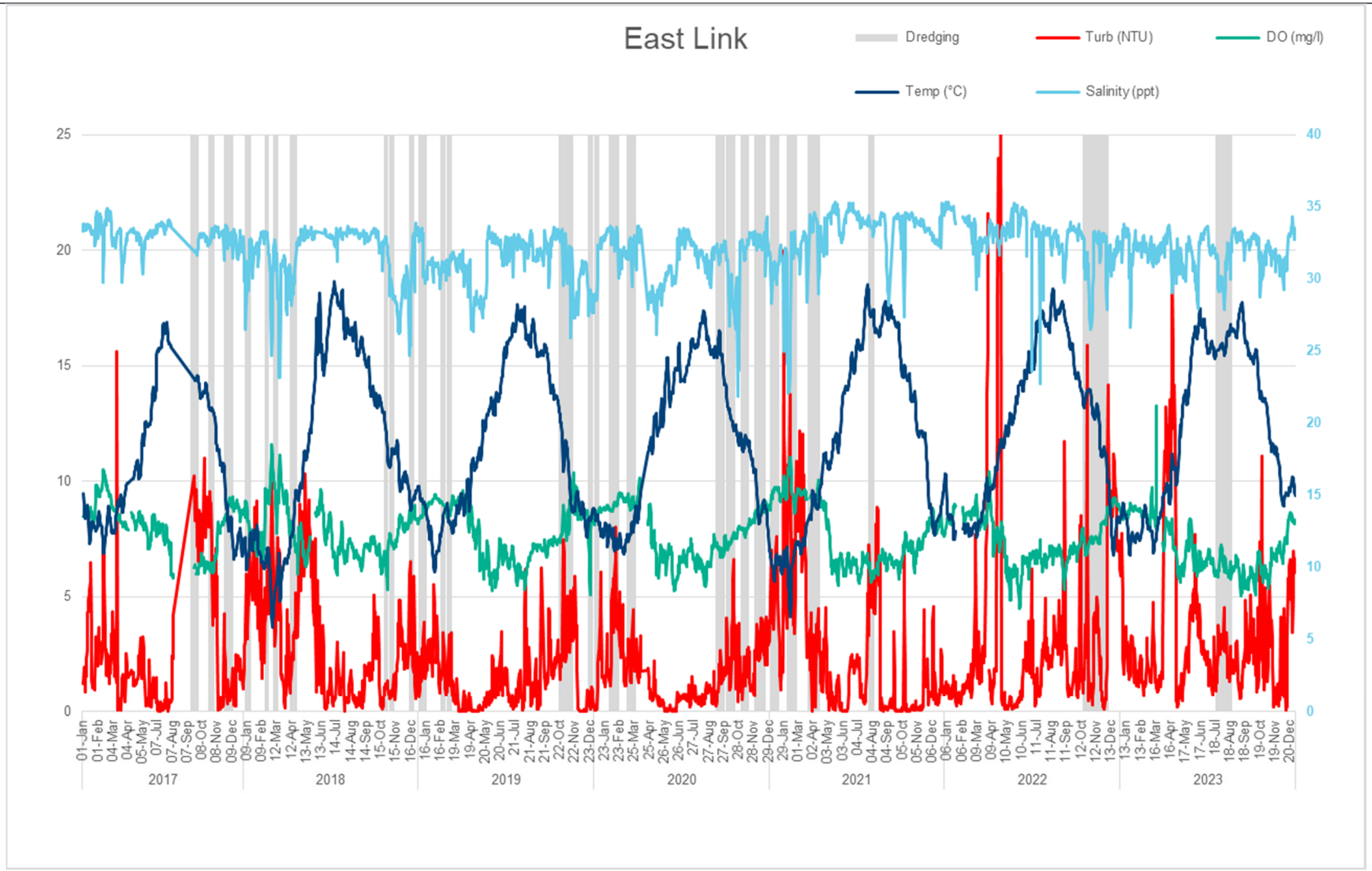


Figure 9-12 Plots of 24-Hour Averages for Water Quality measurements made at Eastlink Monitoring Station (2017-2023). Dredging Periods shown by Grey Bars. Salinity on right axis, all other parameters on left axis.

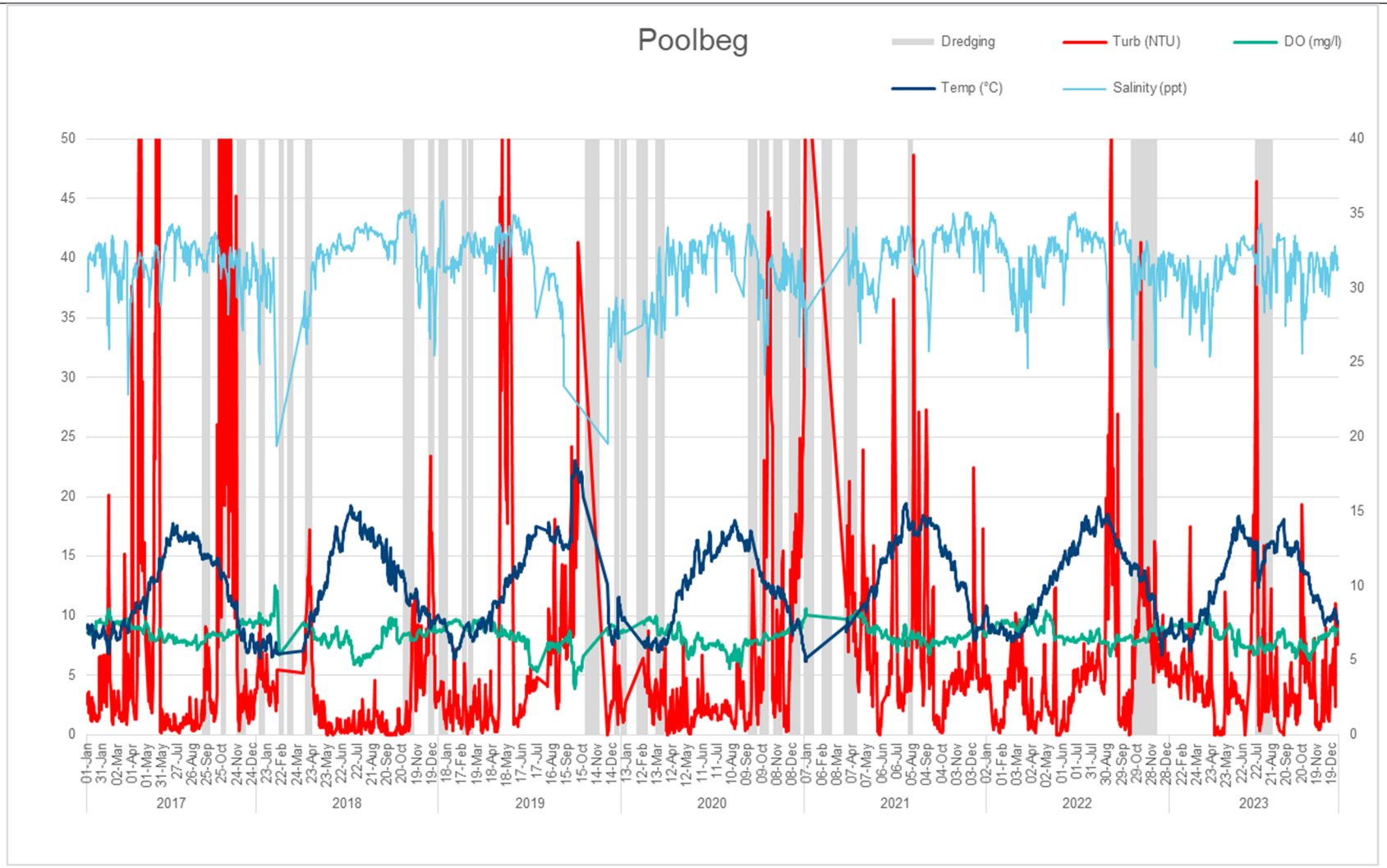


Figure 9-13 Plots of 24-Hour Averages for Water Quality measurements made at Poolbeg Monitoring Station (2017-2023). Dredging Periods shown by Grey Bars. Salinity on right axis, all other parameters on left axis.

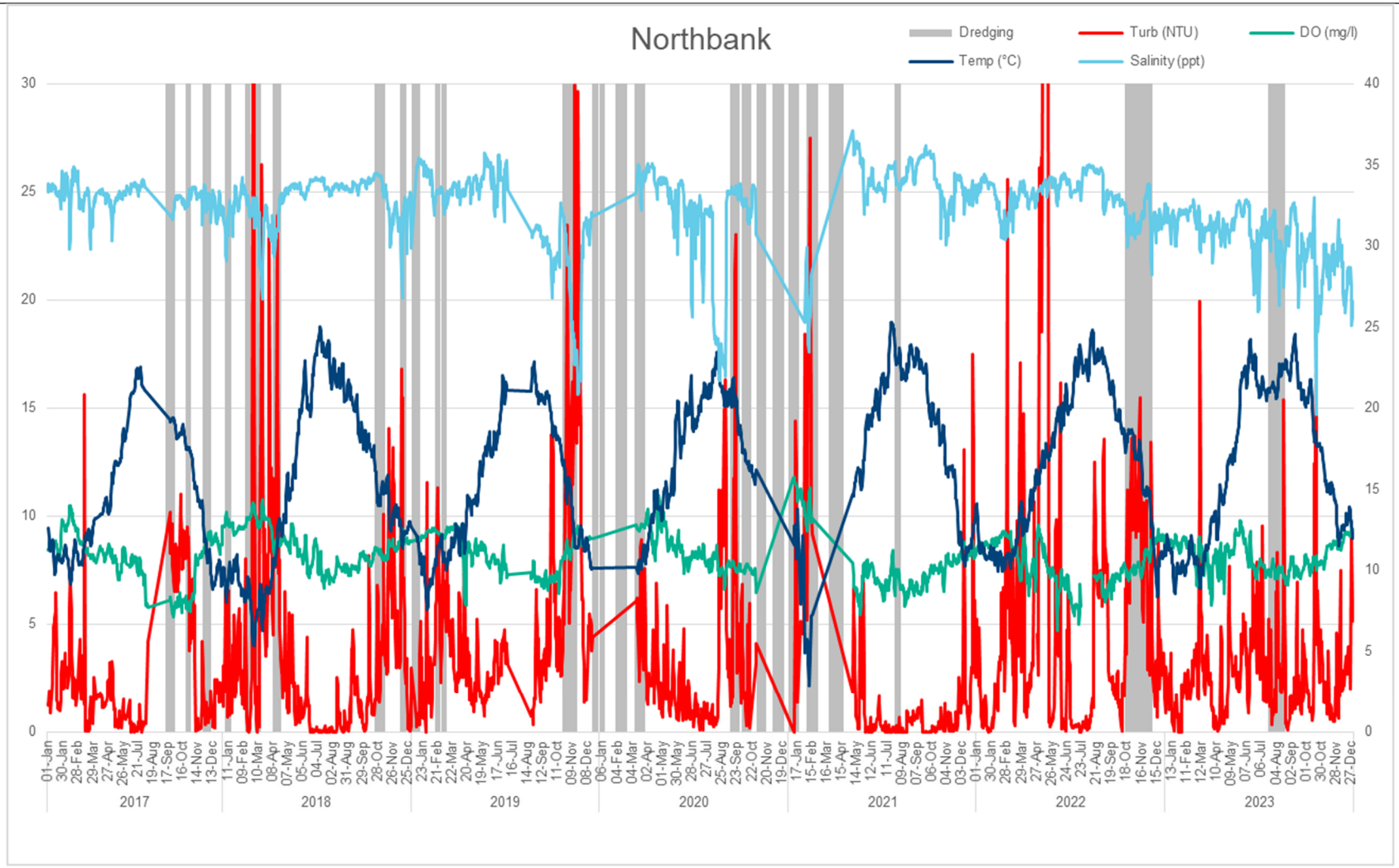


Figure 9-14 Plots of 24-Hour Averages for Water Quality measurements made at Northbank Monitoring Station (2017-2023). Dredging Periods shown by Grey Bars. Salinity on right axis, all other parameters on left axis.

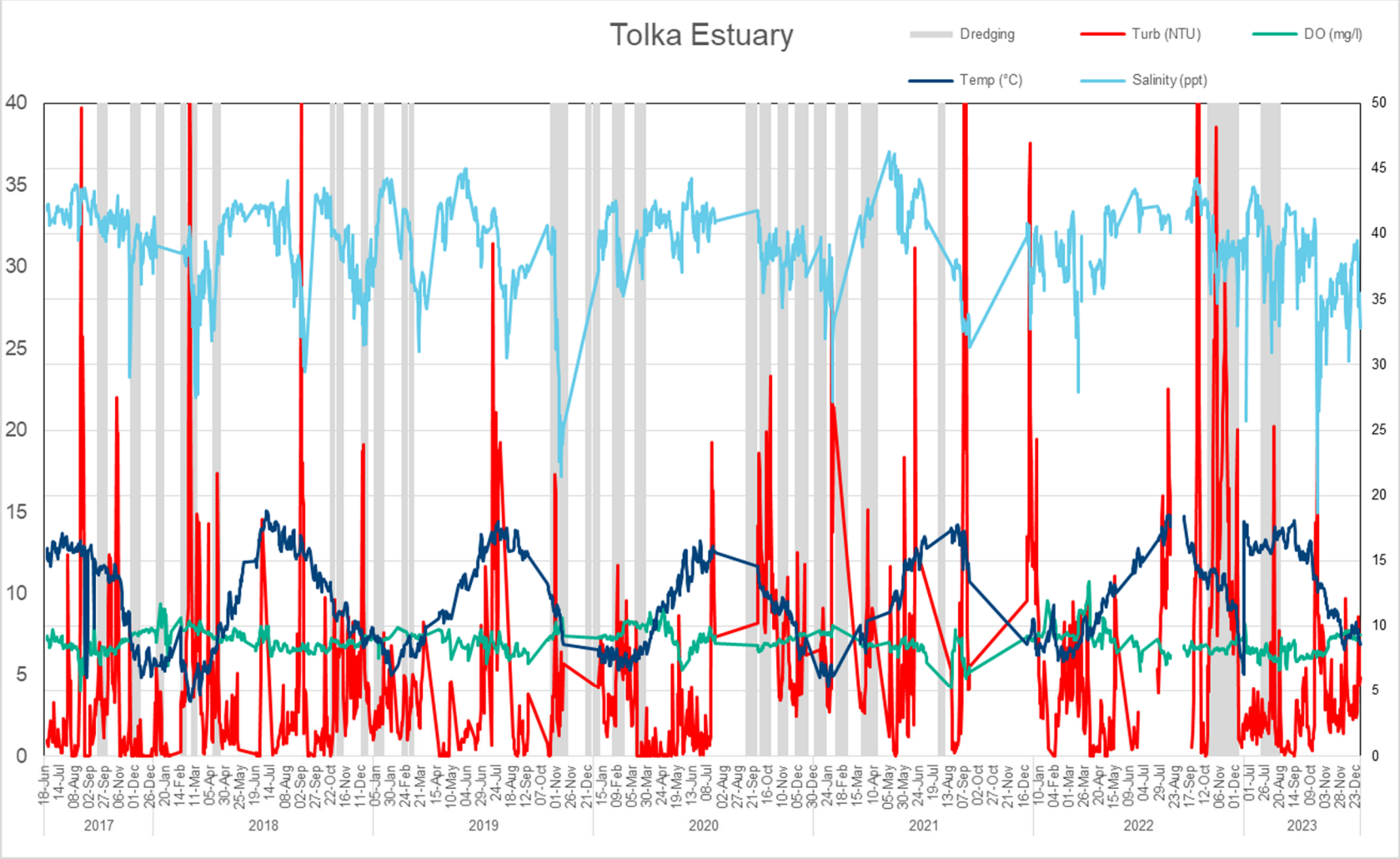


Figure 9-15 Plots of 24-Hour Averages for Water Quality measurements made at Tolka Monitoring Station (2017-2023). Dredging Periods shown by Grey Bars. Salinity on right axis, all other parameters on left axis.

Periods of higher turbidity often occur during the winter period and storms are a major factor in generating elevated turbidity. High turbidity in October 2017 resulted from the impact of storm Ophelia followed quickly by storm Brian. Maximum wave heights of 4.8m and 3.8m respectively were recorded in Dublin Bay during these storms. The impact of storm Ophelia on turbidity is illustrated in Figure 9-16. A further high turbidity event occurred in February/March 2018 and was caused by storm Emma which struck Ireland on 28th February 2018 (Figure 9-17). A maximum wave height of 7.8m was recorded in Dublin Bay during this storm which was extremely destructive and resulted in extensive damage to coastal and monitoring infrastructure.

In April 2021 Maynooth University, as part of the Science Foundation Ireland Predict project, analysed the effect of dumping/dredging on water turbidity in Dublin Port and Dublin Bay using ABR monitoring data provided by Dublin Port Company. The Predict Project developed a model to calculate the effects of wind speed, dredging and dumping on turbidity. The greatest dredging effect was estimated at 4 NTU at the Northbank monitoring station. At the three other stations in Dublin Port (East Link, Poolbeg and Tolka Estuary) it was estimated to be less than 1 NTU.

Investigations during elevated turbidity events have confirmed that ABR Project activities were not implicated in these events. Comparisons of mean turbidity during periods of 'dredging' and 'no dredging' activity showed that there is little difference between absolute values and no apparent pattern i.e. no consistent increase in mean turbidity during dredging episodes as reflected in the plots above. In fact, mean turbidity is higher just as frequently during periods when no dredging was occurring. Measured turbidity results demonstrate that dredging campaigns from 2017 to 2023 did not cause any discernible increase in turbidity within the inner Liffey channel.

Finally, mean dissolved oxygen levels range 7.7 to 8.9 mg/l at the monitoring locations, and 95% of DO values recorded are above 5.6 mg/l to 7.5 mg/l at individual sites. The dissolved oxygen values clearly indicate that oxygen levels are consistently close to saturation levels and no extended periods of oxygen sag occur.

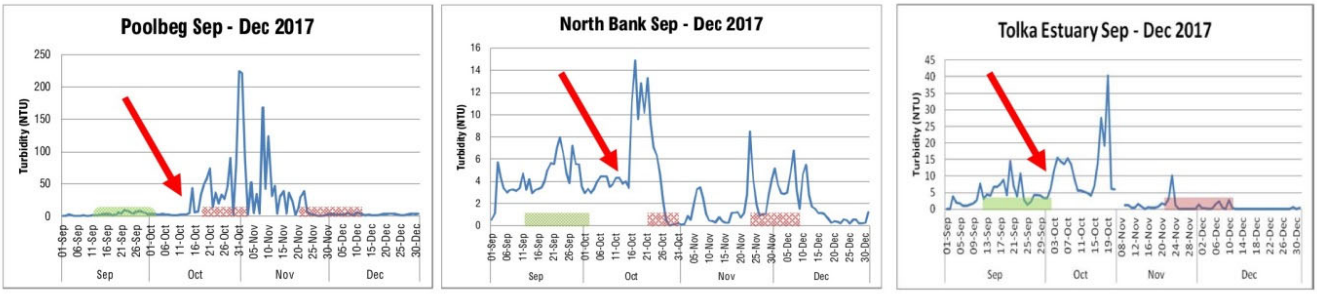


Figure 9-16 Mean daily turbidity September to December 2017 (periods of dredging are indicated by horizontal bars – green for maintenance dredging and red for capital dredging). The onset of storm Ophelia is shown by the red arrows

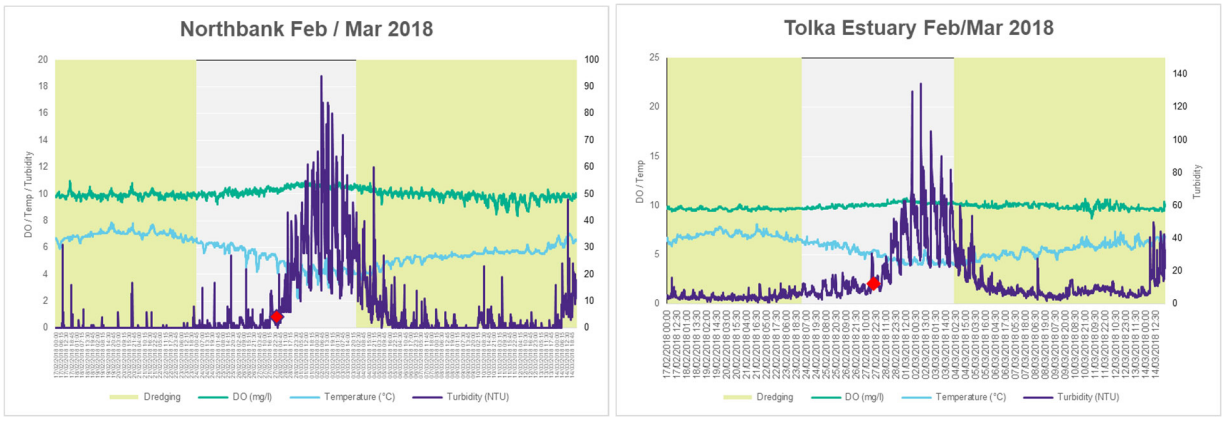


Figure 9-17 Turbidity during Storm Emma. The onset of the storm on 28th February 2018 is indicated by the red marker in both plots. Dredging periods are indicated by the green bars.

### *Within Dublin Bay*

Turbidity was measured in the outer bay area using four Coast Eye Monitoring Buoys as part of the ABR Project monitoring programme. The buoys are shown in Figure 9-18 on the deck of the Commissioners of Irish Light vessel the ILV Granuaile at the time they were launched. Three of the buoys were positioned at the licensed dumping site near the Burford Bank (to the north, in the middle, and to the south). A fourth buoy was located about 2.5km to the northeast of Dalkey to act as a control site. This fourth buoy gives an indication of the background conditions in Dublin Bay remote from the potential impact of dredging activities. All the buoys were moored in about 20m water depth. Their locations are shown in Figure 9-19.


Figure 9-18 Coasteye Monitoring Buoys On Board the ILV Granuaile for Deployment in Dublin Bay

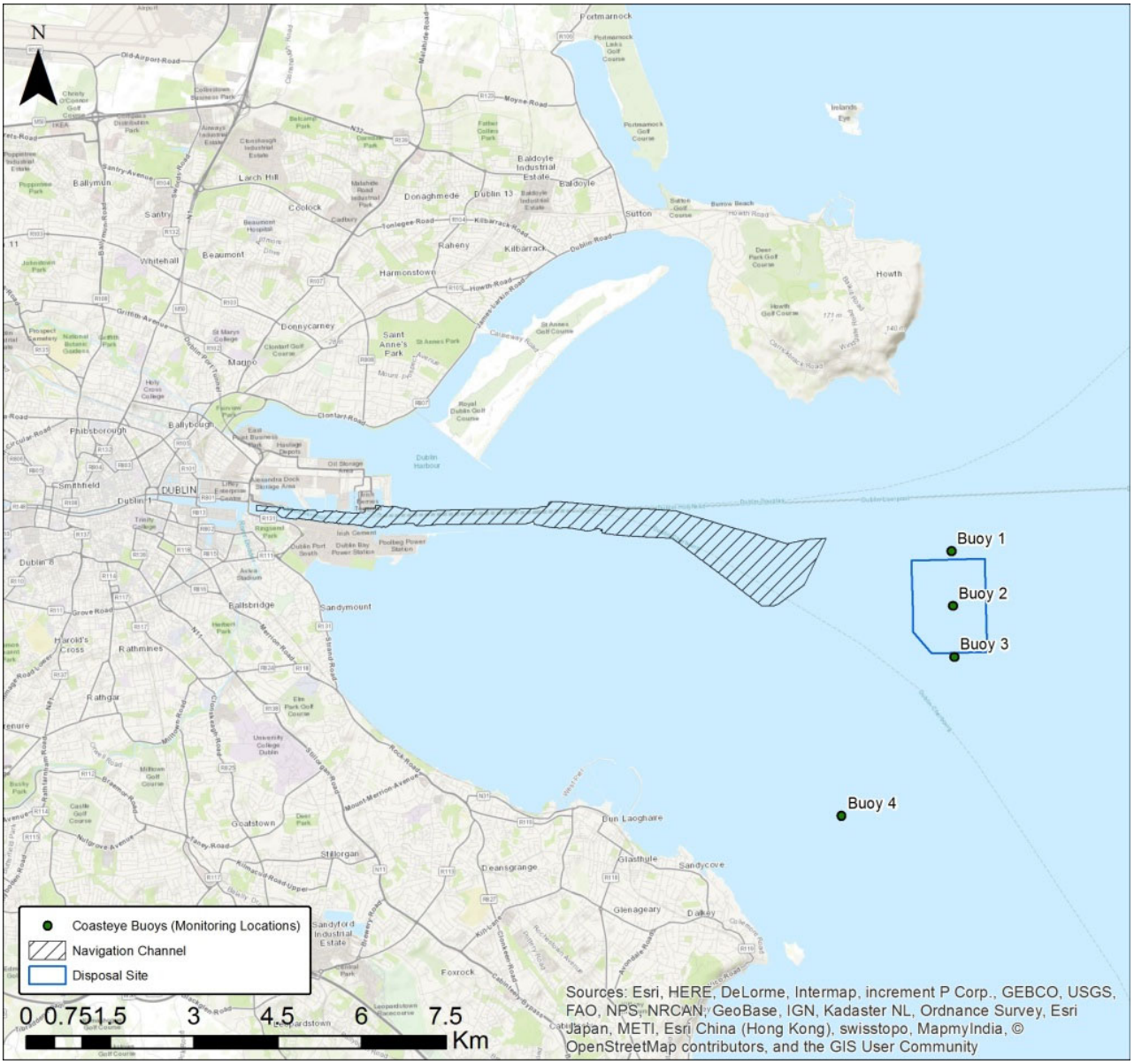


Figure 9-19 Locations of the offshore Coasteye Monitoring Buoys

*Turbidity and Total Suspended Solids in the Bay*

As described above the relationship between turbidity and suspended solids in water is site specific. Therefore, sediment from outside the breakwaters was sampled and used to establish a relationship between turbidity and suspended solids for the outer Bay area. The sediment consisted of fine sand and suspensions were prepared from this sample to provide turbidity in the range 0 to 150 NTU. Turbidity (NTU) and TSS (mg/l) were measured for 75 suspensions to allow construction of the blue calibration curve in Figure 9-20. The previous calibration curve for fine river sediments is also shown for comparison (red curve).

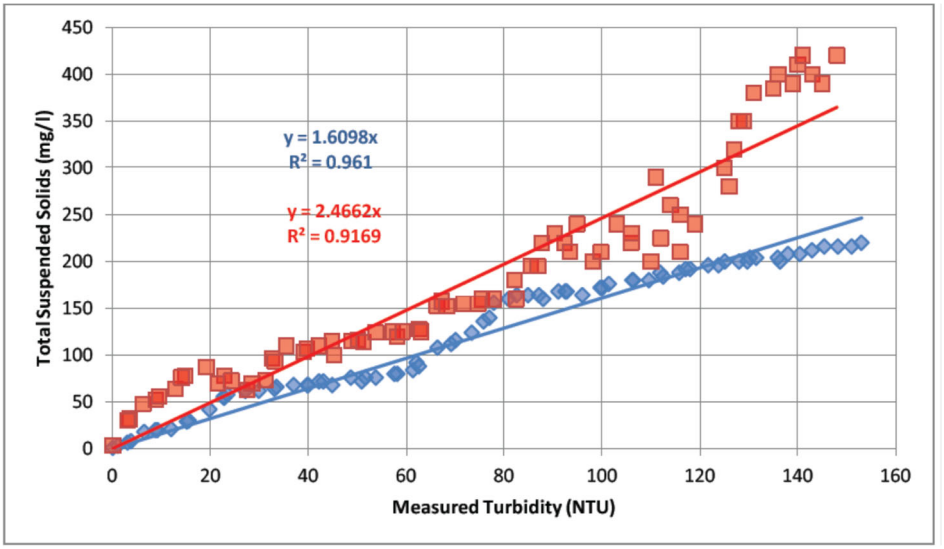


Figure 9-20 TSS versus Turbidity for suspensions of river bed silt sediment (red) and approach channel fine sand sediment (blue). Equations and $r^2$ values are shown in corresponding colours for each series.

Total suspended solids (TSS) (mg/l) is estimated at 1.61 times the turbidity (NTU) for the approach channel sediments (fine sand). The correlation coefficients squared show very good relationships in both calibration series ($r^2 > 0.90$). These relationships are site/sediment-specific but allow an estimate of TSS based on recorded turbidity. They indicate that suspended solids are estimated at 2.5 times turbidity for finer sediments (silt) in suspension, and at 1.6 times turbidity for coarser sediments (fine sand).

Each of the monitoring buoys was equipped with three turbidity sensors: one near the water surface; one in mid water; and one nearer the bottom. Measurements at the buoys were made every fifteen minutes and relayed to a shore-based computer for analysis and reporting. This gives a 3-dimensional record of water clarity and allows detection of any plume of sediment spreading from the dump site when dredge spoil is released. Data recording at each buoy began in September 2017 and continued until May 2021.

Turbidity at each monitoring station generally increases slightly with depth but mean buoy turbidity gave a robust indication of turbidity at each site. Summary statistics for the entire period of record (2017-2021) at each monitoring buoy are given in Table 9.14. Mean turbidity in Dublin Bay was found to be low and ranges from 7.5 to 14.8 NTU. The majority (95%) of turbidity values were less than 25 NTU at buoys 2 to 4 and less than 43 NTU at buoy 1.

Table 9.14 Summary Statistics of 15-minute interval turbidity monitoring data for buoys in Dublin Bay from 2017 to 2021

| | B1 | B2 | B3 | B4 |
|---|---|---|---|---|
| **Mean** | 14.8 | 7.5 | 8.8 | 7.8 |
| **Max** | 548.9 | 342.4 | 323.3 | 253.9 |
| **Min** | 0.0 | 0.0 | 0.0 | 0.0 |
| **5%-ile** | 1.3 | 1.0 | 1.2 | 1.2 |
| **95 %-ile** | 42.9 | 16.8 | 24.1 | 17.2 |
| **n** | 89191 | 53496 | 87777 | 75232 |

Mean daily turbidity at buoys 1 to 4 over the period 2017 to 2021 is shown in Figure 9-21 along with intervals when dredging was ongoing and spoil material was being disposed of at the dumping site. The generally low values for turbidity at all sites are obvious and it is clear that there is no significant effect of dredging on turbidity.

In April 2021 Maynooth University, as part of the Science Foundation Ireland Predict project, analysed the effect of dumping/dredging on water turbidity in Dublin Port and Dublin Bay and using ABR monitoring data provided by Dublin Port Company. The Predict Project developed a model to calculate the effects of wind speed, dredging and dumping on turbidity. The dumping effect was estimated at less than 1 NTU at all monitoring sites in Dublin Bay.

In conclusion, the measured turbidity results demonstrate that the various dredging campaigns between 2017 and 2021 did not cause any discernible increase in turbidity above background levels. These site-specific detailed monitoring data have provided further understanding of existing turbidity levels and variations to provide added context for the assessment of potential significant effects of the construction and operational activities of the 3FM Project.

#### 9.1.2.9 Water Quality Model Simulations

Chapter 13 Coastal Processes details the extensive numerical modelling programme that has been used to assess the 3FM Project and determine the likelihood of significant impacts on the coastal processes within Dublin Port and Dublin Bay. The assessment includes the dispersion and fate of suspended solids arising from the dredging and the loading and dumping of dredge spoil. The Coastal Processes Chapter also includes an assessment of the operational impacts of the 3FM Project on the dispersion of thermal plumes, tidal regime, wave climate and sediment transport regime which are all important elements of the physico-chemical and hydromorphological supporting conditions of the Liffey Estuary Lower in particular. The results of the computational modelling have informed the water quality assessment presented in this Chapter and the assessment of the impacts on the physico-chemical and hydromorphological conditions supporting ecological status in the WFD assessment (appended under separate cover).

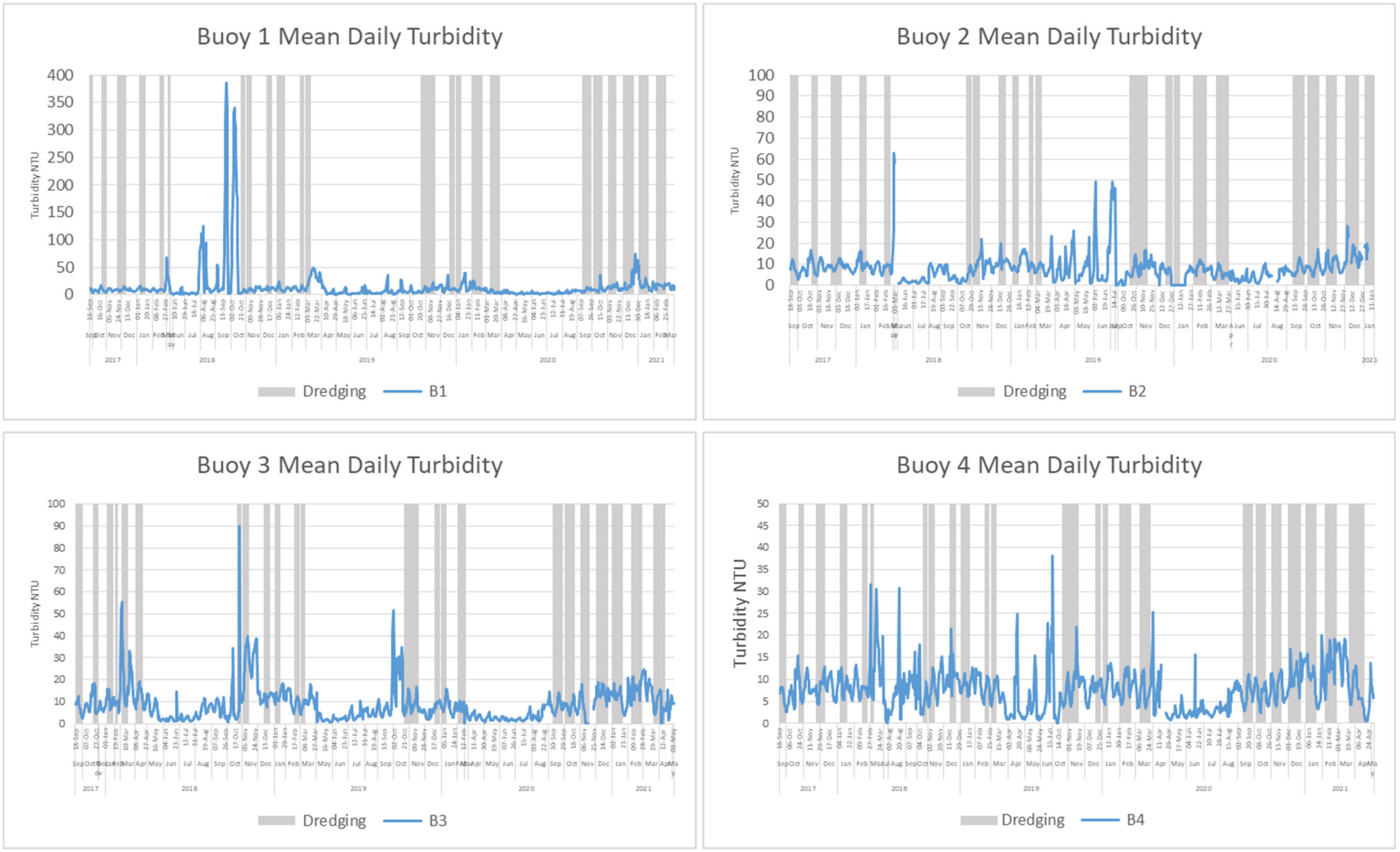


Figure 9-21 Mean daily turbidity measured at 4 Coasteye Buoys (2017-2021). Dredging Periods shown by grey bars.

### 9.1.2.10 Summary of Existing Water Quality

A review of available national monitoring information for the water bodies in the immediate vicinity of the 3FM application boundary, in combination with real time monitoring results from the ABR and MP2 Projects and supported by water quality model simulations has concluded:

- The overall WFD Surface Water Quality status between 2016-2021 is:
  - Liffey Estuary Lower - Moderate
  - Liffey Estuary Upper - Good
  - Tolka Estuary - Poor
  - Dublin Bay – Good
- The overall WFD Groundwater Quality status between 2007-2021 is:
  - Dublin Urban groundwater body (EA-G-008) - Good
- Within the immediate vicinity of the 3FM Project area, there are a number of protected areas as specified in Article 6 of the WFD Directive including areas of Bathing and Recreational Water, Nutrient Sensitive Areas and Water Dependant Natura 2000 sites
  - The regulated bathing areas in the immediate vicinity of the 3FM Project have been classified in the 2023 Monitoring period as Dollymount Strand - Good; Sandymount Strand - Poor; Seapoint – Excellent. Bathing water monitoring in the 2023 season has indicated excellent quality in most samples.
  - The Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon has been designated as a nutrient sensitive area.
  - The licensed dredge spoil dumping area lies within the Rockabill to Dalkey SAC which is designated for Annex I qualifying interest Reef and Annex II species *Phocoea phocoena* (harbour porpoise).
- To date, the extent of achievement of GES under the MSFD has not been established for individual water bodies, consequently no further conclusions can be drawn currently in relation to the MSFD, and the WFD water quality assessment is relied on until specific standards are identified.
- The EPA Water Quality in 2023: An indicators Report has reviewed trends in nutrient inputs to some coastal and transitional water bodies:
  - The report indicates that the Median DIN concentration trend between 2012 and 2023 has changed in the Liffey Estuary Upper and Liffey Estuary Lower with an upward trend in winter DIN concentrations however the median concentrations recorded in the 2021 to 2023 monitoring period were still 49% to 15% below the threshold. The Tolka Estuary recorded median winter DIN concentrations in the 2021 – 2023 monitoring period of between 1% to 50% above the threshold. Dublin Bay has experienced a significant reduction in winter DIN levels, a trend which has been continuing since 2012, and the median winter DIN concentrations are more than 50% lower than the threshold.

  - The report indicates that the Median MRP concentration trend between 2012 and 2023 has remained stable for Liffey Lower Estuary, the Tolka Estuary and Dublin Bay with no exceedances in the Winter MRP threshold. Concentrations recorded were between 15% and 49% lower than the MRP Standard.

- Marine Institute monitoring in Dublin Bay in 2022 determined that the effects of dredging (both loading and spoil disposal) appear to be contained within the areas in question and do not appear to be impacting the wider seabed invertebrate communities in Dublin Bay. The Marine Institute also measures turbidity, temperature and dissolved oxygen in the Liffey estuary and Dublin Bay.
- Dublin Port Company is carrying out extensive monitoring of water quality in Dublin Port and Dublin Bay as part of the ABR and MP2 Projects. Monitoring stations have been established in Dublin Port and Dublin Bay to provide detailed information on relevant water quality parameters. Monitoring carried out by the Marine Institute shows similar turbidity and dissolved oxygen levels to that recorded by the ABR Project monitoring programme.
  - High frequency water quality monitoring over a period of seven years as part of the ABR and MP2 Projects at various locations in the Port has shown that turbidity remains generally low at most sites, typically less than 10 NTU (equivalent to about 25mg/l Total Suspended Solids). Dredging operations have been shown to have no significant effect on turbidity outside immediate areas of operation. Dissolved oxygen remains consistently close to saturation levels.
  - High frequency measurements of turbidity in Dublin Bay from 2017 to 2021 show that mean turbidity is below 15 NTU at all monitored sites (equivalent to about 24mg/l Total Suspended Solids). There is no obvious relationship between turbidity and dredging periods. The effect of spoil dumping on Dublin Bay turbidity has been modelled at less than one NTU.
  - Ambient water quality has been satisfactory during the monitoring programme 2017 - 2023 and has not been impacted by loading or dumping during dredging operations. Dredging campaigns between 2017 and 2023 did not cause any discernible increase in turbidity above background levels.
- Water quality model simulations, undertaken to assess the likely water quality impact of dredging and disposal operations on general water quality and protected areas, have concluded that there will be no significant elevation in suspended solids outside the immediate zone of the operations. Independent analysis of DPC monitoring data as part of the Science Foundation Ireland Predict Project confirmed no significant effect of dredging on turbidity in the Liffey Estuary or Dublin Bay.

### 9.1.3 Likelihood of Impacts

The likelihood of environmental impacts arising due to the 3FM Project is assessed in relation to the construction and operational phases. The elements of construction and operation and the potential impacts on water quality have been identified for assessment.

The assessment has been informed by consultation with a wide range of stakeholders. Consultees included Dublin City Council, Inland Fisheries Ireland, Marine Institute, EPA, National Parks and Wildlife Service. The consultation process is described in detail in Chapter 3 of this EIAR.

The significance of any environmental effect is rated based on the magnitude of the impact and the importance of the attribute as detailed in Section 9.1.1. Based on the criteria detailed in NRA Guidelines, the Dublin Bay coastal water body, the Liffey Estuary Lower and Tolka Estuary water bodies are considered to be of "extremely high" importance due to designation under the Urban Waste Water Treatment Directive (91/271/EEC) and/or proximity to the North Dublin Bay SAC and South Dublin Bay and Tolka Estuary SPA designated under EU Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC). The Liffey Estuary Upper is considered to be of "very high" importance due to its quality and value on a regional scale. The Dodder-050 and Tolka_060 river water bodies are considered to be of "high" importance due to their quality and value on a local scale.

The 3FM Project at Dublin Port has the potential to directly impact upon the ‘Liffey Estuary Lower’ transitional water body (EA_090_0300), ‘Dublin Bay’ coastal water body (EA_090_0000), the Dodder_050 river water body and the Tolka_060 river water body given the location of the works. The potential to indirectly impact upon the adjacent 'Tolka Estuary' (EA_090_0200) ‘and Liffey Estuary Upper’ (EA_090_0400) transitional water bodies has also been considered.

#### 9.1.3.1 Potential Construction Phase Impacts

The major elements of the construction programme are outlined in Chapter 5 of this EIAR. In summary and for the purposes of this assessment they have been considered as the following main types of works:

- Demolition of existing structures, i.e. Poolbeg Oil Jetty, Sludge Jetty; existing buildings at Poolbeg Yacht and Boat Club, Stella Maris Rowing Club, Seatruck T4 Terminal and Port Park, the concrete nib at Berth 44/45, the disused slipway at Poolbeg Yacht and boat Club and demolition of the existing structures at the MTL container terminal to facilitate works at Area K;
- Road and Bridge Construction - the Southern Port Access Route (SPAR) including new bridge across the River Liffey to link the north and south Port areas and improvements to the existing road network on the north Port are and the Poolbeg Peninsula;
- Maritime Village Construction;
- Construction of new Lo-Lo container terminal with cargo handling area, imports terminal and exports terminal in front of the ESBs generating station;
  - A terminal located north of the ESB’s Generating Station on the eastern end of Poolbeg Peninsula. The terminal will have 650m of deep water berthage dredged to a depth of -13.0m CD (Chart Datum), plus associated cargo handling areas (Dublin Port Masterplan Area N). This terminal will accommodate Lo-Lo vessels of up to 240m length overall, primarily from continental Europe, on a

new open-piled wharf. The works will require the demolition of the existing Poolbeg Oil Jetty which will be replaced by a new oil transfer facility at the eastern end of the wharf.

  - The terminal above will operate in conjunction with a transit container storage yard located on waterside land currently used for bulk cargo handling (Dublin Port Masterplan Area L).

- Replacement of the existing Lo-Lo container terminal, currently operated by Marine Terminals Limited (MTL), with a new Roll-On Roll-Off (Ro-Ro) freight terminal with an annual throughput capacity of 360,000 Ro-Ro units or 8.69m tonnes. The Ro-Ro freight terminal will consist of two main components:
  - Terminal located at existing Berths 42 – 45 including provision of two berths, each with a single tier Ro-Ro ramp, plus associated cargo handling facilities (Dublin Port Masterplan Area K).
  - Terminal located on Port owned land on the southern side of the Poolbeg Peninsula (Dublin Port Masterplan Area O).
- Capital Dredging and Spoil Disposal
  - Dredging of deep berthage to a depth of -13.0m CD (Chart Datum) at the new Lo-Lo container terminal at Area N;
  - Dredging of ship turning circle in front of Pigeon House Harbour to a depth of -10 m CD;
  - Dredging of Liffey channel from Poolbeg Marina to Tom Clarke Bridge;
  - Dredging at Area K - Ro-Ro Terminal to facilitate localised scour protection to 220 kV cables
  - Disposal of dredge spoil at the offshore disposal site
- Landside ancillary works required to serve the marine side operations.

Temporary impacts on water quality have the potential to occur during the construction phase of the works. Mobilised suspended sediment and cement release through construction activities are the principal potential sources of water quality impact. The following have been considered in this assessment:

- Increased suspended sediment levels due to the accidental release of sediment to the water column during:
  - Demolition of buildings and structures;
  - Berth Construction including the construction of waterside berths, quay walls, jetties, open piled structures.
  - Capital Dredging and Sediment disposal operations;
  - Landside ancillary works to serve the marine operations including the transit Lo-Lo container storage yard at Area L and the transit Ro-Ro trailer yard at Area O, construction of buildings, ramps and deck structures to access linkspans, services, including foul water and storm water drainage installation, and installation of jetty furniture and fender systems etc;
  - Road and bridge construction to link the north and south port areas.

- Accidental release of highly alkaline contaminants from concrete and cement during the demolition of buildings and structures and the construction of hardstand areas, waterside berths, quay walls, jetties, bridging structures, etc.; and
- General water quality impacts associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals.

The impacts in relation to the construction of each component of works are assessed in Section 9.1.4 in sequence.

### 9.1.3.2 Potential Operational Phase Impacts

The operational phase impacts associated with the 3FM Project (buildings/structures, roads, berths and associated marine berthing and landside works areas) represents an increase in the current normal day to day port activities. These associated impacts are currently well understood and managed within the Port's operational and maintenance procedures. The principal potential sources of water quality impact are:

- Increased suspended sediment levels due to port operations including the ongoing maintenance dredging of the new berths.
- Increased number and size of vessels using Dublin Port.
- General water quality impacts associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals and releases associated with the operation and maintenance of surface water and foul drainage systems.
- In addition to normal day-to-day port activities and potential impact on water quality, any hydromorphological impacts, associated with the operation of coastal and bankside structures, have been assessed based on the coastal process modelling in Chapter 13 of this EIAR and are assessed further in the context of the designation of the Liffey Estuary Lower as a heavily modified water body (HMWB) with a specified use of Port Operations in the WFD Assessment appended under separate cover.

### 9.1.3.3 Impact Matrix (Absence of Mitigation)

The potential impacts outlined in Sections 9.1.3.1 and 9.1.3.2 above are rated based on the impact level criteria in Section 9.1.1 to indicate their potential severity (profound, significant, moderate, slight and imperceptible) in the absence of any mitigation as summarised in Table 9.15. The assessment reflects the activities and pollutants listed above, and construction and operational phases of the 3FM Project are considered separately.

Table 9.15 Potential Impact Rating Matrix (in the absence of mitigation)

| Potential Impacts | Significance of Environmental Impact | | | | |
|---|---|---|---|---|---|
| **CONSTRUCTION PHASE** | **Demolition of Existing Structures** | **Berth Construction** | **Capital Dredging** | **Road and Bridge Construction** | **Landside Works** |
| Suspended sediments / sedimentation | Significant | Imperceptible | Profound | Significant | Significant |
| Concrete and cement pollution | Significant | Significant | No Impact | Significant | Significant |
| Impacts associated with general construction works | Significant / Moderate | | | | |
| **OPERATIONAL PHASE** | **Buildings & structures** | **Berth Operation** | **Maintenance Dredging** | **Road and Bridge Operation** | **Landside Works** |
| Suspended sediments / sedimentation | Imperceptible | Imperceptible | Significant | Significant | Significant |
| Increased number and size of vessels | Imperceptible | Imperceptible | Significant | Imperceptible | Imperceptible |
| Impacts associated with general port operation activities | Significant | | | | |
| Hydromorphological Impacts | Imperceptible | | | | |

## 9.1.4 Description of Likely Significant Impacts

### 9.1.4.1 Construction Phase Impacts

***Suspended Sediment and Sedimentation***

Demolition of existing buildings and marine structures

As described in Chapter 5, decommissioning and demolition of existing structures such as the Poolbeg Oil Jetty is required to facilitate the construction of the new Lo-Lo container terminal with cargo handling area, imports terminal (Area N), whilst the Sludge Jetty will be demolished to facilitate the dredging of the proposed ship turning circle in front of Pigeon House Harbour. A small existing concrete nib structure will also be demolished to the east of Berth 45 to facilitate the works in the new Ro-Ro terminal (Area K). A portion of the hardstand at berth 47 will also be removed to facilitate the dredging of the turning circle. Buildings in the existing MTL terminal will be demolished to facilitate the construction of Area K, including a number of portacabin structures and warehousing. Three number buildings and a disused slipway in the existing Stella Maris and Poolbeg Rowing/Yacht Club site will also require demolition as will existing buildings in the Seatruck T4 Terminal and Port Park.

The existing Poolbeg Oil Jetty superstructure will be decommissioned, partially dismantled (removing parts of the structure to clear the navigation at Area N). The existing piles at the Poolbeg Oil Jetty will be cut off below deck level and remain in-situ where they don't conflict with the new piling arrangement for the wharf. At the sludge jetty the concrete decking and buildings will be demolished using marine plant and floating platforms and crushed for potential reuse. Alternatively jetting equipment may be used to loosen the surrounding soil allowing piles to be extracted using a suspended vibratory hammer fitted with a clamp. The steel piles of the structure will then be removed and cut into sections using typical mechanical methodology before being removed by barge to a suitably licenced facility. It is anticipated that the existing structures will be

decommissioned in a phased manner starting at the northern elevation and working back towards shore. It is envisaged that the in-situ sections of the existing jetties will be utilised as a demolition platform as the works progress back towards the shore so that no temporary structures will be required to facilitate demolition.

Surface water quality could be impacted during the demolition works outlined above through the generation of sediment plumes during pile removal, or during site clearance by exposing soils/rubble to erosion by rainwater and drainage water run-off from the site.

The magnitude of the potential impacts of sediment entering the aquatic environment due to demolition works, in view of the temporary duration and localised nature of any disturbance to the Liffey Estuary Lower, are considered to be *minor adverse* with regard to water quality. However, given the extremely high sensitivity of the Liffey Estuary Lower receiving environment, the potential impact is rated as 'Significant' (Table 9.3).

Berth Construction and Re-fronting

As described in Chapter 5, the 3FM Project involves the construction of a new berthage at Area N along the south side of the navigation channel at the eastern extreme of the Port. The works will also include the partial removal of the Poolbeg Oil Jetty as outlined above. The berth will be used as the new Lo-Lo container terminal. The open piled quay structure will comprise a composite concrete deck slab (precast and in situ concrete elements) which will be supported on steel tubular piles installed in a grid pattern (approximately 6m spacing). The exact spacing of the piles will be subject to detailed design.

The deck slab will be deep enough to support crane rails and will be supported on precast concrete beams which will span between precast pile caps placed on top of the tubular steel piles. A reinforced concrete edge beam will be provided along the front edge of the structure.

Re-fronting of the existing caissons along Berth 44 and Berth 45 at Area K will also be undertaken. This will require the installation of a combi wall in front of the existing caissons. A combi-wall comprises tubular steel piles installed at intervals with traditional steel sheet piles filling the space between.

Piling is also required at the SPAR road along the southern bank of the Liffey Estuary Lower, at the SPAR Bridge and for the installation of the Linkspan at the Ro-Ro Terminal (Area K).

Pile installation operations have the potential to cause a temporary increase in suspended sediment due to disturbance of the riverbed materials causing the resuspension of sediments in the water column leading to localised reduction in water quality.

The magnitude of the potential impacts arising from pile installation is considered to be *negligible* with regard to water quality. The significance of the environmental effect is therefore *Imperceptible* in the absence of mitigation based on the extremely high sensitivity of the receiving environment over the short term (Table 9.3).

Capital Dredging and Spoil Disposal

Dredging is required to facilitate creation of the proposed turning circle, and to provide sufficient water depth at the berthing pocket for the Lo-Lo Terminal at Area N as described in Chapter 5. Dredged depths will range from -8.7m CD to -13m CD. Dredging of Liffey channel from the Poolbeg Marina to Tom Clarke Bridge is required for the maritime Village and the SPAR Viaduct and at Area K to facilitate localised scour protection to 220 kV cables.

Dredging operations will cause temporary suspension and release of sediments at the loading sites. Dumping operations will also give rise to temporary sediment plumes at the licensed disposal site at the approaches to Dublin Bay. Dredging loading operations have been designed to minimise the disturbance and escape of material at the seabed and during removal through the water column. Individual loading operations are of relatively short duration and intermittent in nature and the works area is limited. While it is proposed to dispose of most of the dredge spoil at the licensed disposal site which is naturally dispersive for fine sediments, an estimated 70,000m$^3$ of dredge material from the area of Poolbeg Marina is not suitable for disposal at sea and will require recovery/disposal to a non-hazardous landfill (see Chapter 8). Nevertheless, significant amounts of dredge material will be removed and deposited at the disposal site on the approaches to Dublin Bay over a relatively extended period.

The magnitude of the potential impact from suspended sediment due to dredging and disposal is considered to have a moderate adverse risk to water quality. The localised significance of the environmental effect is therefore profound adverse in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

SPAR Road and Bridge

There are a number of sections of the SPAR Road that have the potential to generate increased suspended sediment in run-off from the construction areas:

- The northern section and southern sections of the SPAR Road predominantly within Dublin Port Company Lands - Construction works associated with the road construction can give rise to mobilisation and release of sediments during excavation and exposure of unprotected soils and subsoils, stockpiling and the construction of associated infrastructure. This could potentially result in an increase in suspended sediments concentrations in run-off from the site.
- The SPAR Bridge across the Liffey Estuary Lower downstream of the Tom Clarke Bridge – As with the berth construction pilling and cofferdams will be required for the construction of the bridge piers and abutments. Pile installation operations have the potential to cause a temporary increase in suspended sediment due to disturbance of the riverbed materials causing the resuspension of sediments in the water column leading to the localised reduction in water quality.
- The SPAR viaduct with twelve piers (including abutments) along a distance of 620 metres on the south bank of the Estuary linking the SPAR Bridge with the southern SPAR road at the Maritime Village. As with the SPAR Bridge the piling required for the piers could potentially result in increase in suspended solids;

The magnitude of the potential impacts from suspended sediment arising from SPAR Road and Bridge is considered to be moderate with regard to water quality. The significance of the environmental effect is therefore profound adverse in the absence of mitigation based on the extremely high sensitivity of the receiving environment over the short term.

Maritime Village

The development of the Maritime Village will require some reconfiguration of the existing modified coastline through the removal of some of the existing reclaimed land in the Lower Liffey Channel and limited areas of new reclamation to facilitate the construction of the Maritime village.

The magnitude of the potential impacts arising from sediment from the reconfiguration of the shoreline and the localised disturbance to the Liffey Estuary Lower are considered to be minor adverse with regard to localised water quality. The significance of the environmental effect is therefore significant, in the absence of mitigation, based on the extremely high sensitivity of the receiving environment.

Landside ancillary works

Landside construction works are ancillary works required to serve the marine side works including the transit Lo-Lo container storage yard at Area L and the transit Ro-Ro trailer yard at Area O, construction of buildings, ramps and deck structures to access linkspans, services, including foul water and storm water drainage installation, and installation of jetty furniture and fender system. Other relatively minor boundary and access works are also proposed such as a segregated commuter active travel link which is to be provided connecting the proposed North Wall Square and proposed Liffey-Tolka Project to Sean Moore Park and Sandymount (Chapter 5).

Construction works can give rise to mobilisation and release of sediments during excavation and exposure of unprotected soils, stockpiling, and the construction of southern Port road infrastructure and active travel link. This could potentially result in an increase in suspended sediment concentrations in run-off from the site.

Based on the extent and area of works across a number of different locations, the magnitude of the potential impacts arising due to sediment from construction is assessed to have a *moderate adverse* risk to water quality. The significance of the potential environmental effect is therefore *profound adverse* in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

### *Concrete and Cement Pollution*

Demolition of existing buildings & structures

Demolition works will be required and it is likely that this will include localised breaking out of concrete using a rock breaker mounted on an excavator, particularly the removal of the concrete Nib structure at Berth 45 to facilitate the construction of Area K. This has the potential to create highly alkaline dust in the absence of mitigation, which in turn could find its way into the water column in the Liffey Estuary Lower and pose a threat of pollution.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from demolition dust entering waters are considered to be *minor adverse.* The significance of the environmental effect is therefore *significant adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

Berth Construction and Re-fronting

Fresh concrete and cement is highly alkaline and therefore will affect water quality (particularly in terms of pH) if washed into the water body. The impacts in relation to cement and concrete for berth construction (Area N),

re-fronting (Area K) and the combi wall at the 47A hardstanding area to facilitate the development of this area by the Codling Wind Park, relate to several elements of work. Concrete will be poured in-situ during construction of jetty concrete decks, bank-seats and access ramps. Precast structures on dolphins and bridge beams will be filled with reinforced concrete. Steel combi-walls will have concrete capping beams and cofferdam voids will be filled with reinforced concrete.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from concrete/cement entering waters are considered to be *moderate adverse.* The significance of the environmental effect is therefore *profound adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

Capital Dredging and Spoil Disposal

Capital dredging does not entail any concrete or cement works. Therefore, there are no potential effects on water quality arising from concrete/cement pollution associated with dredging. The significance rating of the environmental effect is therefore *imperceptible*.

SPAR Road and Bridge

There will be five piers within the Liffey Estuary Lower which will largely align with piers on the Tom Clarke Bridge so as to minimise impact on navigation and river flows. On the northern shore there will be an abutment and the southern end of the bridge will tie into the proposed SPAR Viaduct which will run parallel with the R131. The SPAR Viaduct will also require a number of supporting piers. The piers will be constructed within cofferdams with piling required to bed rock level and a concrete pile cap. The piers will then be cast within the cofferdams on top of the pile cap.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from concrete/cement entering waters are considered to be moderate adverse. The significance of the environmental effect is therefore profound adverse in the absence of mitigation based on the high sensitivity of the receiving environment.

Maritime Village

The potential impacts in relation to cement and concrete relate to the re-fronting of the shoreline at the Maritime Village and the construction of slipways, boat dock, operational areas for harbour, landside marina areas and public areas. Concrete will be poured in-situ during construction of these areas and precast structures will be filled with reinforced concrete. Steel combi-walls will have concrete capping beams and cofferdam voids will be filled with reinforced concrete.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from concrete/cement entering waters are considered to be moderate adverse. The significance of the environmental effect is therefore profound adverse in the absence of mitigation based on the high sensitivity of the receiving environment.

Landside ancillary works

Landside construction works required to serve the marine side works are described in Chapter 5. The impacts in relation to cement and concrete for the landside works relate to a range of activities mainly including

construction and upgrade of access routes, and installation of underground services and drainage systems associated with the road network and active travel path. The works will also include the demolition of a number of buildings within the existing MTL terminal.

Landside works are relatively small scale and are largely separated from aquatic systems by buffer areas. Demolition of concrete structures has the potential to create highly alkaline dust in the absence of mitigation, which could find its way into the aquatic system and pose a threat of pollution. The scale of demolition required is small and some of the structures for removal are prefabricated units.

Based on the relatively small scale of works the magnitude of the potential impacts arising due to cement and concrete from landside construction is assessed to have a *minor adverse* risk to localised water quality. The significance rating of the potential environmental effect over the short term is *significant adverse* in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

#### *General Construction Works*

The construction works will involve the use of plant and machinery, as well as the associated temporary storage of construction materials, oils, fuels and chemicals. During the construction phase there is the potential for accidental spillage or release of construction materials (e.g. diesel, oil, chemicals), and although the potential site compounds will not be sited immediately adjacent to the water body there is the potential for contaminants to drain into the harbour and estuary in the absence of mitigation. It is also possible that residual contaminants may be mobilised during the demolition of the disused Poolbeg Oil Jetty and the reconfiguration of oil pipeline infrastructure with hydrocarbon residuals within the flushed fluids representing possible sources of contamination to the harbour resulting in a localised deterioration in water quality within the Port area.

Given the scale and nature of the works, the magnitude of the impact associated with general construction is considered to be *minor adverse*. The significance of the environmental effect is therefore *significant adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

### 9.1.4.2 Operational Phase Impacts

#### *Suspended Sediment and Sedimentation*

The new facilities will increase the number of larger vessels that use Dublin Port. Dredging is required to maintain the established charted depth of navigation channels, manoeuvring areas (including the turning circle), and the operational depths of the berthing pockets at Area K and Area N. The annual sediment load entering the Port from the upstream Liffey catchment, leading to deposition in the Port, will not change significantly due to the 3FM Project. Therefore, maintenance dredging requirements to maintain the new channels and pockets should not differ substantially from the current operational conditions.

There will be no perceptible changes in suspended sediments associated with the operation of the new structures, berths or landside works. Any increase in suspended sediments and sedimentation due to maintenance dredging as a result of the 3FM Project is likely to be low and is assessed to have a localised *minor adverse* impact to water quality. The significance of the effect is therefore *significant* in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

### *Washwater from Exhaust Gas Cleaning System*

In order to reduce atmospheric pollution the International Maritime Organisation (IMO) regulates emissions of sulphur oxides (SOx) from ships in line with The International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. It sets limits for the sulphur content of fuels but also allows ships to use alternative compliance options to achieve SOx emission limits in the exhaust gas (IMO, 2020). One of the main alternative compliance options is an Exhaust Gas Cleaning System (EGCS). Wet and dry EGCS systems are available.

The new facilities will allow increase the number of larger vessels to that use Dublin Port. The main pollutants of concern from EGCS emissions in relation to environmental impact and human health risk are acidification (decreased pH), PAHs, metals and particulate matter (PM). In recent years Dublin Port Company, through very significant investment, has made great progress in improving the aquatic environment of the Port, both water and sediment quality. In the interval since 2006 a mean index of sediment contamination based on metals, PCBs and PAHs has improved by approximately 60%. Dublin Port must also consider its proximity to, and shared waters with numerous protected habitats and species.

Given the sensitivity of the receiving environment in the jurisdictional area of Dublin Port Company, the clear evidence for pollutant discharges from EGCS, and the significant information and data gaps in relation to ambient environmental impacts and cumulative effects, Dublin Port applies the precautionary principle and currently has an active Marine Notice prohibiting EGCS discharges. The increase in larger vessels will therefore not result in increased loading of contaminants of concern. This will continue until more evidence on the impact of the washwater from EGCS is known.

Based on the continued prohibition of washwater discharges to Dublin Port the potential impacts arising due to the increased number and size of vessels using the Port facilities is assessed to present a *negligible* risk to localised water quality. The significance rating of the potential environmental effect over the long term is therefore *imperceptible* based on the extremely high sensitivity of the receiving environment.

### *General Operational Activities*

Surface water drains installed in new hardstand areas, the SPAR road, and the reconfigured road network on the Poolbeg Peninsula have the potential to provide pathways for a wide range of contaminants arising from general port operations to the aquatic environment. Direct pathways also exist within the immediate landside hinterland of facilities. Such pollutants may derive from spillages, vehicle operation, atmospheric deposition, erosional losses and leakages. The main potential pollutants from surface water drainage or direct run-off are sediment, hydrocarbons, and trace contaminants including metals and organics.

The development will be serviced by a dedicated foul water network connecting to the existing Uisce Éireann Rathmines to Pembrooke 1,500mm trunk sewer, which will also require a diversion to accommodate the development of Area K Ro-Ro terminal. The increased loading to the urban wastewater agglomeration at Ringsend will be relatively small when compared to the overall loading to the Ringsend WWTP.

The magnitude of the potential impacts arising from contaminated surface water run-off from the new berthing, hardstanding areas and roads entering the aquatic environment directly or via the surface water drainage system would potentially have *minor adverse* impacts on water quality in the area depending on the volumes

released. The significance of the environmental effect is therefore *significant* in the absence of mitigation based on the high sensitivity of the receiving environment over the short term.

### *Changes in the hydromorphological supporting conditions within the Lower Liffey Estuary*

As outlined in Section 9.1.2.4 waterbodies that are designated as heavily modified have a WFD environmental objective of Good Ecological Potential rather than Good Ecological Status. The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society needs to be continued. The physical modifications caused by the use need to be mitigated against as far as possible, whilst acknowledging that the specified use needs to be retained.

Ireland intends to undertake the "Mitigation (Prague) Approach" in the establishment of good ecological potential, i.e. a mitigation measures-based approach used by many member states. Under this system a heavily modified waterbody is considered to be at Good Ecological Potential (GEP) when it has

1. the relevant mitigation measures in place? The recommendation here is to use the EU mitigation measures library for surface waters;
2. achieved Good (or better) condition for the monitored biological quality elements (BQE) that are not sensitive to the hydromorphological modification.
3. achieved the physico-chemical conditions equivalent to Good Ecological Status, except where parameters are impacted by the hydromorphological alteration caused by the specified use; and
4. achieved the best state previously achieved since the modification for the monitored biological quality elements that are sensitive to the hydromorphological modification, where those data are available.

Mitigation Measures

The Mitigation Measures Library detailed in CIS Guidance Document No. 37 (Steps for defining and assessing ecological potential for improving comparability of Heavily Modified Water Bodies) lists 12 mitigation measure categories that are relevant across EU member states, including Ireland, and for which a tool box of measures has been developed to address hydromorphological pressures as far as practical whilst still retaining the specified use of the water body. The design of the 3FM Project has considered these mitigation measures and has adopted measures where relevant. Key groups of measures listed in the EU tool box of mitigation measures that are applicable to the 3FM Project are summarised in Table 9.16. Incorporation of relevant measures during design and development of the 3FM Project will ensure that the project will contribute to the achievement of good ecological potential during the operational phase.

Table 9.16 Mitigation Measure Categories relevant to the 3FM Project

| Key groups of measures from EU tool box | Examples of Specific measures to reach GEP | Mitigation incorporated into 3FM Design |
|---|---|---|
| Realign to mitigate effects on flow | - Construct structures to normalise flow; realign breakwater, frontage, etc.<br>- Lower or sever root of groyne or breakwater<br>- Reduce wave reflection; increase wave absorption<br>- Build culverts in breakwaters, groynes, etc.<br>- Introduce e-flow | - Lo-Lo container terminal (Area N) is an open piled structure<br>- SPAR Viaduct – open piled structure<br>- SPAR Bridge – aligns with Tom Clarke Bridge piers to ensure flow regime is not significantly impacted |
| Sediment management | - Sediment bypassing, move sediment from behind breakwater, dam, jetty, terminal groyne, etc. and (re)place in natural system to address downstream/downdrift erosion (habitat loss or degradation)<br>- Sever root of groyne, breakwater, etc. to reinstate longshore sediment transport | - Lo-Lo container terminal (Area N) is an open piled structure<br>- SPAR Viaduct – open piled structure<br>- SPAR Bridge – aligns with Tom Clarke Bridge piers to ensure flow regime is not significantly impacted |
| Modification or management of operations or structures e.g. sluices, vessel traffic | - Remove redundant infrastructure<br>- Modify operation of lock, sluice or other structure to facilitate fish passage or to maintain desired salinity levels<br>- Retrofit if necessary to enable above<br>- Use fluid mud navigation / dynamic underkeel clearance where safe to do so<br>- Explore use of SMART technology for vessel traffic management<br>- Speed limits to reduce wash-induced erosion | - Removal of oil jetty<br>- Removal of sludge jetty<br>- Removal of concrete Nib at Berth 47<br>- New Structures will not have negative impact on fish passage<br>- Open piled structure at Lo-Lo container terminal (Area N), SPAR viaduct<br>- Use of SMART Technology for vessel traffic management at turning circle<br>- Speed limits to be imposed to reduce wash-induced erosion<br>- Continued Enforcement of the Marine Notice (Notice to Mariners (No 26 of 2021) – Prohibition on the Discharge of Exhaust Gas Scrubber Wash Water) prohibiting the discharge of EGCS effluent from existing and new vessels resulting from the 3FM Project into Dublin Port jurisdictional waters until such time as EGCS may be conclusively proven not to impact water or sediment quality. |
| Intertidal habitat restoration, enhancement or creation | - Habitat rehabilitation<br>- Managed realignment to new line<br>- Re-open polders; setback (to higher ground; to existing secondary defence line)<br>- Step back (create intertidal shelf against vertical wall)<br>- Planter baskets; other planting initiatives<br>- Improve creek or backwater habitats<br>- Use breakwaters, shore parallel islands or similar to create sheltered conditions promoting intertidal enhancement<br>- Offsetting measures e.g. spawning habitat for fish | - Significant area of new hard surfaces represented by the open piled structures which are likely in the main to be rapidly colonised by both estuarine and marine flora and fauna<br>- Habitat enhancement measures being trialled using eco-structures |
| Seasonal or tidal constraints on activity | - Constraints on maintenance activities or other works during breeding/spawning season or fish migration periods; low oxygen<br>- Working on flood or ebb tide to avoid impacts on sensitive adjacent habitats or species<br>- Programme vegetation cutting or clearance | - Dredging in Dublin Port is seasonally constrained so as to avoid impacting on sensitive species and habitats;<br>- Non-piling windows are presented in Chapter 7 of the EIAR |
| Selection of methods or equipment | - Select dredging method to retain sediment in system or to avoid raising suspended sediment levels<br>- Use silt curtain<br>- Manage overspill<br>- Selective cutting or clearance e.g. only along one bank<br>- Use long arm excavator to avoid disturbing or damaging sensitive habitats; to retain riparian vegetation<br>- Strip dredging (for aggregate) to facilitate recolonisation | - Dredging will be undertaken using methods to minimise suspended sediment levels (see best practice measures below)<br>- Management of overspill |

This is supported by the analysis undertaken in Chapter 13 Coastal Processes which has concluded that:

- The tidal regime will remain substantially unchanged post 3FM Project and no notable changes to the tidal regime were detected outside of Dublin Port. Given the localised nature and small absolute magnitude of any predicted changes in tidal current velocity it is unlikely that there will be any significant change in net scouring or deposition of sediments within the Liffey Estuary Lower and Dublin Bay resulting from the 3FM Project.
- The risk of impact to the tidal regime is generally determined to be negligible, however increased current speeds as a result of the SPAR bridge development could result in scouring of the seabed around the proposed SPAR bridge foundations during periods of extreme river flow discharge conditions. To mitigate the operational phase impact of the SPAR bridge development suitable scour protection should be developed and implemented within the immediate vicinity of the proposed development. The risk of impact to the existing tidal regime is therefore determined to be negligible because of the measures incorporated into the design and no further mitigation is required.
- The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in Dublin Port during storm events did not exceed ±0.20m. These changes were confined primarily to Poolbeg Marina and Area N. There was no discernible change in the wave climate due to the 3FM Project in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. These changes to the wave climate are not considered significant and will not impact on the overall supporting hydromorphological conditions in the Liffey Estuary Lower, Dublin Bay or the Tolka Estuary.
- A minor change to the dispersion of thermal plume envelopes is observed within the immediate vicinity of Area N which can be attributed to the influence of the proposed piling in this area which results in a very marginal decrease in thermal dispersion in this area. Importantly, this will not result in a significant change to the ambient water temperatures in the Liffey Estuary Lower outside the immediate vicinity of the piling. The change in water temperatures at the Poolbeg intakes as a result of the 3FM Project was found to reduce the average temperature at the Poolbeg intake in the surface and bottom layers of the water column by 0.14 and 0.03$^{o}$C respectively.
- Given that there are no significant changes to key coastal processes that govern sediment transport, i.e., tides, waves and water levels, it can be concluded that the 3FM Project will result in no discernible change to the existing sediment transport regime in the Liffey Estuary Lower and the in the greater Dublin Bay area.

<u>Biological quality elements (BQE) that are not sensitive to the hydromorphological modification</u>

In the case of the Liffey Estuary Lower, the most recent WFD biological monitoring (2016-2021), as reported by the EPA[1] indicates that biological elements not achieving good ecological status are predominantly sensitive

[1] https://www.catchments.ie/data/?_gl=1*625lbd*_ga*MTQyOTMyODAwNi4xNjk1NzM2NTU2*_ga_TPK2CK9KEX*MTY5NjUxNTQ3NS40LjEuMTY5NjUxNTQ3Ni4wLjAuMA..#/waterbody/IE_EA_090_0300?_k=afryth

to organic and nutrient enrichment. The significant pressures in the Liffey Estuary Lower have been identified as urban wastewater pressures. Implementation of the 3FM Project will not significantly increase this pressure.

Physico-Chemical Conditions

Alteration of general physico-chemical conditions downstream of major hydromorphological alterations can occur (e.g. temperature, dissolved oxygen supersaturation). Current WFD monitoring for general physico-chemical conditions indicates that such impacts are not evident within the Liffey Estuary Lower, and therefore the specified use for this HMWB, port navigation, is not having a significant impact on ambient physico-chemical conditions. The design of the 3FM development will ensure its operation will not impact on coastal processes, i.e. wave climate, tidal regime and flow conditions, and therefore will not affect the physico-chemical supporting conditions. This is supported by the ongoing monitoring regime being implemented for the MP2 and ABR Projects (section 9.1.2.8).

Biological quality elements that are sensitive to the hydromorphological modification

The Mitigation Measures Library (EU CIS Guidance No. 37) library was consulted for Transitional and Coastal water bodies to determine the likely effects of a particular pressure on the ecological conditions of a water body. The key biological elements that are sensitive to hydromorphological alterations associated with the 3FM Project (i.e. quay walls, vertical piling, and dredging) are fish, benthic invertebrates, angiosperms and macroalgae.

Shoreline surveys were carried out in June and July 2023 (Section 7.2.2 Intertidal Surveys) along the south side of the Liffey Estuary from Tom Clarke Bridge in the west to just east of the ESB/Ringsend discharge at the base of the Great South Bull Wall, a straight line distance of approximately 3km. Habitat substrates along this stretch are roughly 38% rock armour/ rock rubble intertidal, 45% sheet pile wall and 17% stone wall. This entire shore has been manmade at some stage in the recent centuries.

The supralittoral along rock revetments/rock rubble shores supports a sparse flora dominated by ruderal angiosperms, many of which are non-native species. Angiosperms are otherwise limited on building and artificial surface habitats that dominate the supralittoral shoreline in this area.

Within the Lower Liffey, the intertidal habitat is relatively sheltered from direct wave action and is therefore dominated by fucoid (brown) algae and the typical associated intertidal mobile and attached invertebrate fauna. This shore community is typical of sheltered rocky intertidal shores but with somewhat reduced diversity probably due to a lack of microhabitats, and the influence of several local freshwater inputs.

Floating gangways and berths at the Poolbeg Marina support a mixed epibiotic flora and fauna, providing a microhabitat for small mobile crustaceans.

A number of migratory fish species pass through the Liffey estuary, including salmon, eel and lamprey. These are unlikely to be impacted by any of the hydromorphological issues considered here. The Water Framework Directive Fish Monitoring Programme conducted by Inland Fisheries Ireland has recorded a range of common marine/estuarine species in the Liffey estuary.

The algal, fish and benthic invertebrate communities outlined above have the potential to be affected by hydromorphological alterations associated with the 3FM Project. In terms of the benthic ecology Chapter 7 has concluded that temporary habitat disturbance from the dredging activities is not expected to result in any long-term impact, with recovery occurring rapidly on cessation of dredging activities. Loss of sub-tidal habitats

associated with the installation of piles are deemed minor. However, the introduction of shade by the SPAR Viaduct and at Area N will have negative effects on the habitats affected. However, all these changes need to be viewed in the context of the Lower Liffey Estuary as a HMWB where natural intertidal habitats have been dramatically altered as a result of its specified use as a Port. Furthermore Chapter 7, Biodiversity, concludes that the importance of the Lower Liffey as a locally important nursery ground for estuarine/marine residents and migrants will remain substantially intact and fully functional and its role as a conduit for inwardly and outwardly migrating anadromous and catadromous species for the wider River Liffey catchment will remain fully intact.

Chapter 13, Coastal Processes has concluded that where the mitigation measures are fully implemented during the construction and operational phases, the impact of the 3FM Project on the coastal processes within Dublin Port and Dublin Bay will consist of small scale, low magnitude changes in the tidal regime and wave climate. On the basis that the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the 3FM Project on coastal processes will be imperceptible.

Therefore, based on the above analysis and the design of the 3FM Project, there are no perceptible changes in the hydromorphological conditions and the ability of the Liffey Estuary Lower to achieve good ecological potential. The project has incorporated mitigation measures as is required under the WFD and will not impact on the other elements of ecological status that are not sensitive to hydromorphological changes. The impact of the operational stage of the 3FM Project is therefore negligible. Accordingly, the significance of the effect is imperceptible, due mainly to the mitigation by design, based on the extremely high sensitivity of the receiving environment.

### 9.1.5 Mitigation Measures

In the absence of mitigation, the construction of some elements of the 3FM Project has the potential to have *Significant or Profound* negative impacts on the aquatic environment. Similarly, with no mitigation the 3FM Project has the potential to have *Significant adverse* impacts on the aquatic environment during the operation stage, mainly as a result of maintenance dredging operations and the possibility of contaminated run off entering the aquatic environment.

With these considerations in mind, detailed mitigation has been incorporated into the engineering design of the 3FM Project to minimise its potential impact on the water environment. Extensive mitigation is also proposed during construction and operation phases. Such mitigation includes control of surface water drainage and treatment of site run-off before discharge to the estuary, and best practice measures in relation to all construction activities to control these pressures at source. Section 9.1.5.1 and Section 9.1.5.2 details the mitigation measures that will be employed on site during the 3FM Project construction and operational phases.

### 9.1.5.1 Construction Phase Mitigation Measures

#### *Construction Phase Best Practice Measures*

Mitigation measures will be implemented by the contractor and will include the requirements for best practice and adherence to the following relevant Irish guidelines and recognised international guidelines:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001);
- Netregs Guidance for Pollution Prevention series (GPP) series in relation to a variety of activities developed by the Scottish Environmental Protection Agency (SEPA), Natural Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA);
  - GPP2: Above Ground oil storage tanks
  - GPP3: Use and design of oil separators in surface water drainage
  - GPP5: Works and maintenance in or near water
  - GPP6: Working at construction and demolition sites
  - GPP8: Safe Storage and disposal of used oils
  - GPP13: Vehicle washing and cleaning
  - GPP20: Dewatering underground ducts and chambers
  - GPP21: Pollution incident response planning
  - GPP22: Dealing with spills
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- International Convention for the Prevention of Pollution From Ships, 1973, as modified by the Protocol of 1978 (MARPOL) for domestic waste discharges to the environment;
- International Marine Organisation guidelines; and
- Control of Substances Hazardous to Health (COSHH) Handling of Hazardous Materials.

#### *Suspended Sediment and Sedimentation*

Suspended sediment, including all soils, sands and rubble, is the single main pollutant to the aquatic environment generated at construction sites and largely arises from the erosion of exposed soils and sediments by surface water runoff. The adoption of appropriate erosion and sediment controls during construction is essential to prevent sediment pollution.

Demolition of existing buildings and structures, berth construction and construction of landside ancillary works

As indicated above these demolition and construction works have the potential to result in a localised impact on water quality.

The mitigation and control measures to address the impact from suspended sediments associated with these activities will follow sound design principals and good working practices as listed in the Netregs Guidance for

Pollution Prevention series. In addition to the requirements of best practice and relevant guidelines, the following mitigation measures will be implemented by the contractor during the construction phase.

In addition to the mitigation measures referenced in the documents listed above, the following sediment control measures will be installed where necessary;

- Where preferential surface flow paths occur, silt fencing or other suitable barriers will be used to ensure silt laden or contaminated surface runoff from the site does not discharge directly to a water body or surface water drain.
- In the event that dewatering of foundations or drainage trenches is required during construction and/or discharge of surface water from sumps, a treatment system prior to the discharge will be used; silt traps, settlement skips etc. This measure will allow additional settlement of any suspended solids within storm water arising from the construction areas.

Assuming the above mitigation measures are employed during demolition, clearing, road and berth construction activities, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to *Imperceptible.*

Capital Dredging and Spoil Disposal

The Dublin Port Company completed a winter capital dredging season in October 2022 as part of the MP2 Project. This dredging campaign was fully compliant with the requirements of all the development consents, as confirmed by high resolution environmental monitoring results reported in the Annual Environmental Report submitted to the Office of Environmental Enforcement (OEE) in March 2023. Further capital dredging for the MP2 Project was completed in March 2024. The monitoring included year-round real-time measurement of water quality parameters in the Liffey Estuary at four monitoring stations chosen to represent ambient surface water quality in the Liffey Estuary Lower and in the Tolka Estuary water bodies. This was supplemented by sediment plume and hydrographic monitoring that validated Plume Dispersal Modelling, as reported in the Year 7 Environmental Monitoring Report for the ABR and MP2 Projects (DPC, 2023).

A Dredging Management Plan was developed for the MP2 Project and is set out in the *MP2 Project Construction Environmental Management Plan (CEMP) Rev A, November 2021*. The mitigation for dredging operations in the 3FM Project has been informed by the MP2 Project and the ABR Project monitoring and experience working in the same locations. The following key relevant mitigation measures will apply to each dredging campaign in the 3FM Project:

- Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD).
- The capital dredging activity will be carried out during the winter months (October – March) to negate any potential impact on salmonid migration (particularly smolts) and summer bird feeding, notably terns, in the vicinity of the dredging operations.
- No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel.
- The TSHD pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment.

- The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water) to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight).
- Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS, 2014).
- A documented Accident Prevention Procedure will be put in place prior to commencement.
- A documented Emergency Response Procedure will be put in place prior to commencement.
- A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip.
- Dumping will be carried out through the vessel's hull.
- The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey.
- When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.

The options for disposal of the Class 2 element of dredged sediment from the Maritime Village / Marina, in order of preference, are:

1. Filled to berth 52/53 under a revised IE licence subject to availability of receptor capacity;
2. Recovered at a soil recovery or soil treatment facility in Ireland subject to testing of the sediments in line with the selected facility licence at the time of the works;
3. Recovered at a soil treatment facility in Great Britain or northern Europe;
4. Disposed of at a licenced landfill facility in Ireland.

Therefore, there is no potential to impact on the supporting physico-chemical conditions or the chemical status of the Liffey Estuary Lower or Dublin Bay coastal water body.

In circumstances where the above mitigation measures are employed during capital dredging and disposal operations, the potential impact to receiving water environment will be negligible thus reducing the significance of environmental effect to *Imperceptible.*

### *Concrete and Cement Pollution*

Demolition of existing buildings and structures, berth construction and re-fronting, maritime village construction and construction of landside ancillary works

The impacts in relation to cement and concrete for the 3FM Project are, for the most part (but not limited to); demolition of buildings and structures, construction of piles and foundations for the berthing areas, quay walls etc., the installation of the concrete berthing area areas (to be poured in-situ) and construction of landside ancillary works.

The principal risks and related mitigation measures are:

- Breaking of concrete (associated with structure demolition) has the potential to emit alkaline dust into the receiving environment. A barrier between the dust source and the sensitive receptor (the water body in this case) will be erected to limit the possibility of dust and falling debris from contacting the receptor.
- Concrete use and production shall adhere to control measures outlined in Guidance for Pollution Prevention (GPP5): Works and maintenance in or near water. Any on-site concrete production will have the following mitigation measures: bunded designated concrete washout area; closed circuit wheel wash and initial siting of any concrete mixing facilities such that there is no production within a minimum of 10 metres from the aquatic zone.
- The use of concrete in close proximity to water bodies requires a great deal of care. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in water bodies. It is essential to ensure that the use of wet concrete and cement in or close to any water body is carefully controlled so as to minimise the risk of any material entering the water, from the shuttered structures and cofferdams that will be used to contain the concrete.
- Where concrete is to be placed under water or in tidal conditions, specific fast-setting mix is required to limit segregation and washout of fine material / cement. This will normally be achieved by having either a higher than normal fines content, a higher cement content or the use of chemical admixtures.

In circumstances where the above mitigation measures are employed during demolition, clearing and berth construction operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

Capital Dredging and Spoil Disposal

Capital dredging does not entail any concrete or cement works, therefore, no construction phase mitigation measures have been proposed.

### *General Construction Works*

The risk of water quality impacts associated with works machinery, infrastructure and on-land operations (for example leakages/spillages of fuels, oils, other chemicals and waste water) will be controlled through good site management and the adherence to codes and practices which limit the risk to within acceptable levels. The following measures will be implemented during construction:

- A detailed works specific Construction Environmental Management Plan (CEMP) will be prepared by the contractor which will meet the minimum requirements of the draft CEMP (under separate cover) and will include detail in respect of every aspect of the works in order to minimise potential impacts and maximise potential benefits associated with the works;
- Management and auditing procedures, including tool box talks to personnel, will be put in place to ensure that any works which have the potential to impact on the aquatic environment are being carried out in accordance with required permits, licences, certificates and planning permissions;
- Existing and proposed surface water drainage and discharge points will be mapped on the Drainage layout. These will be noted on construction site plans and protected accordingly to ensure water bodies are not impacted from sediment and other pollutants using measures to intercept the pathway for such pollutants;

- The use of oils and chemicals on-site requires significant care and attention. The following procedures will be followed to reduce the potential risk from oils and chemicals:
  - Fuel, oil and chemical storage will be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. The control measures in GPP2: Above Ground Oil Storage Tanks and GPP 26 “Safe storage – drums and intermediate bulk containers” will be implemented to ensure safe storage of oils and chemical.
  - The safe operation of refuelling activities shall be in accordance with GPP 7 “Safe Storage – The safe operation of refuelling facilities”.
- Contingency Planning: A project specific Pollution Incident Response Plan will be prepared by the contractor consistent with DPC's Environmental Emergency Plan and will be in accordance with GPP 21 Pollution Incident Response Planning. Whilst a major incident is highly unlikely to occur in circumstances where the mitigation measures are implemented, the finalisation of the draft CEMP is considered to be best practice. The contractor's Environmental Manager and DPC will be notified in a timely manner of all incidents where there has been a breach in agreed environmental management procedures. Suitable training will be provided by the contractor to relevant personnel detailed within the Pollution Incident Response Plan to ensure that appropriate and timely actions is taken.

In circumstances where the above mitigation measures are employed during construction the significance of environmental effect to the receiving water environment will be reduced to *Imperceptible.*

### 9.1.5.2 Operational Phase Mitigation Measures

#### *Channel Maintenance Dredging Works*

Maintenance dredging is an ongoing requirement in the Port and new licences will be required to cover maintenance of the areas newly dredged in capital dredging works under the 3FM Project. Conditions set in any Marine Area Consent (MAC) and Dumping at Sea Permit will prescribe strict environmental protection measures. Maintenance dredging will implement comprehensive mitigation measures as set out below:

- Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD).
- No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel.
- The TSHD pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment.
- The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water) to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight).
- Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS 2014).
- A documented Accident Prevention Procedure will be put in place prior to commencement.

- A documented Emergency Response Procedure will be put in place prior to commencement.
- A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip.
- Dumping will be carried out through the vessel's hull.
- The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey.
- When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.

Assuming the above mitigation measures are employed during maintenance dredging and disposal operations, the potential impact to receiving water environment will be reduced to *negligible* thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

### *Washwater from Exhaust Gas Cleaning System (EGCS)*

DPC will continue to enforce the Marine Notice (Notice to Mariners (No 26 of 2021) – Prohibition on the Discharge of Exhaust Gas Scrubber Wash Water) prohibiting the discharge of EGCS effluent from existing and new vessels resulting from the 3FM Project into Dublin Port jurisdictional waters until such time as EGCS may be conclusively proven not to impact water or sediment quality. This will ensure that new and larger vessels using the Port as a result of the greater capacity offered by the 3FM Project will not have the potential to impact on the water quality of the Lower Liffey Estuary, Dublin Bay or the Tolka Estuary.

In circumstances where the above mitigation measures listed are employed, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect will be reduced to *Imperceptible*.

### *General Operational Activities*

Storm water runoff will be collected in a dedicated storm water drainage system and will not be permitted to discharge directly to the marine environment from new jetties, and hardstand areas. The surface water drainage system will consist, *inter alia*, of heavy-duty gullies cast into the reinforced concrete deck, with concrete pipes cast into the in-situ concrete deck structure. These pipes will carry the storm water to an appropriate full retention oil separator for the Port Operations at Area K, Area N and Area O which will trap oils and silt prior to being discharged into the harbour waters through a non-return flap valve. Drainage from the new SPAR Road, bridge and viaduct will be via by-pass oil interceptors given the reduced risk associated with these areas. Sustainable Urban Drainage Systems (SuDs) are not proposed due to limited space and the industrial nature of the operations. A readily and safely accessible monitoring chamber will be provided on the storm water pipeline as appropriate to allow for inspection and sampling of the storm water being discharged.

The oil interceptors on the surface water drainage network will be selected and sized based on the pollution prevention guideline: “Use and design of oil separators in surface water drainage systems: GPP3 and BS EN 858 which is the European Standard for the design, performance, testing, marking and quality control of separators within the EU. All separators must comply with this standard. In accordance with GPP3 a class 1

bypass separator will be required for general road and car parking areas of the site whilst a class 1 full retention separator will be required for the HGV parking and loading areas within Area K, Area N and Area O.

Wastewater from new infrastructure will be collected in foul sewer systems that are fully compliant with Uisce Éireann requirements, and discharged by gravity, or through wastewater packaged pumping stations if required, to the public sewer (the Rathmines to Pembroke 1,500mm sewer), subject to Uisce Éireann approval, for treatment at Ringsend WwTP. Part of the public sewer will require diversion around Area K which will be undertaken in advance of the operation of the 3FM Project. The additional loading from the development can be accommodated within the Ringsend Agglomeration without any significant impact on the existing operations in the agglomeration or the ability to achieve the required discharge emission limit values under the wastewater discharge licence.

The 3FM Project, when complete, will be subject to the Port's existing Environmental Management System (EMS) which is accredited to the Port Environmental Review System (PERS) which has gained Dublin Port designation as an 'Ecoport' at European level.

The EMS comprehensively identifies environmental aspects and impacts relating to Dublin Port including Tenant operations. Regular review of environmental aspects is required and will facilitate incorporation of any 3FM Project-specific issues that may arise with implementation of mitigation, as necessary. The EMS is supported by a comprehensive suite of Standard Operating Procedures (SOP) providing mitigation of all environmental aspects identified and mechanisms to ensure effective implementation. SOPs have been prepared for oil and chemical spill responses, mineral oil handling, waste handling, monitoring and maintenance of surface water interceptors and handling of drain cleaning waste. Controls are in place for transport, handling and storage of hazardous materials, ship cargo, dry bulk material, surface water runoff, fuelling and bunkering of vessels and ship discharges. Site audits promote best practice and ensure compliance with the EMS requirements.

In circumstances where the mitigation measures listed above are employed, the potential impact to receiving water environment will be reduced to *negligible* thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

***Changes in the hydromorphological supporting conditions within the Lower Liffey Estuary***

The impact of the operational stage of the 3FM Project on hydromorphology and the WFD ecological potential for the Liffey Estuary Lower is assessed as negligible due to the mitigation by design already incorporated into the project. The significance of the effect is therefore imperceptible, and no further mitigation is required.

### 9.1.6 Residual Impacts

In circumstances where the appropriate mitigation measures are fully implemented during the construction and operational phases as outlined in the previous section, the impact of the 3FM Project on the water quality in the area will be imperceptible as indicated in Table 9.17.

Accordingly, the 3FM Project will not have a significant effect on the water quality of the receiving waters or make a significant change to the existing hydromorphology.

In all the circumstances as outlined, it can therefore be concluded that the proposed works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies.

Table 9.17 Residual Impacts (with mitigation)

| Significance of Environmental Impact | | | | |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | **Demolition of existing buildings & structures** | **Berth Construction** | **Capital Dredging** | **Landside Works** |
| Suspended sediments / sedimentation | Imperceptible | Imperceptible | Imperceptible | Imperceptible |
| Concrete and cement pollution | Imperceptible | Imperceptible | No Impact | Imperceptible |
| Impacts associated with general construction works | Imperceptible | | | |
| | | | | |
| **OPERATIONAL PHASE** | **Buildings & structures** | **Berth Operation** | **Maintenance Dredging** | **Landside Works** |
| Suspended sediments / sedimentation | Imperceptible | Imperceptible | Imperceptible | Imperceptible |
| Increased number and size of vessels | Imperceptible | Imperceptible | Imperceptible | Imperceptible |
| Impacts associated with general port operation activities | Imperceptible | Imperceptible | Imperceptible | Imperceptible |
| Hydromorphological Impacts | Imperceptible | Imperceptible | Imperceptible | Imperceptible |

## 9.1.7 Potential Cumulative Impacts

Potential cumulative impacts may arise from the 3FM Project when combined with other existing and/or approved projects where the zones of influence overlap. In accordance with the European Commission (2017) and EPA Guidelines (2022), existing and/or approved projects with the potential for cumulative impacts have been identified. Cumulative impact assessments have been undertaken in this section for relevant pressures that could potentially give rise to cumulative impact on water quality in the 3FM Project zone of influence. Each development with the potential to impact on the water environment has been considered through a review of the environmental supporting information (where available) for the existing or approved developments.

### 9.1.7.1 Poolbeg West SDZ

Poolbeg West is designated as a Strategic Development Zone (SDZ). Planning permission for this development was approved by An Bord Pleanála in April 2019. In addition to 3,500 residential units, its uses will include leisure, community, educational and commercial facilities. In relation to potential water quality issues and cumulative impact, the primary consideration is wastewater discharges from the SDZ. Wastewater discharges will be treated at Ringsend WwTP which is considered under Section 9.1.4.2 and captures any potential cumulative effects arising from the SDZ. No cumulative effects on water quality will arise.

### 9.1.7.2 ABR, MP2 and Dredging Projects

This section of the cumulative impact assessment considers several consented or proposed projects by Dublin Port Company. Consented projects include the first two elements of Strategic Infrastructure Development to be brought forward for planning consent from the Dublin Port Masterplan 2040, reviewed 2018; the ABR Project and the MP2 Project. The cumulative impact of the consented Dublin Port 2022-2029 Maintenance Dredging Programme, and the proposed Dublin Harbour Capital Dredging Project are also assessed.

In circumstances where the appropriate mitigation measures are fully implemented during the construction and operational phases, the impact of the 3FM Project on the water quality has been assessed as imperceptible (Table 9.17), and therefore the likelihood of cumulative impact with other the projects being considered here is low. Additionally, the ABR Project, MP2 Project and 3FM Project are part of Dublin Port Company's Masterplan and have been planned and designed as part of a structured and integrated development programme that considers environmental impact and cumulative effects.

The most significant elements of the ABR and MP2 Projects in considering potential cumulative impacts with 3FM on water quality are the capital dredging elements. Annual maintenance dredging and Dublin Harbour capital dredging programmes are also included here to provide a comprehensive and robust assessment of potential cumulative impacts, since all projects will overlap temporally, and all will load material within Dublin Port and use the same licensed spoil grounds in Dublin Bay.

**a) ABR Project**

The ABR Project was the first Strategic Infrastructure Development project to be brought forward for planning and other consents from Dublin Port Company's (DPC) Masterplan 2012 to 2040. An Bord Pleanála granted permission for the ABR Project on 8th July 2015 (29N.PA0034) for a period of 10 years, ending July 2025.

The ABR Project comprises a number of engineering works set out in DPC's Masterplan document, mainly:

- Works at Alexandra Basin West including construction of new quays and jetties, remediation of contamination on the bed of the basin, capital dredging to deepen the basin and to achieve the specified depths of -10m Chart Datum (CD) at the new berths.
- Infilling of the basin at Berths 52 & 53 and construction of a new river berth with a double tiered Ro-Ro ramp.
- Deepening of the fairway and approach to Dublin Port to increase the ruling depth from -7.8m CD to -10.0m CD.

Construction of the infrastructural elements of the ABR Project are essentially complete. The only remaining work is completion of a section of quay wall (combi-wall) within Alexandra Basin West. This will be completed by July 2025 and prior to commencement of the 3FM Project. Dredging works are considered below. There is no potential for cumulative impact of the ABR Project and 3FM Project.

**b) MP2 Project**

The MP2 Project is the second Strategic Infrastructure Development project from the Dublin Port Company's (DPC) Masterplan 2012 to 2040. An Bord Pleanála granted permission for the MP2 Project on 1st July 2020 (29N.304888; Dumping at Sea Permit S0024-02) for a period of 15 years, ending July 2035.

The MP2 Project comprises a number of engineering works set out in DPC's Masterplan document, mainly

- Construction of a new Ro-Ro jetty (Berth 53) for ferries up to 240m in length.
- A reorientation of the already consented Berth 52 (ABP Ref. 29N.PA0034) and modification to Berth 49.
- A lengthening of an existing river berth (50A).
- The redevelopment of Oil Berth 3, and infill of Oil berth 4, as a future deep-water container berth for the Container Freight Terminal.
- The dredging of berthing pockets and channel widening.
- Consolidation of passenger terminal buildings, demolition of redundant structures and buildings, and removal of connecting roads to increase the area of land for the transit storage of Ro-Ro freight units as a Unified Ferry Terminal (UFT); a heritage zone adjacent to Berth 53 and the Unified Ferry Terminal set down area.

MP2 Project capital dredging at Berth 52/53, and the localised widening of the navigation channel will be completed prior to commencement of the 3FM Project. The outstanding dredging works are considered below in relation to potential cumulative impacts with 3FM and other dredging works.

Piling at Berth 53 will commence Q2 2024. Piling at Berth 52 will follow. Piling at Berth 52 and 53 is expected to be completed prior to commencement of the 3FM Project. The next phase of the MP2 Project (Berth 50A extension / Oil Berth 3 / Infilling of Basin at Oil Berth 4) is due to commence in 2028. Works have the potential to overlap with the 3FM Project but piling and dredging operations will be managed by DPC to ensure no overlap. These works are situated on the north side of the Liffey channel and separated from the 3FM Project site's piling locations.

The MP2 Project's Environmental Impact Assessment Report (RPS, 2019) has determined that, in circumstances where the appropriate mitigation measures are fully implemented during the construction and operational phases, the impact of the MP2 Project on water quality will be imperceptible, and therefore the likelihood of cumulative impact with other the projects being considered here is low.

Given the mitigation measures above and temporal and spatial separation of works, it is therefore considered that there will be no cumulative impacts of MP2 construction phase works (excluding dredging which is considered below) with the 3FM Project.

**c) Maintenance Dredging**

Maintenance Dredging at Dublin Port between August 2022 and September 2029 has been consented (Dumping at Sea Permit S0004-03; Foreshore Licence FS007132) within the period April to September inclusive each year. Cumulative impacts with 3FM and other dredging works are considered below.

**d) Capital Dredging**

DPC has also submitted a Dumping at Sea Permit Application to the EPA for the Dublin Harbour Capital Dredging Project on 26th August 2021 (DAS Permit Ref S0033- 01) to allow for the safe passage and berthage of vessels of deeper draught expected to visit Dublin Port. It is proposed to limit the capital dredging and disposal

at sea operations between October and March annually over a five year period. Cumulative impacts with the 3FM Project and other dredging works are considered below.

**Potential Cumulative Impacts of Dredging**

Capital dredging for in the navigation channel for the ABR Project is now complete, and therefore there will be no potential for cumulative impact. Additional dredging at Alexandra Basin West may be required post July 2025. Dredged material will be brought ashore for treatment and re-use as a fill material at the Berth 52/53 basin. This is to be subject to application for extension of the existing IED License (P1022-01).

The proposed Overarching Dredge Programme to 2038 is summarised in Figure 9-22 based on DPC's submission to the EPA (January 2024) in response to S0033-01 Section 5(2) Notice to provide details on the predicted sediment deposition and sediment dispersion from loading and dumping activities, cumulatively from the proposed activities and those permitted under (S0004-03 and S0024-02) and any subsequent impacts on the wider environment.

Water quality environmental control measures for vessels (including shipboard oil emergency plans, discharge of ballast water etc.) under MARPOL Convention and the Sea Pollution Act requirements are mandatory and will be observed during all works. All dredging programme takes on board the following common mitigation constraints to both minimise the source of sediment entering the receiving waters, and to control the formation of sediment plumes:

- All capital dredging activity at Dublin Port takes place over the winter period (October – March).
- All Maintenance dredging activity at Dublin Port takes place over the summer period (April –September).
- No overspill is permitted within the inner Liffey channel.
- The hopper volume is limited to 4,100m$^3$ per trip.
- No dredging will take place between the 1st April and 14th May (inclusively) in the inner Liffey channel upstream of Berth 49, including the main channel and channel-side berths but not including basins.

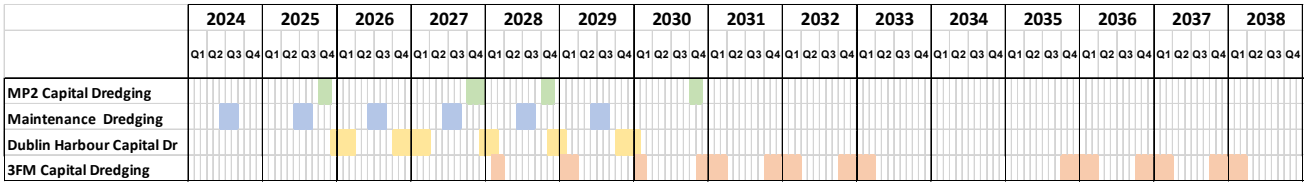


Figure 9-22 Proposed Dredging Programme at Dublin Port to 2038

Dredging in any year has been scheduled to temporally separate individual campaigns and minimise periods of overlap. Figure 9-22 shows that concurrent capital dredging for the 3FM Project and dredging activities for other projects will only occur during the years 2028, 2029 and 2030. In each year there are fallow periods when no dredging for any purposes will occur.

Modelling (Coastal Processes Risk Assessment, RPS 2021; MP2 Project Additional Sediment Plume Modelling, RPS 2021) and monitoring data (DPC ABR/MP2 Project Environmental Monitoring Report, RPS 2023) have shown that during dredging operations, suspended sediment plumes are spatially confined at loading sites, and suspended sediment concentrations are generally low (less than 25 mg/l) beyond the immediate dredge area. In almost all instances, the lateral extent of the 10mg/l sediment plume envelope is generally less than 750m

under most tidal conditions. Such increases in suspended solids due to the channel dredging works is well within the background range experienced in Dublin Port during normal Port operations.

The impact of spoil disposal on water quality at the dump site in Dublin Bay has been studied during capital and maintenance dredging campaigns, using turbidity as a proxy for suspended solids to measure the development and dispersal of sediment plumes (S0004-03 Dublin Port Maintenance Dredging Sediment Plume Monitoring Report Maintenance Dredging Campaign 2023 (RPS 2023a); Dublin Bay Sediment plume monitoring report, MP2 Capital Dredging August 2023 (RPS 2023b); Dublin Bay Sediment Plume Monitoring Report March 2020, (RPS 2020a); ABR Project Capital Dredging Programme, Sediment Plume Validation Modelling, (RPS, 2020b)). Sediment plumes were of small extent, and moved in the direction of the residual currents, remaining in relatively narrow bands. Sediment plumes were short lived and dispersed within the dump site within short periods following discharge by the dredger and had no significant impact on water quality within the dump site or in adjacent waters.

Numerical modelling work undertaken previously in support of the ABR Project (RPS, 2014) used detailed recorded information from loading and dumping logs to predict sediment deposition from dumping activities. DPC's submission to the EPA (January 2024) in response to S0033-01 Section 5(2) Notice considered the output from the ABR Project simulation of recorded trips, and scaled results to reflect the dredging and disposal requirements associated with S0024-02, S0004-03, S0033-01 and the 3FM Projects considered cumulatively here. These scaled results were then combined to provide details on the cumulative impacts from all four projects over the full period of the planned projects as set out in the overarching dredging programme presented in Figure 9-22.

The computational modelling studies concluded that the impact of sediment deposition from cumulative dumping activities is several magnitudes lower compared to natural sedimentation and can therefore be considered to be *de minimis*. By extension significant cumulative water quality impacts due to suspended solids are also highly unlikely. Adherence with the key mitigation measures set out above, will ensure that cumulatively the projects considered here will comply with, or will not result in the contravention of the following Directives:

- The Habitats Directive 82/43/EEC and Birds Directive 2009/147/EEC,
- The Water Framework Directive 2000/60/EC,
- The Marine Strategy Framework Directive 2008/56/EC.

Work undertaken by the Marine Institute, which included extensive sampling and monitoring of benthic communities throughout Dublin Bay since 2012, also concluded that the effects of dredging (loading) and spoil disposal appear to be contained within the loading and dumping areas, and do not appear to be impacting the wider seabed invertebrate communities in Dublin Bay.

Therefore, evidence from computational modelling, water quality monitoring, and benthic surveys suggests that the disposal of sediment at the dump location over many years has had no measurable long term effect on water quality or environmental conditions outside the dump site or within the dump site.

Adherence to mitigation measures outlined above for capital and maintenance dredging loading and dumping activities will ensure that cumulatively they will comply with, and will not result in the contravention of The Water Framework Directive 2000/60/EC. On the basis of scheduling of works and comprehensive mitigation measures applied it can be concluded that there will be no cumulative effects of the ABR, MP2, Dublin Port 2022-2029

Maintenance Dredging Programme, or the proposed Dublin Harbour Capital Dredging Project with the proposed 3FM Project.

### 9.1.7.3 Uisce Éireann – Ringsend Wastewater Treatment Plant (WwTP) Upgrade Project

The need for additional wastewater treatment capacity has previously been identified to meet increased commercial, domestic and industrial demand together with a requirement to meet higher environmental standards in the Lower Liffey Estuary which is designated as a "sensitive" water body requiring higher treatment standards. As a result, Uisce Éireann propose to expand the existing wastewater treatment plant to 2.4 million population equivalent (PE) capacity and to upgrade the Ringsend WwTP using enhanced Nereda© treatment technology to allow for improved environmental outcomes.

Estimates of the potential reduction of pollutants due to the upgrade are provided in the *Ringsend Wastewater Treatment Plant Upgrade Project EIAR* (June 2018). These are reproduced in Table 9.18. It has been estimated in process-proving trials that the proposed upgrade and enhanced treatment process will result in a substantial reduction in Biochemical Oxygen Demand (BOD), suspended solids and nutrient loads with significant positive environmental benefits.

The Ringsend Wastewater Treatment Plant Upgrade EIAR (June 2018) finds that there is potential for a temporary negative but not significant effect in the Tolka Estuary during the upgrade due to a number of secondary treatment tanks being temporarily out of operation. However, it concludes that the benefit of the permanent positive impact after the completion of construction outweighs the insignificant, temporary negative impact observed during the construction phase. Therefore, given the positive impact of the WwTP upgrade on receiving water quality it is unlikely that there will be any cumulative adverse effects when considered in combination with the 3FM Project.

Table 9.18 Ringsend Wastewater Treatment Plant, Final Effluent Discharge – Load Reduction Summary

| Parameter | Current Average | Future Average | % Reduction |
|---|---|---|---|
| BOD (Biochemical Oxygen Demand) | 8,739 kg/day | 7,206 kg/day | 17.5% |
| Suspended Solids | 16,205 kg/day | 10,508 kg/day | 35.2% |
| Ammonia | 4,370 kg/day | 600 kg/day | 86.3% |
| DIN (Dissolved Inorganic Nitrogen) | 5,939 kg/day | 4,804 kg/day | 19.1% |
| MRP (Molybdate Reactive Phosphate) | 1,056 kg/day | 420 kg/day | 60.2% |

### 9.1.7.4 Dublin Bay Power Plant

Synergen Power Limited operates the Dublin Bay Power Plant at Pigeon House Road in Poolbeg peninsula. The plant is a primarily natural gas-powered electricity generation plant in tandem with a heat recovery steam generator (IED Licence PO486-02).

The most significant discharge from the plant is the condenser cooling water discharge. The cooling water is abstracted from the Liffey Estuary Lower and returned via a channel downstream. The maximum volume of

cooling water discharge permitted in any one day is 726,000 cubic metres and the maximum permitted rate per hour is 30,250 cubic metres. The cooling water stream also receives emissions from the boiler blowdown emission point (maximum 100 cubic metres per day) and the plant's water treatment neutralisation tank emission point (maximum 200 cubic metres per day).

The IED licence sets emission limit values (ELVs) for a range of parameters including suspended solids and thermal limits for the cooling water discharge. The most relevant parameters in terms of potential cumulative effects with the 3FM Project are suspended solids and temperature. For suspended solids an ELV of 30mg/l applies to the Synergen water neutralisation treatment tank emission point. The 2017 AER reports a value of 5.25mg/l. This compares with an average turbidity measured at Poolbeg (Table 9.11) of 6.3 NTU which is equivalent to a total suspended solids of 15.75mg/l based on the relationship established in

. Compliance with the ELV for suspended solids means it is highly unlikely that any significant cumulative effect would occur from the Synergen discharge and the 3FM Project.

In respect to the power station intakes any increase in the suspended sediment concentrations was generally very small by comparison with background levels in the Liffey Estuary. The dredging operations are therefore unlikely to have any effect on the quality of intake waters in terms of suspended solids content. Thermal plume modelling has also concluded that there are no significant changes to the dispersion of thermal plumes envelopes within Dublin Port as a result of the 3FM Project. However, as customary, DPC will continue to notify the power station operators in advance of each dredging campaign. This will allow operators to temporarily stop abstracting water from the Liffey for a short duration should this be necessary.

Therefore, given the nature and composition of the Dublin Bay Power Plant discharge there will be no additive contribution to pollutant loads and no cumulative effects are likely.

#### 9.1.7.5 Poolbeg Generating Station

The ESB operates the Poolbeg Generating Station, Pigeon House Road in accordance with IED Licence P0577-03. Poolbeg Generating Station has a total electricity generating capacity of 470 MWe from a combined cycle gas turbine (CCGT) generating unit firing on natural gas from the national gas network.

Emissions to water include discharge of condenser cooling waters to the Liffey Estuary Lower. The maximum permitted volume to be discharged in any one day is 1,036,800 cubic metres and the maximum permitted rate per hour is 43,200 cubic metres. The cooling water stream also receives emissions from the water treatment neutralisation tank emission point (maximum 200 cubic metres per day), and boiler blowdown emission points (combined maximum 200 cubic metres per day). Screen wash water at the upstream abstraction point is returned locally to the Liffey Estuary Lower (combined maximum 480 cubic metres per day).

The IED licence sets emission limit values (ELVs) for a range of parameters including temperature, thermal load and chlorine in the cooling water discharge. These and the other parameters specified are of little relevance to 3FM Project activities. No limits have been specified in relation to suspended solids at the point of discharge.

Therefore, given the nature and composition of the Poolbeg Generating Station discharge there will be no additive contribution to pollutant loads and no cumulative effects are likely.

### 9.1.7.6 Waste Incinerator / Waste to Energy Facility

Covanta operates a waste incinerator/waste to energy facility at Pigeon House Road in Poolbeg peninsula in accordance with Waste Licence W0232-01. Up to 600,000 tonnes of waste per annum may be processed at the facility.

Cooling water is discharged to the Liffey Estuary Lower via the same channel as the Dublin Bay Power Plant above. The maximum volume of cooling water discharge permitted in any one day is 570,000 cubic metres and the maximum permitted rate per hour is 14,040 cubic metres.

The IED licence requires monitoring of flow, temperature and residual chlorine in the cooling water emissions and sets ELVs for temperature and total residual chlorine. It also requires toxicity testing and upstream and downstream biological surveys (including fish diversity).

As above for the Dublin Bay Power Plant and Poolbeg Generating Station, the nature and composition of the discharge is such that there will be no additive contribution to pollutant loads and no cumulative effects are likely.

### 9.1.7.7 Point Pedestrian & Cycling Bridge

This project involves the construction of a new pedestrian cycling bridge immediately upriver from the Tom Clarke Bridge. This scheme is currently at Options Review Stage and an Environmental Impact Assessment Report was proposed for completion in 2023. The project will significantly improve pedestrian and cycling crossing facilities as an alternative to Tom Clarke Bridge.

The proposed location of the Point Pedestrian & Cycling Bridge is also within the Liffey Estuary Lower transitional water body. The changes to the hydromorphology of the Liffey Estuary Lower, which is a heavily modified water body, through the operation of the Point Pedestrian and Cycling Bridge will not be significant given the modified nature of this water body for Port and Navigation use. The scale of this project is small in comparison to the wider port activities and the proposed 3FM Project. It is assumed that the Bridge design will be undertaken in a manner that is sympathetic to the environmental objectives of the water body, particularly the mitigation measures that will be required for good ecological potential to be achieved and with full cognisance of the Tom Clarke Bridge and the SPAR road bridge. This will ensure that flows are not negatively impacted and the longitudinal connectivity of the Liffey Estuary Lower is not compromised therefore the movement of fish upstream or downstream will not be negatively affected and the cumulative effects with the 3FM Project will not be significant.

The Point Pedestrian and Cycle Bridge will require a detailed Environmental Impact Assessment and EIAR. Provided the EIAR outlines the mitigation measures necessary to reduce the significant effects during the construction of the bridge then there is no risk of cumulative effects with the 3FM Project during construction.

### 9.1.7.8 The Howth Yacht Club Marina Extension – DAS Permit Reg. No. S0010-01

Howth Yacht Club (HYC) is proposing to extend the marina at Howth within the confines of the existing breakwater. A Dumping at Sea Permit was granted in August 2011 (Reg No. S0010-01) for the disposal of 120,000 tonnes of dredged material at the licensed offshore spoil grounds located to the west of the Burford

Bank, the same offshore site for the dredge spoil from the 3FM Project. HYC estimated a maximum daily quantity for dumping of 1,200 tonnes, and 800 tonnes in each load. It also suggested a spring or winter commencement and campaign duration of six months.

No dumping at sea under the HYC permit has taken place since it was granted in 2011. In the unlikely event that this work was to proceed during the construction phase of the 3FM Project, all dumping will be subject to the approval of the Dublin Port Harbourmaster and dumping activity will not be permitted by the Harbourmaster for DPC and HYC operations simultaneously. Given this, the nature of the material, and the relatively small volumes for disposal, cumulative effects are unlikely.

### 9.1.7.9 Offshore Wind Energy Projects

Under the revised Climate Action Plan 2023 (CAP23), the targets for wind energy in Ireland have been set as 6GW of onshore wind energy by the end of 2025, growing to 9GW of onshore wind energy by 2030, and at least 7GW of offshore wind energy by the end of 2030 with 2GW of that to be used for green hydrogen production. Of the 5GW of offshore wind contained within the 2030 targets, 3GW is expected to be delivered on the East coast of Ireland with the remaining 2GW delivered on the South coast in the Celtic Sea, and on the West coast. The distribution of proposed offshore wind projects is shown in Figure 9-23.

Almost 40GW of offshore wind projects are in development in Ireland, many at concept or early planning stages. In early 2022 the first six commercial scale offshore wind projects off Ireland were declared. Five of these projects are in the Irish Sea, and one on the West Coast of Ireland. In May 2023, the Irish government selected four projects with a combined capacity of nearly 3.1GW in the first offshore wind auction under the country's Renewable Electricity Support Scheme (ORESS 1): the 1,300MW Codling Wind Park (Reg. Ref. FS007045 Site Investigations), the 824MW Dublin Array (Reg. Ref. FS007188 Site Investigations), the 500MW North Irish Sea Array (NISA) (FS007031 and FS007358, Array and Cable Site Investigations respectively), and the 450MW Sceirde Rocks (located off Galway). A brief description of the three relevant offshore wind farm (OWF) projects is presented below followed by consideration of potential cumulative effects.

***a) Dublin Array Wind Farm***

The Dublin Array proposed offshore wind farm is located on the Kish and Bray Banks, 10km from the coastline of Dublin (Figure 9-24). These are naturally occurring sandbanks which the busy east coast commercial shipping routes avoid due to the shallowness of the water. The proximity of the wind farm to the coastline of Dublin, a major electricity demand hub, was a key consideration in the site selection. The export cable routes indicate possible landfall options in the area of Shanganagh Park and Poolbeg. A reduction in the length of the offshore transmission cables reduces the environmental impact and costs of construction. Between 39 and 50 turbines with tip heights of between approximately 270m and 310m are proposed. Subject to all necessary permits and consents being received, Dublin Array Wind Farm could begin construction in 2025, taking up to two years to complete (2027).

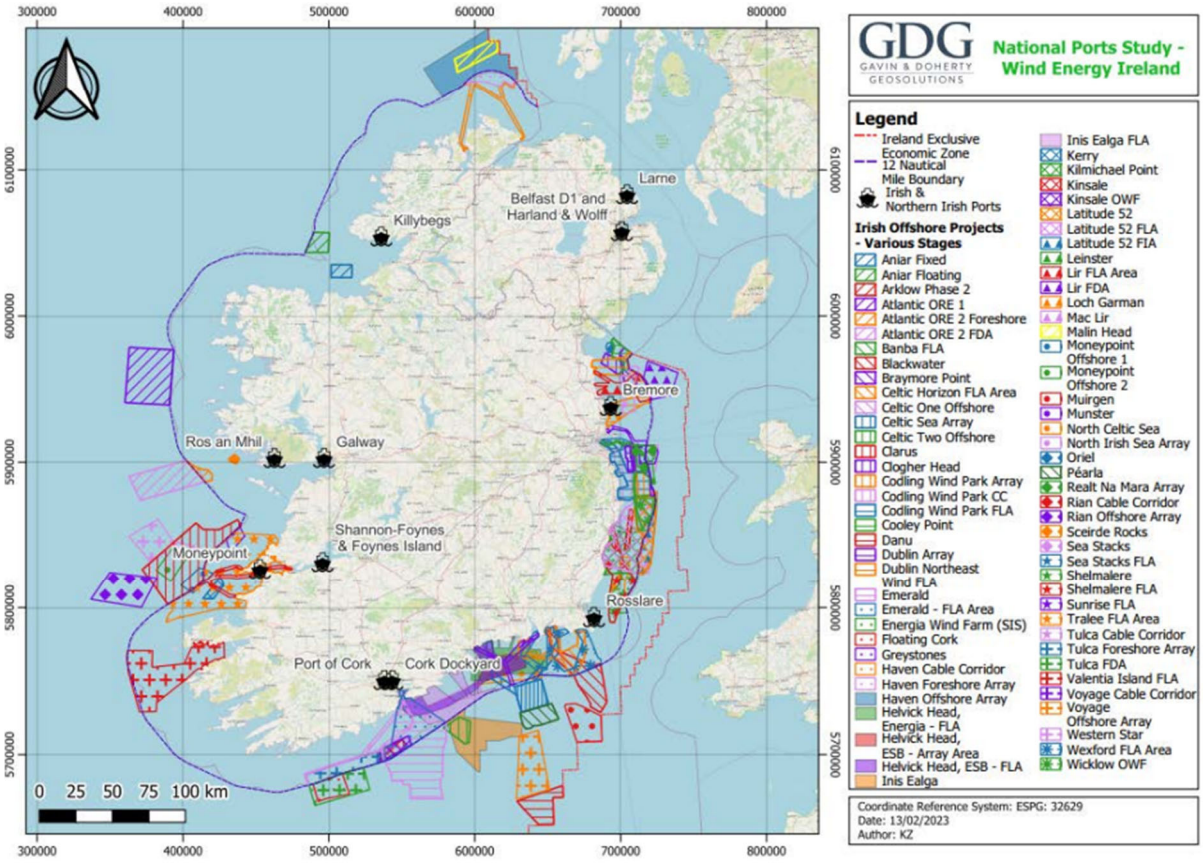


Figure 9-23 Distribution of proposed offshore wind projects (after Wind Energy Ireland - National Ports Study (GDG September 2022)

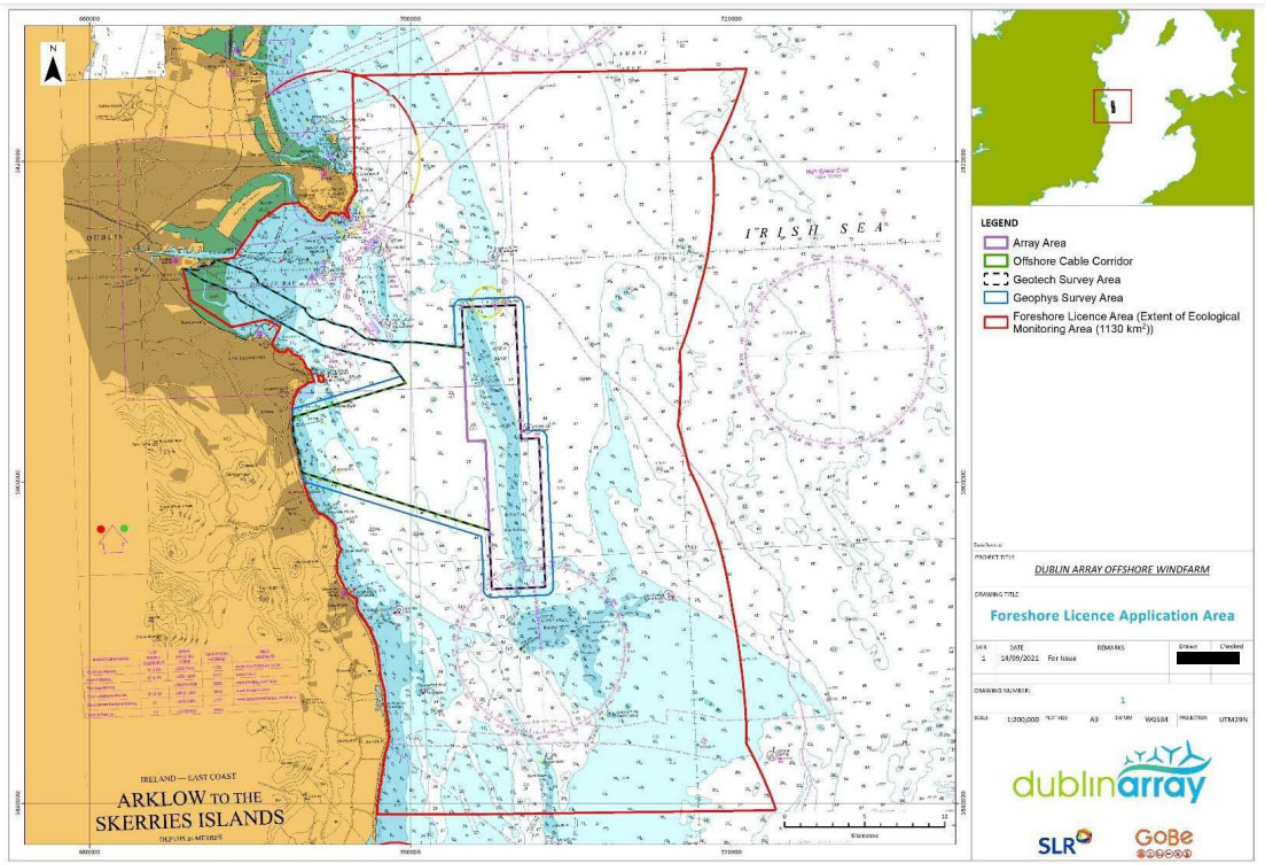


Figure 9-24 Dublin Array Windfarm Boundary and possible export cable routes

**b) *Codling Wind Park***

Codling Wind Park is a proposed 1.45GW offshore windfarm off counties Dublin and Wicklow. It represents one of the largest energy infrastructure projects in Ireland this decade. The turbine arrays are in an area lying between approximately 13 and 22 km off the County Wicklow coast, between Greystones and Wicklow Town (Figure 9-25). The application area extends to approximately 17.5km north of the constructed Arklow Bank Wind farm, and to about 0.5km south of the proposed Dublin Array Wind farm. The area extends into Dublin Port, Dun Laoghaire Port and Wicklow Port. A maximum number of 100 turbines will be installed across the 125km$^2$ site. Poolbeg Peninsula is considered as a possible landfall for the export cable. Subject to all necessary permits and consents being received, Codling Wind Park could begin construction in 2026. Construction is expected to take two to three years to complete (2026-2028).

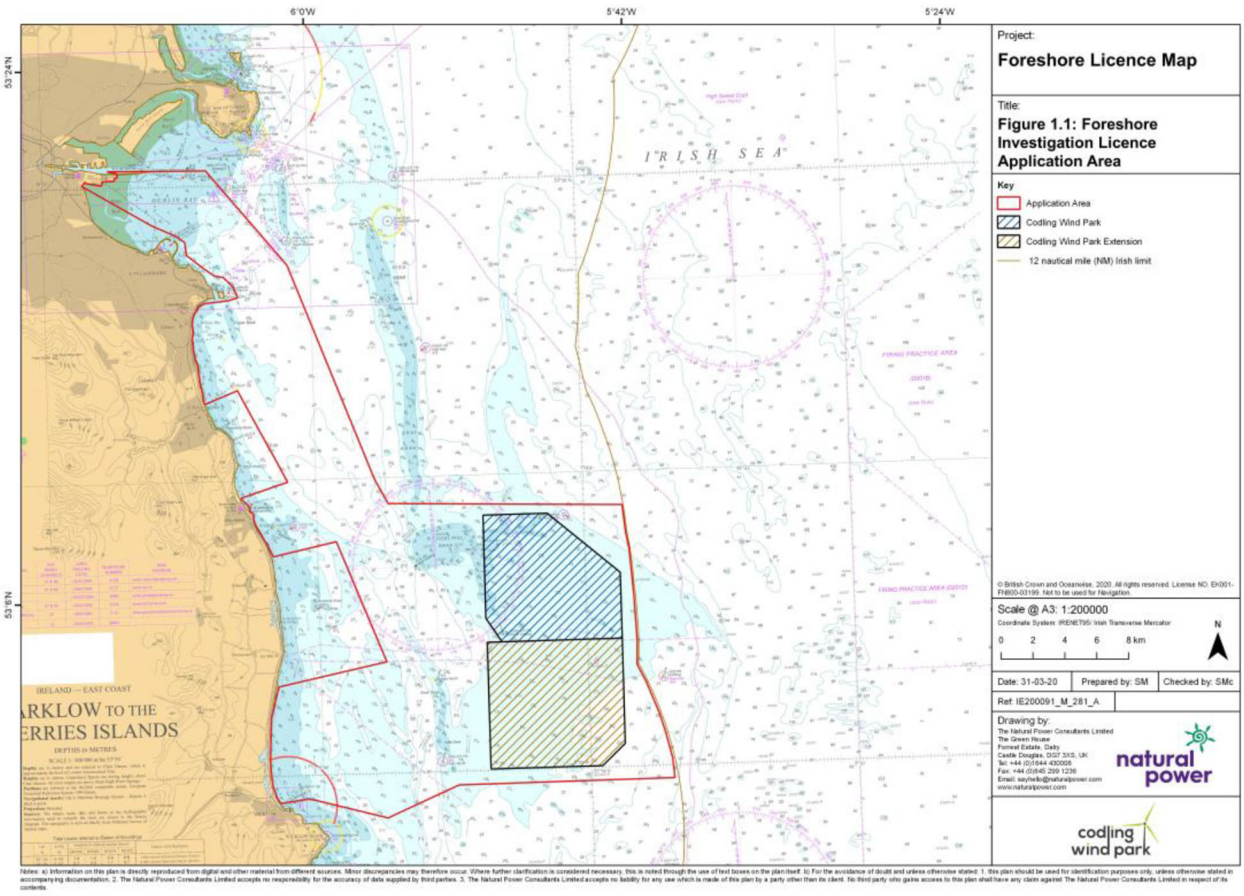


Figure 9-25 Codling Wind Park array location and possible export cable routes

Codling Wind Park also intend to construct an onshore substation on Poolbeg Peninsula adjacent to the proposed 3FM Project Turning Circle (Figure 9-26). A common boundary has been agreed between DPC and Codling Wind Park, comprising a vertical piled combi wall. This element of work has already been included in the 3FM Project assessment and therefore there are no additional cumulative impacts for this element of construction work.

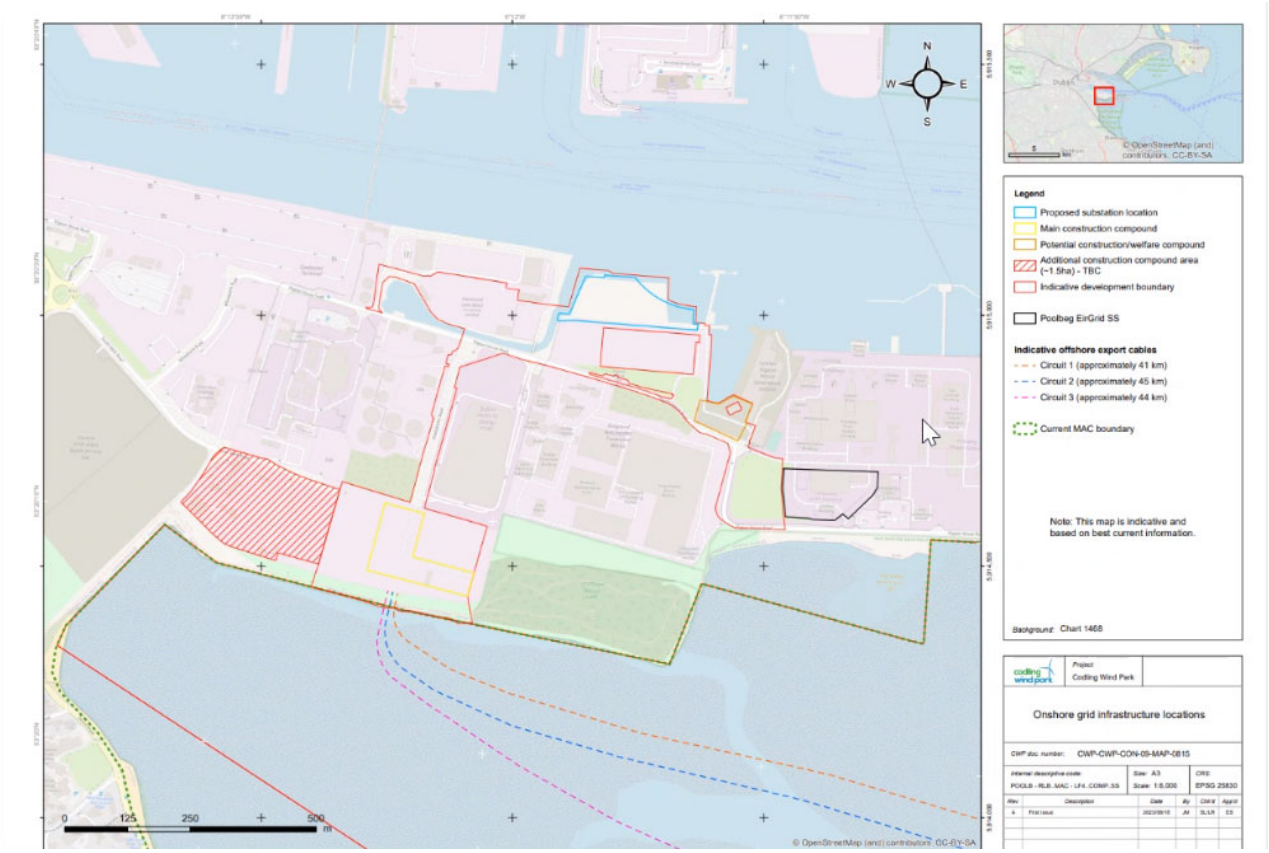


Figure 9-26 Codling Substation location on Poolbeg peninsula and export cable landfall

### *c) North Irish Sea Array*

The proposed North Irish Sea Array (NISA) project site covers an area of about 227km2 in the Irish Sea and lies between 7 and 17 kilometres off the coasts of counties Dublin, Meath, and Louth (Figure 9-27). The project proposes to generate capacity to power approximately half a million Irish homes and businesses with somewhere from 35 to 46 turbines and an export cable landfall north of Balbriggan in County Dublin. The project is currently at Design Review Stage and a planning submission date for NISA in 2024 is targeted, with commencement of construction anticipated for 2026 and operation to start in 2028.

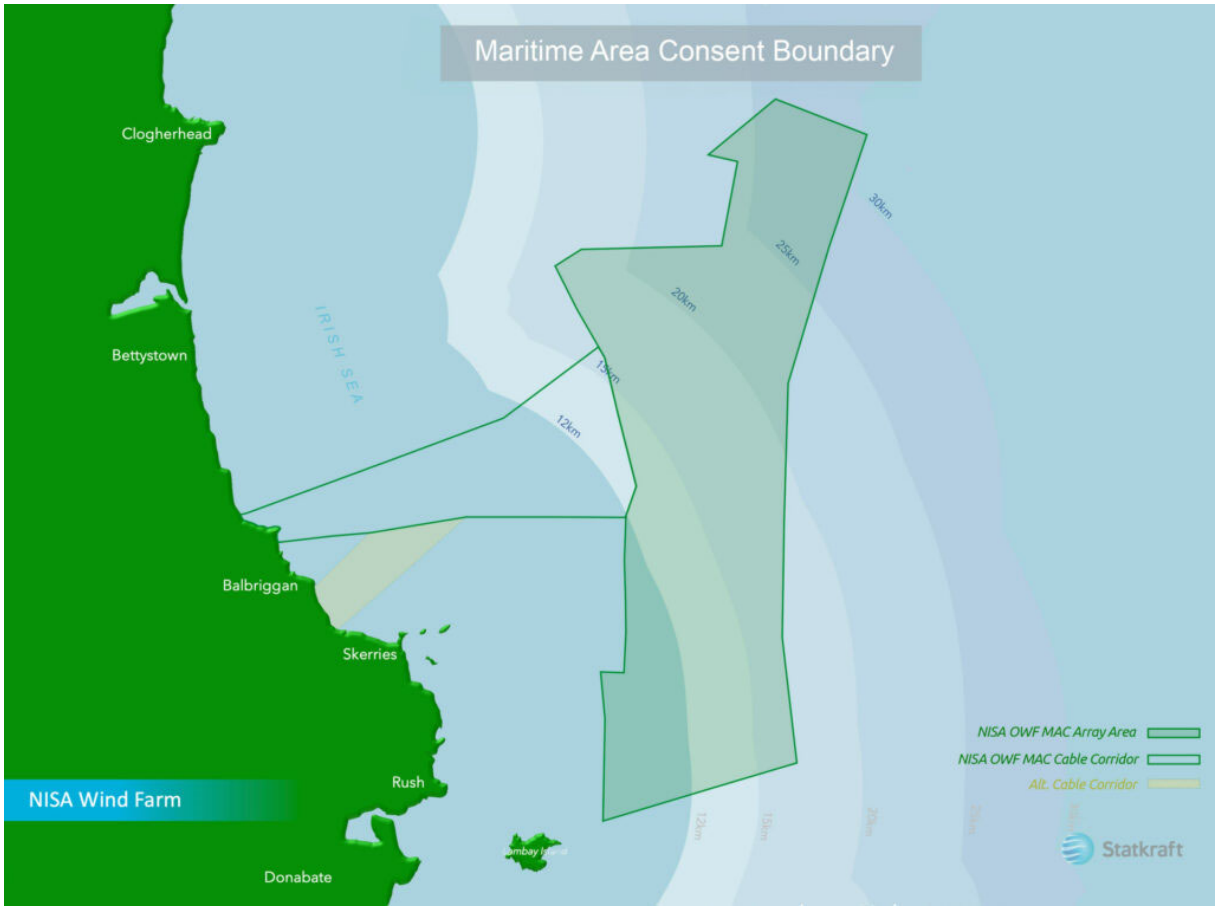


Figure 9-27 North Irish Sea Array location (Image: Statkraft / NISA)

**3FM / OWF Cumulative Effects on Water Quality**

*Dredging and Sediment Plumes*

Of the three relevant OWFs identified with potential for cumulative effects with the 3FM Project, the Codling Wind Park and the Dublin Array have proposed possible export cable landfall on the south of Poolbeg Peninsula in Dublin Bay, each with cable corridors that traverse south Dublin Bay from the southeast.

The laying of cables offshore will involve vessels using ploughs, mechanical excavation, or jetting. Some pre-installation dredging of sand waves may also be required. ABR/MP2 modelling and monitoring data has shown that plumes from dredging within the Liffey channel are confined to the immediate area of operation and do not impact the wider environment. Dredging for cable corridors will also be separated from 3FM dredging within the Liffey channel by the Great South Wall. The material excavated during cable works will be retained in the cable corridor, and no dumping at the Burford bank dump site will take place. Therefore, there will be no cumulative impact with 3FM Project dredge spoil dumping operations at the dump site where sediment plumes have been shown to settle rapidly and within 750m of the site.

It is highly unlikely that there will be any cumulative impacts of offshore wind energy projects with the 3FM Project.

## 9.1.8 Interactions

The impacts on water quality on the receiving water environment and the overall significance of effect has also considered the potential for interactions with other environmental factors. For example the water quality chapter has considered the potential effects of the 3FM Project on the environmental objectives of the water bodies within the study area. This requires consideration of the biological elements, particularly benthic ecology and fisheries and how the supporting physico-chemical and hydromorphological elements can impact on the biology.

Coastal processes have a strong interaction with the water quality and WFD assessment in that the outputs from the coastal processes chapter has informed the impact of the project on the supporting hydromorphological and physico-chemical conditions of ecological status. There is also an interaction between water quality and the Lands Soils Geology and Hydrogeology chapter which identified the presence of contaminated sediment from the Maritime Village / Marina which if disposed of inappropriately could impact on the water quality and WFD status of the Dublin Bay coastal water body. Suitable mitigation is proposed to mitigate this impact.

There is also an interaction between water quality and the provision of the services detailed in Chapter 15 which ensures the appropriate collection and treatment of storm water and foul water from the 3FM Project to avoid water quality impacts on surface water bodies.

## 9.1.9 Monitoring

### 9.1.9.1 Water Quality Monitoring within the inner Liffey channel

The construction works associated with the 3FM Project are located primarily on the southern shores in the Dublin Port Estate.

A water quality monitoring system has been designed to ensure robust protection of the marine environment and for users of the inner Liffey channel during the construction phase of the 3FM Project. Water quality monitoring stations previously established and operated during the ABR and MP2 Projects will continue to monitor a range of water quality parameters in real time. The locations of the monitoring stations are shown in Figure 9-28.

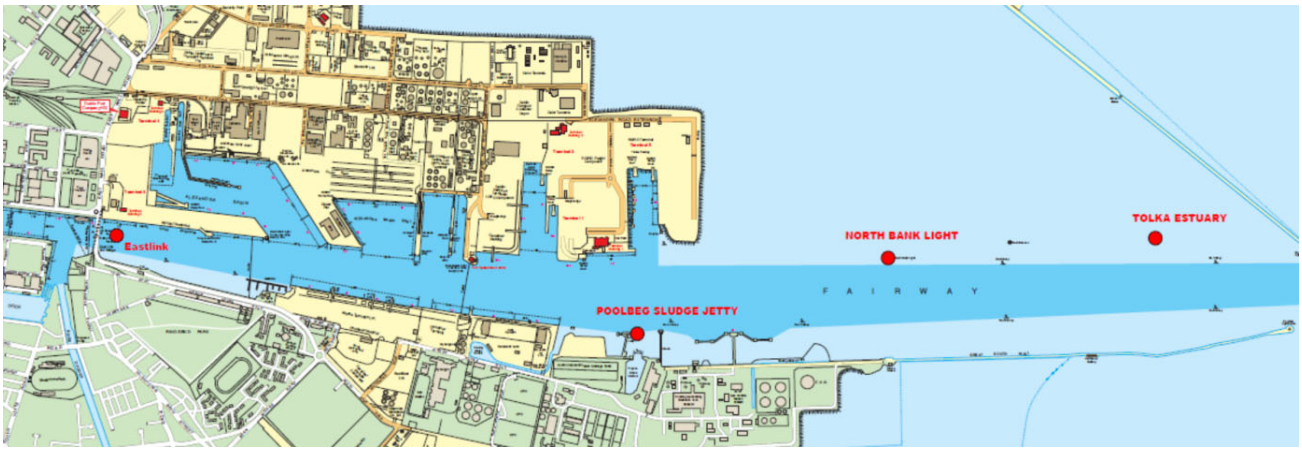


Figure 9-28 Location of Monitoring Stations

***Monitoring Station 1 (Eastlink)*** This monitoring station is sited in the River Liffey Channel downstream of East Link Bridge.

***Monitoring Station 2 (Poolbeg Sludge Jetty)*** This monitoring station is sited along the southern edge of the River Liffey Channel at the Poolbeg Sludge Jetty in close proximity to a power station intake.

***Monitoring Station 3 (North Bank Light)*** This monitoring station is sited along the northern edge of the River Liffey Channel at the North Bank Light outside, but in close proximity to, the South Dublin Bay and River Tolka SPA.

***Monitoring Station 4 (Tolka Estuary)*** This monitoring station is sited in the Tolka Estuary near the northern edge of the River Liffey Channel inside the South Dublin Bay and River Tolka SPA.

Monitoring station 1 (Eastlink) and monitoring station 2 (Poolbeg Sludge Jetty) will be moved to accommodate the progress of 3FM works, subject to agreement with the Planning Authority and the EPA.

Monitoring System Specification

The specification is based on state of the art 24/7 real time monitoring. Water quality monitoring sensors, giving high resolution data with respect to the following parameters are being used at each of the four monitoring locations

- Turbidity
- Dissolved Oxygen
- Temperature
- Salinity
- pH.

Water level is also measured at one monitoring station to provide information on tidal state. Turbidity is measured as a surrogate for suspended solids. Site specific tests have previously been undertaken by the ABR Project to define site specific relationships between turbidity and suspended solids.

Apparatus housing and moorings used are robust and designed for the marine conditions at the monitoring locations. An ongoing calibration and maintenance programme is in place comprising:

- Regular field calibration of sensors at weekly to three week intervals depending on operations
- Regular maintenance of sensors (including cleaning and factory calibration as required)
- Documented procedures for Data Quality Control
- Availability of standby and operational instrumentation as required

A data acquisition and transfer system is being used to enable the transmission of high resolution data to an onshore station at approximately 15 minute intervals.

A data storage, interrogation system is in place comprising

- Provision of Data Server for data storage and secure archival
- Secure web portal access to data

– Suitable Software to interrogate and display data

The following threshold values (TVs) for turbidity and DO for compliance assessment are proposed based on existing multi-annual data sets. They consider established baseline conditions at these sites, data accuracy, coastal process and sediment plume model outputs, and potential for significant environmental impact.

- **Inner Liffey channel Turbidity TV:** Peak Daily ≤ 59 NTU (90%ile compliance)
- **Dublin Bay Turbidity TV:** Peak Daily ≤ 80 NTU (90%ile compliance)
- **Inner Liffey channel DO TV:** Mean Daily ≥ 6mg/l (90%ile compliance)

Duration of Monitoring Programme

The monitoring network infrastructure has been in place since 2016 and will continue for the duration of the construction phase of the 3FM Project.

This monitoring system has already generated a robust water quality baseline within the inner Liffey channel with the ability to identify water quality trends. The continuation of the monitoring system will serve to further strengthen the knowledge of water quality trends, a key indicator of the health of the marine environment.

The water quality data currently being collected is summarised in monthly environmental reports and circulated to Dublin City Council. This transfer of information will continue for the duration of the construction phase of the 3FM Project.

The data collected is also being shared with research organisations (Dublin City University, Maynooth University and University College Cork).

Incident Response / General Observations

In the event of possible environmental incidents, the on-site Environmental Facilities Manager will initiate additional investigative sampling as required to seek to identify the possible source and nature of any pollutants present. A record will be made of any general observations relevant to the event which may inform the investigation including: weather conditions; any unusual water attributes (e.g. unusual colour or smell of sample, foam, scum); any other observations including works within or surrounding the site; any other general observations including written and photographic records will be made as appropriate.

Reporting

Data from ongoing monitoring programmes will be collated at regular intervals (usually calendar months) and summarised in synoptic reports by the Environmental Facilities Manager. Any breaches of emission, threshold values or compliance values will be indicated in the report along with the findings of any relevant investigation. In addition to interim synoptic reports an annual environmental report will be prepared.

### 9.1.9.2 Water Quality Monitoring within Dublin Bay

It is proposed that dredge spoil arising from the 3FM Project will be disposed of at the licenced offshore disposal site located at the entrance to Dublin Bay, to the west of the Burford Bank.

Extensive DPC monitoring has been undertaken at four water quality monitoring stations in Dublin Bay between 2017 and 2021. The monitoring included capital dredging campaigns over four winter seasons and a number

of maintenance dredging campaigns. This monitoring has provided sufficient data to validate computational models developed to predict the impact of the 3FM Project capital dredging campaign. The monitoring requirements at the dump site will be subject to the conditions of a separate Dumping at Sea Permit, if granted by the EPA.

### 9.1.10 Conclusions

Baseline water quality within the receiving environment was established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive (WFD) and supporting environmental standards. Recent extensive high-frequency monitoring data collected over a period of six years during Dublin Port Company's ABR and MP2 Projects was also reviewed.

Using baseline water quality data and site specific water quality model simulation outputs, an assessment of the 3FM Project was conducted to determine the likelihood of significant impacts on water quality using the criteria for rating significance and magnitude as set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*" (NRA, 2008), and appropriate mitigation measures to reduce impacts were proposed where necessary.

In circumstances where the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the 3FM Project on water quality in the project zone of influence will be imperceptible. An assessment of potential cumulative impacts has also been made. The 3FM Project is therefore not expected to significantly impact water quality, either alone or in combination with other projects, in the receiving waters.

It can therefore be concluded that the 3FM Project works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies.

## 9.2 Flood Risk Assessment

This section of Chapter 9 addresses the potential for flooding to the 3FM Project site. It identifies possible sources of flooding, establishes the impact of the development on flood risk and proposes mitigation measures to minimise the flood risk. The potential impact of the 3FM Project on flooding to adjoining receptors is also considered as part of this assessment.

### 9.2.1 Assessment Methodology

The risk of flooding to the 3FM Project has been assessed in accordance with the methodologies set out in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' published by the Department of the Environment, Heritage and Local Government and the OPW in November 2009, referred to hereafter as 'The Planning System and Flood Risk Management Guidelines'.

The assessment comprises the following stages:

- consideration of Dublin Port Masterplan 2040 Strategic Flood Risk Assessment (SFRA);
- identification of potential sources of flooding, determination of Flood Zones and consideration of how the 3FM Project complies with The Planning System and Flood Risk Management Guidelines using the sequential approach; and
- impact assessment of the 3FM Project based on the Flood Zones and the development vulnerability classifications is carried out and mitigation measures proposed where applicable.

#### 9.2.1.1 Dublin Port Masterplan 2040 Strategic Flood Risk Assessment

RPS have previously carried out a Strategic Flood Risk Assessment (SFRA) in support of the Masterplan 2040 (reviewed in 2018) for the redevelopment of Dublin Port. The main purpose of the SFRA was to appraise the adequacy of existing information, prepare flood zone maps, and to highlight potential development areas that require more detailed assessment on a site-specific level. The SFRA also provides guidance for appropriate types of development within areas at potential risk of flooding and suitable mitigation measures to ensure resilience to the predicted effects of climate change.

The SFRA provided the framework as to how all subsequent developments within the Port should manage flood risk and identified the need to undertake a site-specific flood risk assessment for all sites identified as being at risk from flooding. This section of the EIAR is equivalent to a site-specific flood risk assessment and has been prepared in accordance with The Planning System and Flood Risk Management Guidelines.

#### 9.2.1.2 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range, and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types or levels of flood zones defined for the purposes of The Planning System and Flood Risk Management Guidelines:

- **Flood Zone A** - where the probability of flooding from rivers and the sea is highest (greater than 1% for river flooding, or 0.5% for coastal flooding).

- **Flood Zone B -** where the probability of flooding from rivers and the sea is moderate (between 0.1% and 1% for river flooding, or between 0.1% and 0.5% for coastal flooding).
- **Flood Zone C** - where the probability of flooding from rivers and the sea is low (less than 0.1% for both river and coastal flooding).

The flood zones are based on the current (present-day) assessment of events without the inclusion of climate change factors. The presence of flood protection structures should be ignored in determining flood zones. This is because areas protected by flood defences still carry a residual risk of flooding from overtopping or breach of defences and the fact that there may be no guarantee that the defences will be maintained in perpetuity. The flood zones described above are indicative of river and coastal flooding only so they should not be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as groundwater or artificial drainage systems.

#### 9.2.1.3 Sequential Approach

A sequential approach to planning is a key tool in ensuring that development, particularly new developments, is first and foremost directed towards land that is at low risk of flooding. The sequential approach as described in The Planning System and Flood Risk Management Guidelines (reproduced as Figure 9-29) should be applied to all stages of the planning and development management process. It is of particular importance at the plan-making stage but is also applicable in the layout and design of development within a specific site at the development management stage. Figure 9-30 describes how the sequential approach is used in the planning process.

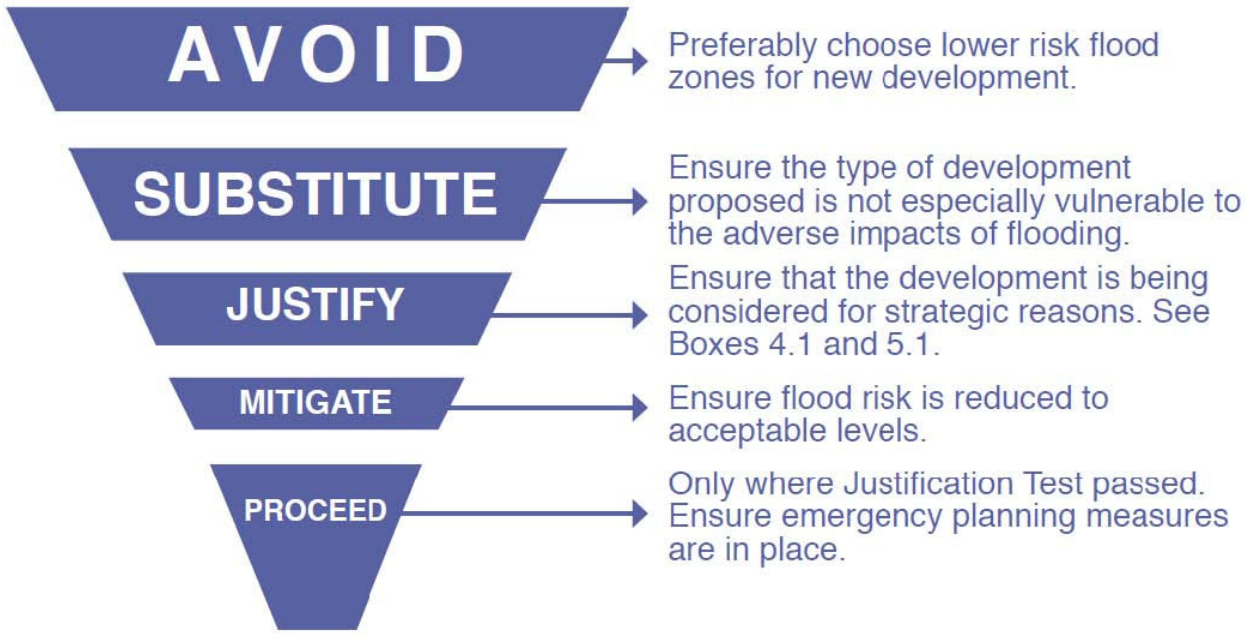


Figure 9-29 Sequential approach principles in flood risk management (DEHLG, 2009)

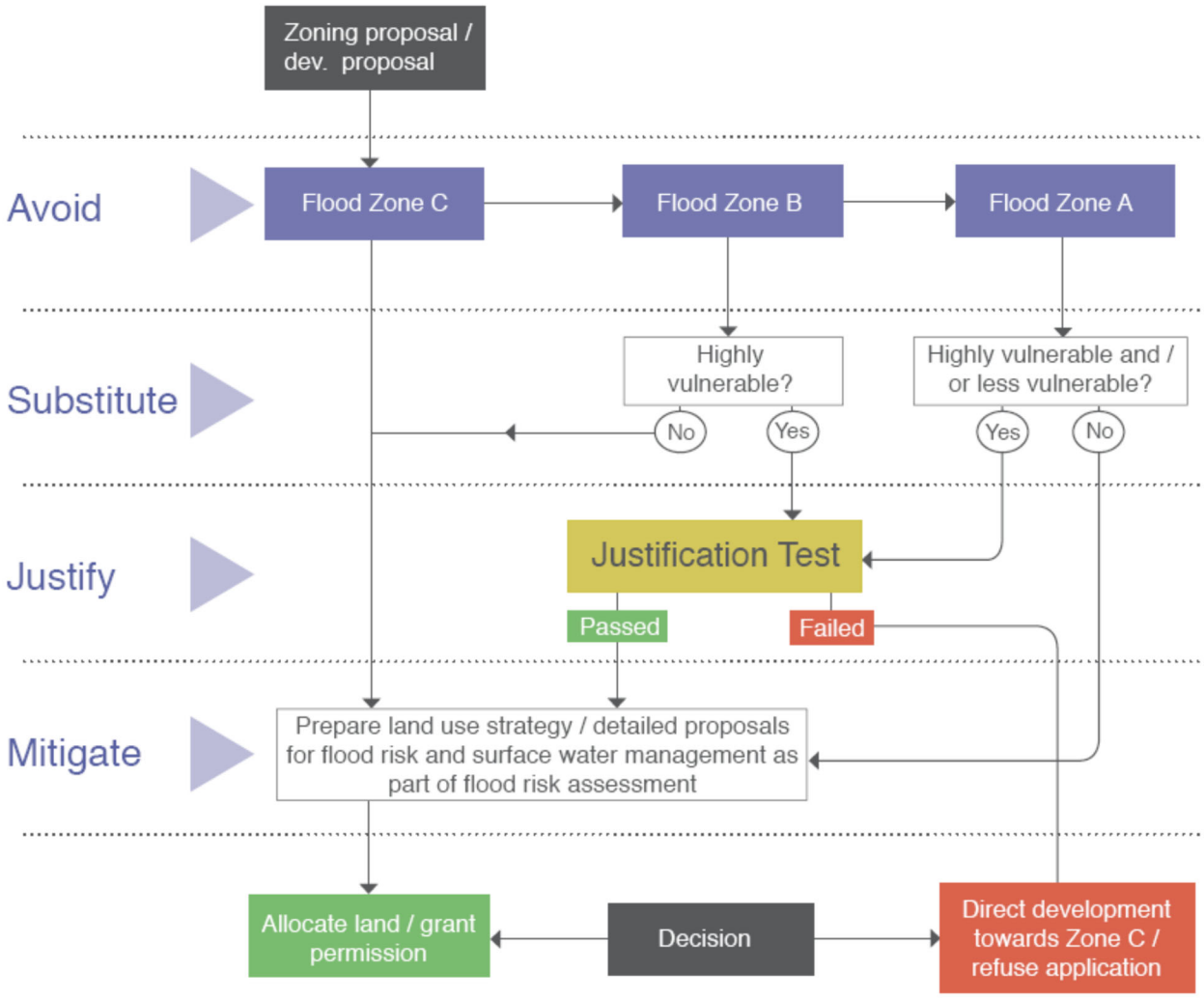


Figure 9-30 Sequential Approach Mechanism in the Planning Process (DEHLG, 2009)

### 9.2.1.4 Classification of Vulnerability

The Planning System and Flood Risk Management Guidelines classify different types of development in terms of their vulnerability class as shown in Table 9.19. The Guidelines identify the type of development that would be appropriate to each flood zone and those that would be required to meet the Justification Test. This is shown in Table 9.20. Appropriate development is development whose vulnerability to flooding is such that it is generally acceptable within a particular flood zone.

Table 9.19 Classification of vulnerability of different types of development

| Vulnerability Class | Land use and types of development include: |
|---|---|
| Highly Vulnerable development (including essential infrastructure) | Garda, ambulance and fire stations<br>Hospitals<br>Schools<br>Dwelling houses, student halls of residence and hostels<br>Residential institutions<br>Caravans and mobile home parks<br>Essential infrastructure |
| Less Vulnerable development | Buildings used for retail, leisure, warehousing, commercial, industrial and non-residential institutions<br>Lands and buildings used for holiday caravans or camping<br>Land and building used for agriculture and forestry<br>Waste treatment<br>Mineral workings and processing<br>Local transport infrastructure |
| Water-compatible development | Flood control infrastructure<br>Docks, marina and wharves<br>Navigation facilities<br>Ship building, repairing and dismantling<br>Water-based recreation and tourism<br>Lifeguard and coastguard stations<br>Amenity open space, outdoor sports and recreation and essential facilities |

Table 9.20 Matrix of vulnerability versus flood zone

| Vulnerability | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| **Highly Vulnerable** | Justification Test | Justification Test | Appropriate |
| **Less Vulnerable** | Justification Test | Appropriate | Appropriate |
| **Water Compatible** | Appropriate | Appropriate | Appropriate |

## 9.2.2 Existing Environment

### 9.2.2.1 Fluvial Flooding

The River Liffey flows adjacent to the 3FM Project site. At this location, the River Liffey can be considered as tidal, therefore extreme flood events are likely to be dominated by coastal flooding and extreme fluvial events will not further increase the extreme levels predicted during extreme tidal and storm events. Fluvial flood risk has not been considered further in this assessment on the basis that coastal flood risk is the predominant source of flood risk at this location.

### 9.2.2.2 Coastal Flooding

As noted above, the River Liffey can be considered tidal at this location. The Strategic Flood Risk Assessment states that a review of the most to date available data should be undertaken for any site-specific FRA. The most up to date extreme water levels at Dublin Port are from Phase 1 of the Irish Coastal Wave and Water Level

Modelling Study (ICWWS) published in 2018 by OPW. The predicted tidal water levels of this analysis are as shown in Table 9.21. These are for Estimation Point NE22, the location of which is shown in Figure 9-31.

Table 9.21 Predicted tidal water levels (Point NE22, ICWWS 2018)

| Annual Exceedance Probability (AEP) | Return Period | Water level to OD Malin (OSGM15) |
|---|---|---|
| 0.5% | 200 year | 3.15 |
| 0.1% | 1000 year | 3.30 |


Figure 9-31 Location of North East coast estimation points (ICWWS)

### 9.2.2.3 Pluvial Flooding

Pluvial flooding maps are available for this area from OPW. Figure 9-32 shows extracts from the pluvial flood map. This shows that there are areas of the sites at risk from pluvial flooding.


Figure 9-32 Extract from Pluvial Flood Extent Map (Dublin Pluvial Study)

#### 9.2.2.4 Historical Flooding

The Office of Public Works (OPW) gathers and collates data from reported flood events throughout the country. From a review of the OPW's National Flood Hazard Mapping database (www.floodmaps.ie), there was a recorded event in February 2002 when overtopping waves caused flooding to an area of the R131, see Figure 9-33 for location.


Figure 9-33 Locations of historical flood events

#### 9.2.2.5 Flood Zones

The flood zones for the 3FM Project have been derived based on the predicted tidal water levels indicated in Table 9.21, without the inclusion of climate change factors. These flood levels are indicative of coastal flooding and should not be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as groundwater or artificial drainage systems. Figure 9-34 shows the extent of these present-day flood zones in relation to the 3FM Project site. As illustrated in Figure 9-34, portions of the 3FM Project site are within Flood Zones A and B, with the remaining areas in Flood Zone C.

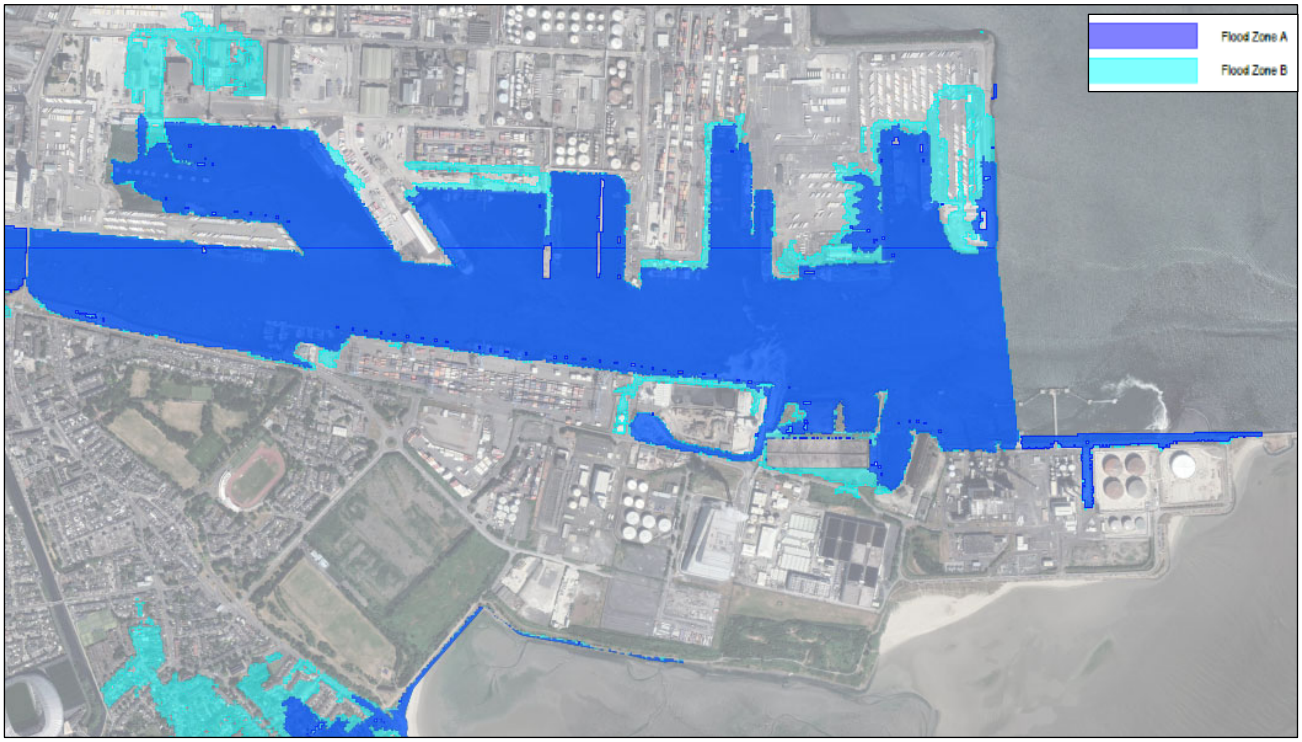


Figure 9-34 Extent of flood zones (Present day)

#### 9.2.2.6 Existing Storm Drainage

The existing surface runoff generated within the southern estate lands, drains either directly into the sea, after passing through oil interceptors or is attenuated prior to entering the existing drainage network. The areas on the northern half of the Poolbeg Peninsula generally follow the former arrangement and are generally characterised by large swathes of reasonably flat hardstand area. Whereas the areas on the southern half of the peninsula generally follow the latter arrangement. Of note is that the southside of the southern peninsula contains two known outfall points, the first at Pembroke Cove, which currently drains both the Whitebank Road and South Bank Road, and the second is in line with Shellybanks Road which currently drains private sites, the Covanta site and Shellybanks Road.

### 9.2.3 Impact Assessment

#### 9.2.3.1 Potential Impact of Flooding to Proposed Development

As highlighted in Section 9.2.1.4, The Planning System and Flood Risk Management Guidelines classify different types of development in terms of their vulnerability class (Table 9.19). Table 9.20 illustrates the types

of development that would be appropriate to each flood zone and those that would be required to meet the Justification Test. The flood zones have been mapped onto the current proposals for the 3FM Project site. This is shown in Figure 9-35.

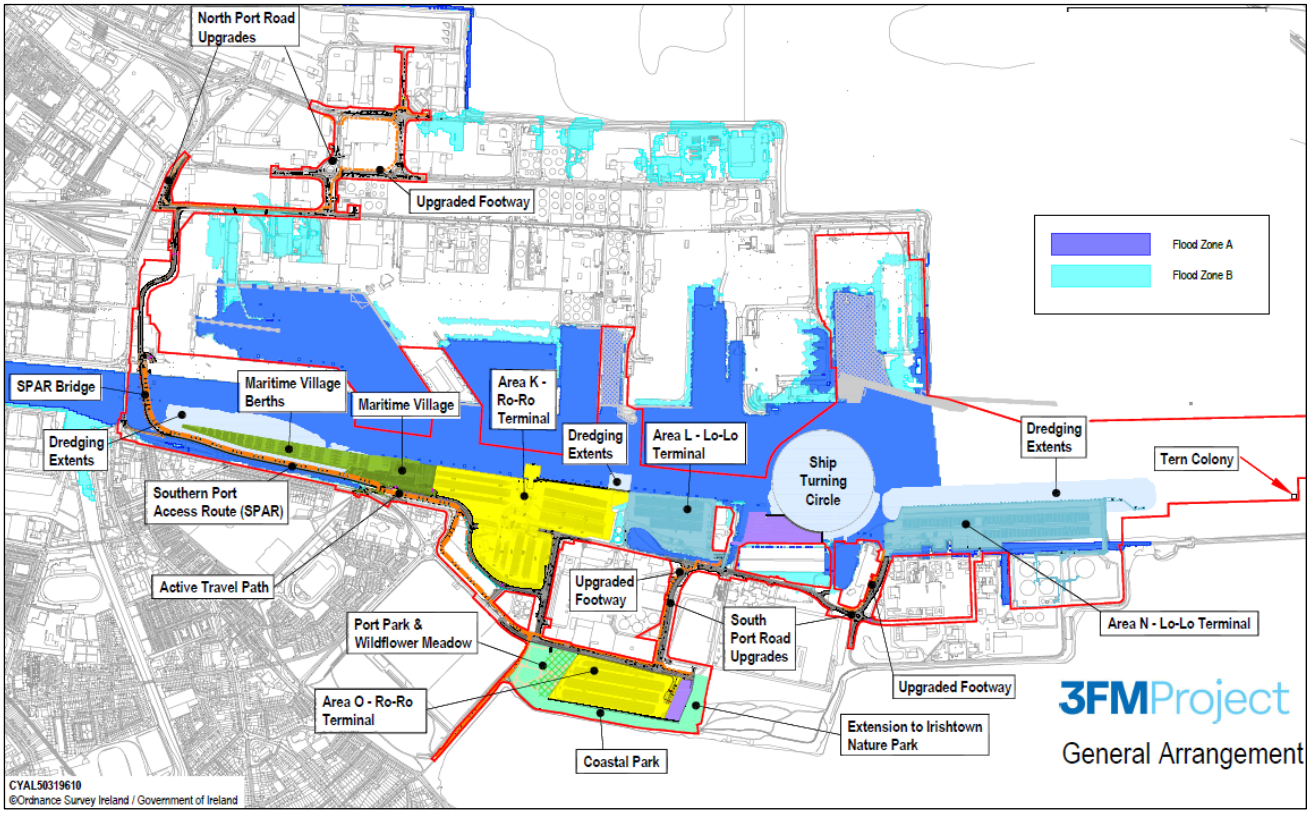


Figure 9-35 Extent of flood zones (including 3FM Project layout)

The 3FM Project has a range of uses with varying degrees of vulnerability as classified under The Planning System and Flood Risk Management Guidelines. This is summarised for each element of the proposed development in Table 9.22. Only the land-based elements of the proposal have been considered, with the infilling and dredging areas located within the existing marine environment.

A Justification Test will be required for the Southern Port Access Road (SPAR) and bridge, and this is presented in Section 9.2.6. All the other uses within the 3FM Project site can be considered as appropriate for the identified flood zones, and therefore a Justification Test is not required. While the combination of risk and vulnerability is such that these elements of the development are generally acceptable the risk remains, and it may change during the lifetime of the development. Therefore, mitigation measures have been considered that will reduce that risk.

Table 9.22 Summary of flood risk and vulnerability classification for proposed development

| Proposed development | Vulnerability class | Flood zone | Appropriate/ Justification Test |
|---|---|---|---|
| North Port Road Upgrades | Less vulnerable (Local transport infrastructure) | B/C | Appropriate |
| Southern Port Access Route (SPAR) & Bridge | Less vulnerable (Local & transport infrastructure) | A | Justification Test |
| Maritime Village | Water-compatible (Water-based recreation) | A/B/C | Appropriate |
| Ro-Ro Terminal (Area K) | Water-compatible (Docks, marinas and wharves) | C | Appropriate |
| Lo-Lo Terminal (Area L) | Water-compatible (Docks, marinas and wharves) | B | Appropriate |
| Lo-Lo Terminal (Area N) | Water-compatible (Docks, marinas and wharves) | A | Appropriate |
| Ro-Ro Terminal (Area O) | Water-compatible (Docks, marinas and wharves) | C | Appropriate |
| South Port Road Upgrades | Less vulnerable (Local transport infrastructure) | C | Appropriate |
| Port Park & Wildflower Meadow | Water-compatible (Amenity open space) | C | Appropriate |

#### 9.2.3.2 Potential Impact of Flooding on Adjoining Receptors

An assessment of the impact of the proposed works was undertaken to determine any potential flooding impact on Dublin Port and adjoining receptors due to the development. This is fully described in the Coastal Processes chapter (Chapter 13). The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in Dublin Port during storm events did not exceed ±0.20m. These changes were confined primarily to Poolbeg Marina and Area N. There was no discernible change in the wave climate due to the 3FM Project in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary.

These changes to the wave climate are not considered significant and will not impact operations within the Port. Furthermore, the change in risk of potential coastal flooding due to the 3FM Project at neighbouring sites is negligible and no mitigation is required.

### 9.2.4 Mitigation Measures

#### 9.2.4.1 Flood Warning

The risk to the 3FM Project site is from tidal flooding from the River Liffey. Tidal levels around the coast of Ireland are currently monitored by OPW who issue high tide advisories so there will be sufficient warning of any extreme tidal events that are likely to impact on Dublin Port. In addition, there is a Dublin Bay tidal warning system (TRITAN) in operation by Dublin City Council. Flood warning will be useful for the operation of the 3FM Project.

### 9.2.4.2 Development Levels

In line with The Planning System and Flood Risk Management Guidelines, the Strategic Flood Risk Assessment (SFRA) for the Dublin Port Masterplan 2040 advises that any development should be set at the present day 0.5% AEP tidal event with a suitable allowance for climate change and an appropriate freeboard, taking account of data uncertainties and the site-specific wave climate.

Whilst there is a clear consensus that climate change will present significant challenges in the future, some uncertainty remains regarding the extent and magnitude of change, particularly within the coastal environment. The ICWWS considers four future scenarios - the Mid-Range Future Scenario (MRFS) which is an allowance of 0.5m on extreme water levels; the High End Future Scenario (HEFS) which is an allowance of 1m on extreme water levels; H+EFS which is an allowance of 1.5m on extreme water levels; and the H++EFS which is an allowance of 2m on extreme water levels. In 2021, RPS completed the report 'Dublin Port Bull Walls-Considering the Impact of Future Climate Change' on behalf of Dublin Port Company. The primary objective of this study was to review national guidance documents and the plethora of scientific literature to identify a likely set of future scenario conditions that could be used to assess the impact of climate change on the historical structures at Dublin Port by 2100. The report recommended a 1m increase in sea level rise. It is recommended that an allowance of 1m for climate change is included for the 3FM Project.

Freeboard is a safety margin to account for uncertainties in water-level and wave action prediction. The OPW typically recommend that a freeboard of 300-500mm above the still water level should be included. 300mm is generally considered where hard defences or raised ground is provided and 500mm where engineered earth embankments are the provided means of protection. It is recommended that a freeboard of 0.3m is included for the 3FM Project.

Using the present day 0.5% AEP level coastal level and climate change and freeboard allowances detailed above, the recommended development level for the 3FM Project is 4.45m OD. This level is derived from:

- Present day 0.5% AEP flood level 3.15m OD
- Sea level rise for climate change (HEFS) +1m
- Freeboard to allow for uncertainty +0.3m

RPS have undertaken an assessment of the risk from wave action and whether there should be additional consideration be given to proposed development levels. Over the proposed 3FM development only the Area N quay will be subject to waves of any significant nature within the Port. It is recognised that a level of wave overtopping would be acceptable given the nature of the proposed development, but that an additional 150mm be added to finished levels. In these areas the level should be increased to 4.6m OD to allow for wave action.

Note that Dublin City Council typically use a level of 4.15m OD for flood protection in this area which is derived as follows:

- Present day 0.5% AEP flood level 3.25m OD
- Sea level rise for climate change (HEFS) +0.5m
- Freeboard to allow for uncertainty +0.3m
- Wave action +0.1m

The recommended development levels are aspirational and there will be visual, social or technical reasons why they cannot be achieved at all locations throughout the 3FM development. Each element of the proposed development is considered below based on the recommended development levels.

### *North Port Road Upgrades*

Road improvements include upgrades to Alexandra Road, Tolka Quay Road, Promenade Road, Link Road and Bond Drive, to the junction with Bond Drive Extension. Upgrades include realignment of carriageways, upgraded footways and an additional roundabout. The upgrades are through existing port areas with a variety of hardstand surfaces and uses. Levels for the upgrades will need to tie into with existing levels. The majority of the proposed upgrades are located in Flood Zone C, with only a small area on Alexandra Road in Flood Zone B (moderate probability of flooding). There will be no permanent damage caused if the road should be flooded and other routes through the area are available. Therefore, no further mitigation measures are proposed.

### *Southern Port Access Route (SPAR) Road & Bridge*

The Southern Port Access Route (SPAR) will be constructed to link the northern lands to the southern lands via an opening bridge, crossing the River Liffey to the east of the Tom Clarke (East Link) Bridge, then along the south bank of the River Liffey using a viaduct structure and into the southern lands, linking the proposed and existing infrastructure.

The proposed soffit level for the bridge at the pier housing the lifting machinery is 4.45m OD as shown in Figure 9-36. This level exceeds the 0.5% AEP flood level, including allowances for climate change and freeboard, and therefore minimises the risk of the machinery becoming flooded. It is not practical to keep the entire bridge above this level whilst minimising the perceived difference to the Tom Clarke Bridge and ensuring effective connections to adjacent routes. Therefore, the bearings on other piers are designed to be above the 2% AEP flood level (3.01m OD). This will mean that the probability of the bearings getting wet will be low. The elastomeric bearings that have been nominally chosen are constructed from rubber with steel reinforcement. These are more tolerant to getting wet than a pot bearing would be, but ideally the fixings would be kept mostly dry. The finished centreline level of the road is 5.92m OD at its highest point. The road level at the north side quay is 4.43m OD, which then joins into existing levels at around 4.2m OD.

For reasons relating to visual impact, it is not possible to raise the proposed SPAR viaduct to the recommended development level. As such, the bridge drops from a road level of 5.92m OD mid span down to 4.33m OD as it reaches the south bank. The road centreline level on the viaduct is proposed to be at 3.25m OD which is just above the 0.5% AEP level of 3.15m OD (see Figure 9-37), with road channel levels at 3.15m OD. There will be a concrete vehicle restraint system (VRS) either side of the road that will act as flood protection measure for the road. The VRS will be at a height of 3.95m OD, which provides an allowance for climate change of 0.5m and a freeboard of 0.3m. This would in theory keep the road open during extreme tidal events. The footpaths and cycle ways either side of the road will not be protected from flooding, however It is anticipated that these would not be used if an extreme tidal event occurred.

Modelling has shown that the proposed development which includes the bridge and viaduct structures does not result in any significant impact to coastal processes. As such, there will be no change to the existing flood risk associated with either tidal inundation or wave overtopping. This is fully described in the Coastal Processes chapter (Chapter 13).

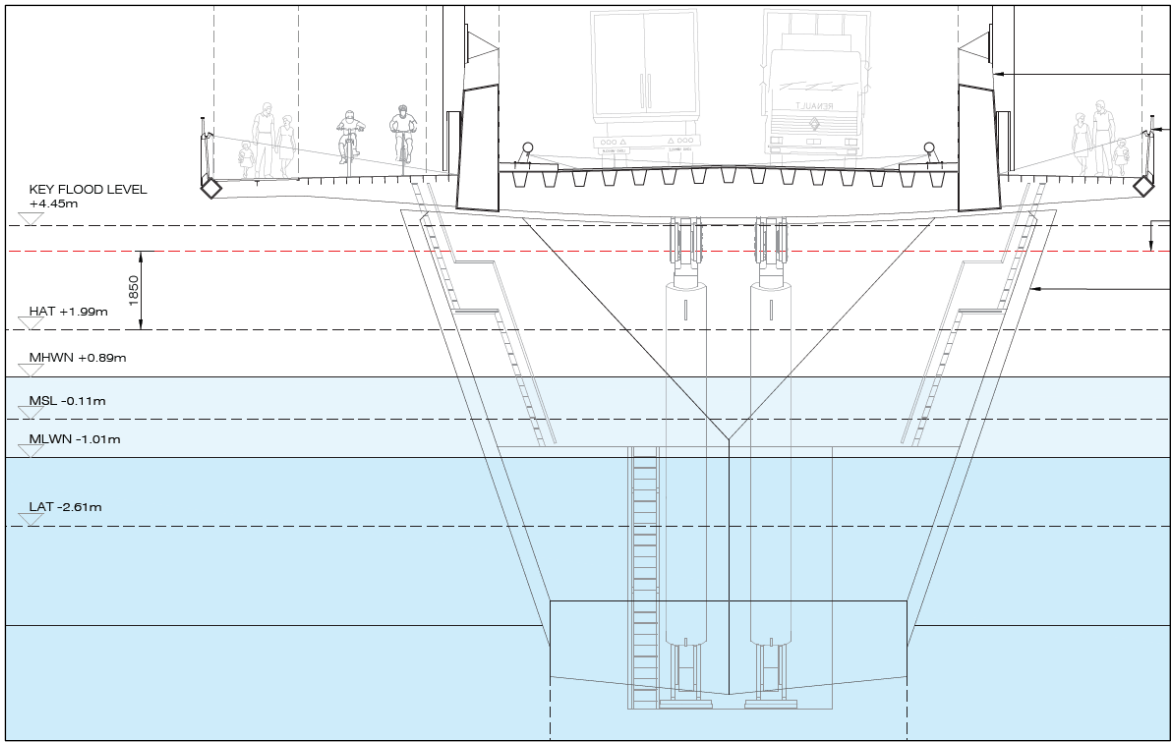


Figure 9-36 Extract from SPAR Bridge Typical Cross Section

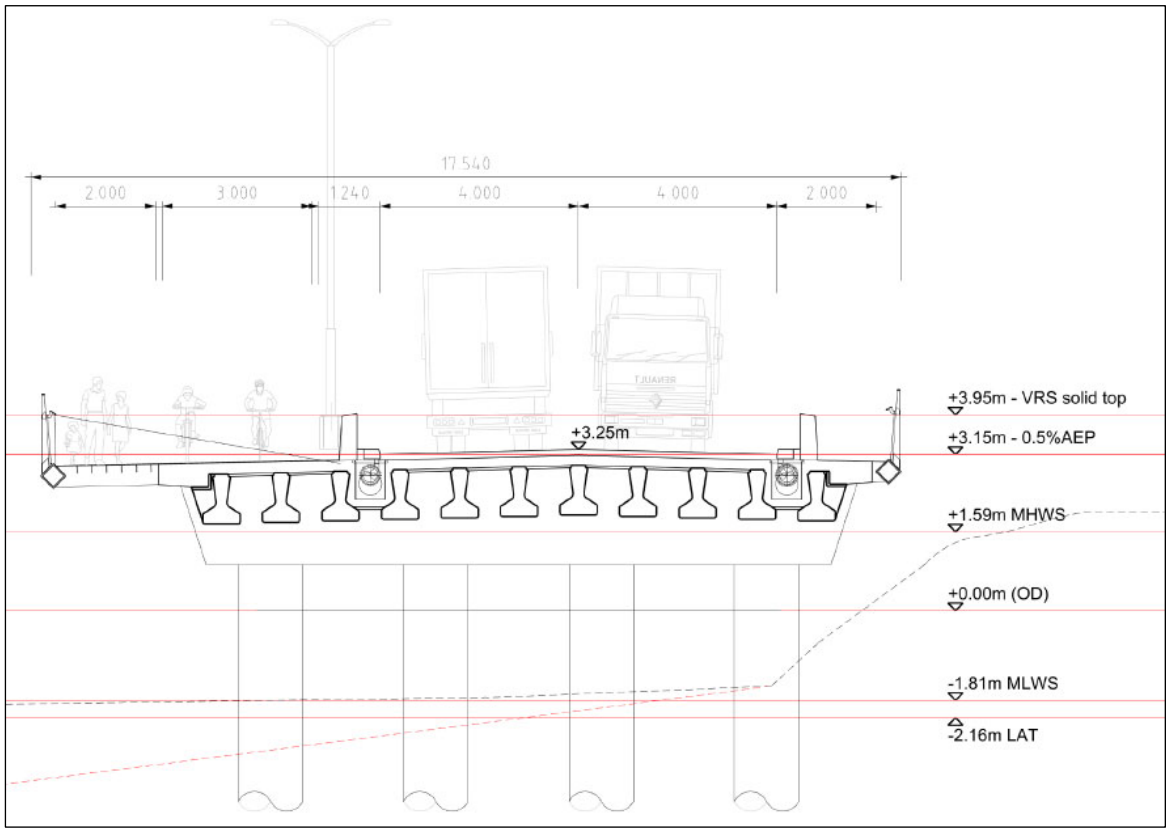


Figure 9-37 Extract from SPAR Viaduct Typical Cross-section

### *Maritime Park*

The Maritime Village will include public events space, yacht club, rowing club, maritime training centre, boat maintenance facility, harbour operations, slipway, boat yard and parking. The Maritime Village will be constructed at a level of 4.45m OD which is the recommended development level.

### *Ro-Ro Terminal (Area K)*

The existing container terminal at Area K will be redeveloped to create a new Ro-Ro terminal. The levels of the new terminal vary from 3.54 m OD adjacent to the Liffey to 5.8m at the south of the site. Some levels are below the recommended development level however all levels are above the predicted 0.5% AEP flood level. There will be no permanent damage caused if the site should be flooded, and therefore no further mitigation measures are proposed.

### *Lo-Lo Terminal (Area L)*

Area L, which is currently used for bulk cargo handling, will be redeveloped to create a new transit container yard that will be operated in conjunction with the terminal at Area N. The levels of the new terminal will be as existing from 3.45m OD adjacent to the Liffey to 3.87m at the south of the site. These levels are below the recommended development level however all levels are above the predicted 0.5% AEP flood level. There will be no permanent damage caused if the site should be flooded, and therefore no further mitigation measures are proposed.

### *Lo-Lo Terminal (Area N)*

The terminal will be constructed north of the ESB's Generating Station within the River Liffey on tubular steel piles. Due to its location, Area N will be subject to wave action and therefore the new container terminal will be set at a level of 4.6m OD as described in Section 9.2.4.2.

### *Ro-Ro Terminal (Area O)*

A new transit Ro-Ro trailer yard will be located on Port-owned land on the Poolbeg Peninsula, which will be operated in conjunction with the Ro-Ro terminal on Area K. The finished surface level around the perimeter of the deck will be raised to an average at a level of 5.5m OD. This is well above the recommended development level.

### *South Port Road Upgrades*

All of the proposed road works will be located within Flood Zone C which has a low probability of flooding. No mitigation measures are required for flood risk.

### *Port Park & Wildflower Meadow*

Port Park is a public amenity area including sports pitches. The parkland will include construction of a play tower, an enclosed dog run area, cyclist bike parking, planting of woodland trees, public lighting and seating along pathways. A wildflower meadow will be created with natural mown pathways for pedestrian permeability and connectivity. The parkland and proposed sports pitch will have a finished level of 4m OD. This is just below the recommended development level however there will be no permanent damage caused by any flooding, and therefore no further mitigation measures are proposed.

#### 9.2.4.3 Storm Drainage

The storm drainage design is fully described in the '3FM Drainage Proposal' report. It is considered that the existing drainage network in the Southern Estate will be unable to accommodate the increased area of impermeable surface to be drained as part of the 3FM Project. Therefore, a new surface water drainage network will need to be designed and constructed in accordance with the requirements of Dublin City Council and the Greater Dublin Regional Code of Practice for Drainage Works Version 6.0, including any relevant addendums.

DPC operates and maintains an independent surface water discharge system throughout the Port, in addition to the network owned and maintained by DCC. Where possible, the proposed drainage network will tie-in to the existing network and make use of existing outfalls. Where additional drainage infrastructure will need to be constructed to accommodate an increase in impermeable areas, attenuation will be provided to prevent an increase of the discharge rate at any existing outfalls when compared to existing discharge volumes.

Where a new surface water drainage network will be required it will be designed to store a 2-year tidal event combined with a 1 in 100 year (1% AEP) six-hour rainfall event with a 20% Climate Change factor based on the Dublin City Council Sustainable Drainage Design & Evaluation Guide 2021 (point 9.4.5.4) and Dublin City Development Plan, Appendix 13 - Surface Water Management Guidance. As a result of the tidal flows all new outfalls will be fitted with a double one-way valve system to prevent water entering the system during tidal events via the outfalls.

### 9.2.5 Residual Impacts

Residual risk is the risk that remains after all mitigation measures have been taken to reduce the frequency of flooding. As with any development within a coastal floodplain there is always a residual risk linked with a more extreme event, greater than the design event, occurring. The mitigation measures will provide a level of protection to reduce the impact from an extreme event as far as reasonably possible. The overall residual risk is therefore considered to be low.

### 9.2.6 Development Management Justification Test

Where a planning authority is considering proposals for new development in areas at a high or moderate risk of flooding that includes types of development that are vulnerable to flooding and that would generally be inappropriate, the planning authority must be satisfied that the development satisfies all the criteria of the Development Management Justification Test outlined in Box 5.1 of The Planning System and Flood Risk Management Guidelines.

Table 9.23 sets out the response to the criteria in Box 5.1 that must be satisfied. The Development Management Justification Test has been applied to the Southern Port Access Route (SPAR) road and bridge only. Each of the criteria have been shown to be satisfied and therefore it is concluded that the proposed development complies with the requirements of the Development Management Justification Test.

Table 9.23 Response to Justification Test for Development Management for proposed development

| Criteria | | Response |
|---|---|---|
| 1. | The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which takes account of these Guidelines | The lands are zoned Z7 in the Dublin City Development Plan 2022-2028 which is to provide for the protection and creation of existing uses and facilitate opportunities for employment creation including Port Related Activities. A Strategic Flood Risk Assessment which takes account of the Guidelines was prepared as part of the Dublin City Development Plan 2022-2028.<br>It can be considered that Point 1 of the Development Management Justification Test has therefore been met. |
| 2. | The proposal has been subject to an appropriate flood risk assessment that demonstrates: | |
| (i) | The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk | Modelling of the proposed bridge and viaduct within the River Liffey has been undertaken and this has shown that there is no increase in coastal flood risk elsewhere.<br>It is therefore considered that Point 2 (i) of the Justification Test has been met. |
| (ii) | The development proposal includes mitigation measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible | The proposed soffit level for the bridge at the pier housing the lifting machinery of the SPAR bridge has been set at a level above the 0.5% AEP which includes for climate change and freeboard. The bearings on other piers are designed to be above the 2% AEP flood level which will mean that the probability of the bearings getting wet will be low. The finished centreline level of the road is 5.92m OD at its highest point.<br>Due to visual reasons, it is not possible to raise the proposed SPAR viaduct to the recommended development level. The road centreline level on the viaduct is proposed to be at a level of 3.25m OD, which is just above the 0.5% AEP level of 3.15m OD. There will be a concrete vehicle restraint system (VRS) either side of the road that will be a flood protection measure for the road. The VRS will be at a height of 3.95m OD, which provides an allowance for climate change of 0.5m and a freeboard of 0.3m. The footpaths and cycle ways either side of the road will not be protected from flooding, however it is anticipated that these would not be used if an extreme tidal event occurred.<br>The level of protection provided will ensure that there will be no impact on the economy, i.e. there will not be an unacceptable level of flood risk which might subsequently require government capital expenditure to alleviate the problem to either the proposed development or existing development.<br>It is therefore considered that Point 2 (ii) of the Justification Test has been met. |
| (iii) | The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access | As with any development within a coastal floodplain there is always a residual risk linked with a more extreme event, greater than the design event, occurring. The mitigation measures will provide a level of protection to reduce the impact from an extreme event as far as reasonably possible. The overall residual risk is therefore considered to be low.<br>It is therefore considered that Point 2 (iii) of the Justification Test has been met. |
| (iv) | The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes | The flood mitigation measures proposed do not materially impact upon the desired layout, orientation or approach to the proposed development. It is considered that the proposed development is compatible with the wider planning objectives in relation to development of good design and planning for the area and is complaint with the Dublin City Development Plan 2022-2028. It is therefore considered that Point 2 (iv) of the Justification Test has been met. |

### 9.2.7 Conclusions

The flood risk to the 3FM application area has been assessed and the predominant source of flood risk emanates from tidal flooding from the River Liffey.

Under The Planning System and Flood Risk Management Planning Guidelines, the 3FM Project site consists of areas located within Flood Zones A, B and C. The 3FM Project has a range of uses with varying degrees of vulnerability as classified under the Guidelines. A Justification Test was required for the Southern Port Access Route (SPAR) road and bridge. All of the other uses within the 3FM Project site can be considered as appropriate for the identified flood zones, and therefore a Justification Test is not required. While the combination of risk and vulnerability is such that these elements of the development are generally acceptable the risk remains, and it may change during the lifetime of the development.

Using the present day 0.5% AEP level from the Irish Coastal Wave and Water Level Modelling Study (ICWWS) with climate change and freeboard allowances, the recommended development level for the 3FM Project is 4.45m OD. Where possible levels for the proposed development were set above this recommended development level.

The Southern Port Access Route (SPAR) will be constructed to link the northern lands to the southern lands via an opening bridge, crossing the River Liffey to the east of the Tom Clarke (East Link) Bridge, then along the south bank of the River Liffey using a viaduct structure and into the southern lands, linking the proposed and existing infrastructure. The proposed soffit level for the bridge at the pier housing the lifting machinery is 4.45m OD. This level exceeds the 0.5% AEP flood level, including allowances for climate change and freeboard, and therefore minimises the risk of the machinery becoming flooded. It is not practical to keep the entire bridge above this level whilst minimising the perceived difference to the Tom Clarke Bridge and ensuring effective connections to adjacent routes. Therefore, the bearings on other piers are designed to be above the 2% AEP flood level. This will mean that the probability of the bearings getting wet will be low. For reasons relating to visual impact, it is not possible to raise the proposed SPAR viaduct to the recommended development level. The road centreline level on the viaduct is proposed to be at 3.25m OD which is just above the 0.5% AEP level of 3.15m OD, with road channel levels at 3.15m OD. There will be a concrete vehicle restraint system (VRS) either side of the road that will act as flood protection measure for the road. The VRS will be at a height of 3.95m OD, which provides an allowance for climate change of 0.5m and a freeboard of 0.3m. This would in theory keep the road open during extreme tidal events. The footpaths and cycle ways either side of the road will not be protected from flooding, however it is anticipated that these would not be used if an extreme tidal event occurred. Modelling of the bridge and viaduct piers has been undertaken and this has shown that there is no impact on coastal flood risk.

As with any development within a coastal floodplain there is always a residual risk linked with a more extreme event, greater than the design event, occurring. The mitigation measures will provide a level of protection to reduce the impact from an extreme event as far as reasonably possible. The overall residual risk is therefore considered to be low.

The 3FM Project is compliant with The Planning System and Flood Risk Management Planning Guidelines.