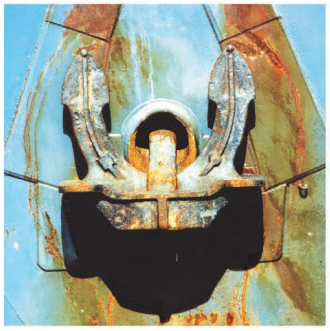
Port of Mostyn

Mostyn Energy Park Extension Project

Further Information in Support of Marine Licence Application CML2283

August 2023

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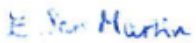		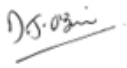

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Notice

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1 Introduction

The Port of Mostyn Limited has submitted an application to Natural Resources Wales (NRW) Marine Licensing Team (MLT) for a Marine Licence under the Marine and Coastal Access Act 2009 for Construction and Dredge Works associated with the Mostyn Energy Park Extension (MEPE) Project (CML2283). NRW MLT has considered the application in accordance with the Marine Works (Environmental Impact Assessment) (EIA) Regulations 2007 (as amended) ("the Regulations"). In accordance with Regulation 14 of the Regulations, NRW MLT in their letter dated 24 March 2023 has advised that further information is required to properly consider, or come to a conclusion on, the likely significant environmental effects of the project. NRW MLT will proceed with the consideration of the environmental impact or the determination of the Marine Licence application once this information has been provided.

1.1 Volume summary and conversion

Following a further request from NRW MLT in their letter dated 28 July 2023, the maximum amounts of material (in both m^3 and tonnes) that are required to be dredged, disposed and/or reused during the construction and subsequent operation of the MEPE Project, and which have formed the basis of the assessment, are set out in Table 1.

Table 1. Proposed maximum amounts to be dredged and disposed for MEPE Project

Project Activity	Cubic metres	Tonnes
Construction		
New berth pocket capital dredge (1) *To be used as infill for reclamation during construction period*	400,000 m^3	800,000 tonnes
Existing berth pocket capital dredge (2) *To be used as infill for reclamation during construction period*	100,000 m^3	200,000 tonnes
Main navigation channel capital dredge (3) *To be disposed of in Mostyn Deep site at currently licensed maximum rate*	3,000,000 m^3	6,000,000 tonnes
Total dredge	**3,500,000 m^3**	**7,000,000 tonnes**
Reuse as fill within reclamation	500,000 m^3	1,000,000 tonnes
Disposal at Mostyn Deep disposal site	3,000,000 m^3 (Using currently licensed maximum rate of up to 450,000 m^3/yr)	6,000,000 tonnes (Using currently licensed maximum rate of up to 900,000 t/yr)
Total disposal/reuse	**3,500,000 m^3**	**7,000,000 tonnes**

Project Activity	Cubic metres	Tonnes
Operation		
Ongoing maintenance dredging of the new berth, existing berth, harbour and navigation channel (collectively termed 'maintenance dredge area') *To commence once relevant capital dredge ((1), (2) and (3), above) of the maintenance dredge area has completed*	499,995 m^3 per year (Split over Mostyn Deep and Mostyn Breakwater sites, as below)	999,990 tonnes per year (Split over Mostyn Deep and Mostyn Breakwater sites, as below)
Disposal of maintenance dredge material from maintenance dredge area at Mostyn Deep disposal site	450,000 m^3 per year (Using currently licensed maximum rate of up to 12,000 m^3 per day)	900,000 tonnes per year (Using currently licensed maximum rate of up to 24,000 tonnes per day)
Disposal of maintenance dredge material from maintenance dredge area at Mostyn Breakwater disposal site	49,995 m^3 per year	99,990 tonnes per year
Additional maintenance dredge allowance that, instead of being deposited at in-estuary disposal sites, is permitted for pumping ashore to be beneficially used in other projects	75,000 m^3 per year	150,000 tonnes per year

1.2 Illustrative example over licence term

To aid with understanding of the various links and interdependencies within the dredge and disposal activities (as listed in Table 1), an illustrative example of dredging, infill, beneficial use and disposal, broken down by each year of the 7-year licence term, is provided in Table 2. **Note this is for illustration purposes only – actual values may differ (within the bounds of the caveats bulleted below)**.

Table 2. Illustrative example of maximum dredge, reuse and disposal over the 7-year licence term

Year of licence term	Infill for new quay reclaim (tonnes)	'Other' beneficial use (tonnes)	Disposal in estuary (tonnes)	Total (tonnes)
1	500,000	150,000	499,990	1,149,990
2	500,000	150,000	499,990	1,149,990
3	0	150,000	999,990	1,149,990
4	0	150,000	999,990	1,149,990
5	0	150,000	999,990	1,149,990
6	0	150,000	999,990	1,149,990
7	0	150,000	999,990	1,149,990
Total	**1,000,000**	**1,050,000**	**5,999,930**	**8,049,930**

Table 2 provides an illustrative break down of dredge/ reuse/ disposal activity through each year of the 7-year licence period. Operational reasons may mean more or less volume in any given year, but the following caveats will hold, in relation to maximum volumes:

- Annual total maximum disposal volume (as applied for) is **999,990 tonnes per year**;
- Annual total maximum additional beneficial use volume (as applied for) is **150,000 tonnes per year**;
- Combined, these maximum values total **1,149,990 tonnes per year dredged**. In any given year, the total dredge volume will not exceed this value;
- During the construction period of the new quay, 1,000,000 tonnes of dredged material will be used for infill for the reclaim (sourced from the capital dredge for the new and existing berth pockets). This volume is shown above in Table 2 as split equally over the first two years of the licence – in reality, more may be dredged in Year 1 and less in Year 2; noting this will be subject to the above caveat that the total dredge volume in any given year will not exceed 1,149,990 tonnes;
- Maintenance dredge requirements for the '*maintenance dredge area*' will only commence once the relevant capital dredge campaign has completed (consequently, no maintenance dredging will be required for any areas where capital dredging is also underway/ to be completed); and
- With the material from the capital dredge of the new and existing berths being used as infill for the reclaim, the *disposal volumes* provided in the above illustration will be sourced from a combination of capital dredge from the navigation channel and future maintenance dredging of the new berth, existing berth (but only after capital works in these areas have completed) and the harbour area. The split in these sources will be defined by operational requirements for maintenance depths, but total maximum dredge volume will be no more than the above 1,149,990 tonnes per year.
- In summary:
    - 1,000,000 tonnes required for the reclaim will be sourced from the capital dredge of the new and existing berths during the initial construction period for the new quay.
    - Any *disposal* undertaken during this period will be for material sourced from the navigation channel (since capital works will be underway at other dredge areas).
    - The 6,000,000 tonnes of dredge material applied for capital works in the navigation channel can all be dredged and disposed of within the 7-year licence period and working within the combined 999,990 tonnes per year *disposal* volume and the

additional applied-for 150,000 tonnes per year *beneficial use*. Noting the above listed caveats, the combined volume of these items (over the 7-year licence) would be **1,050,000 tonnes beneficial use** and **5,999,930 tonnes for disposal in-estuary** (see 'Totals' in columns 3 and 4 of the illustration in Table 2). Together, the combined maximum tonnage over the licence term equates to 7,049,930 tonnes – comprising 6,000,000 tonnes capital dredge from the navigation channel and the remaining 1,049,930 tonnes providing a *maximum limit* on any associated maintenance dredging.
    - For context, the total maintenance dredge volume between January 2017 and February 2023 was 469,688 tonnes.

1.3 Consultation responses

A comments log is provided in Appendix A which sets out individual responses to each consultation comment that has been received on the MEPE Project. This report provides additional evidence, where required, in support of those responses and is structured according to the assessment topics and key areas of clarification as set out below. The relevant comment (No.) from the comments log is provided against each consultee comment in this report for clarity and cross-referencing purposes.

- Physical Processes (Section 2):
    - General clarifications;
    - Volume to weight conversion factor;
    - Capacity of Mostyn Deep disposal site;
    - Sediment dispersion during dredging and disposal; and
    - Removal of dredge material ashore.

- Water and Sediment Quality (Section 3):
    - Water Framework Directive Compliance Assessment; and
    - Suspended sediments and dissolved oxygen.

- Nature Conservation and Marine Ecology (Section 4):
    - Direct habitat effects;
    - Effects on protected habitats and species (including Section 7 species);
    - Indirect effects on benthic habitats and species (including cockles);
    - Effects on sandeels;
    - Piling restrictions for migratory fish;
    - Disturbance of waterbirds; and
    - Habitats Regulations Assessment.

In addition, following a further request from NRW MLT in their letter dated 28 July 2023, a monitoring and mitigation schedule detailing all proposed commitments is included in Section 5 of the report.

As noted in Section 1.2 (Chapter 1) of the Environmental Statement (ES), the application for a Marine Licence (CML283) will subsume the existing dredging related marine licences for ongoing maintenance dredge and disposal activities in the harbour and its approaches (DML1542v2 and DML2001). It will also replace the existing construction marine licence to build a new quay and extend the MEP development (CML1343v3). Evidence has been provided in support of the CML2283 application in the ES and in this Further Information Report to allow an assessment of the proposed development and determination of the application in its entirety. Information relating to existing and previous consents that is considered material to the assessment of CML2283 has been referenced as appropriate.

2 Physical Processes

2.1 General clarifications

NRW Advisory comment No. 47

"ES Chapter 6, Section 6.7.1 Changes to SSC and sedimentation as a result of construction activities: Maximum predicted increase in SSC and Sedimentation from berth dredge and disposal operations.

Figure 6.8 shows the maximum spatial extent of the combined dredge/ disposal SSC plume over peak flood and peak ebb tidal flows (on a spring tide). In order for NRW to fully understand the outputs presented in Figure 6.8 we require clarification on the following:

What does the maximum predicted increase in SSC and sedimentation in Figure 6.8 equate to in terms of amount of sediment in m^3 being disposed of at the Mostyn Deep site?
Was the model run in continuous mode until all 3 million m^3 of sediment had been released at the disposal site?

How many dredge/disposal cycles does the model output represent and what is the total model run time? Has the model been run under neap tide conditions, given that the dredging and disposal operations will not necessarily be conducted over springs? The lower current velocities experienced during neaps would not disperse the sediment as quickly as springs and potentially could cause higher concentrations in suspension and higher sedimentation on the seabed, which could in indirectly cause a greater impact to sensitive receptors.

It would be helpful if all the dredge/disposal scenario outputs were presented as listed."

ABPmer response

The model was run for the full simulation period (17 days, covering a full spring/ neap tidal cycle), with continuous dredging/disposal (within the constraints of the assumptions around dredge method, extraction rate, vessel steaming distance to disposal site etc.) over the first 8 days (starting on a neap tide and extending through to after the peak of the following spring tide). Consequently, the assessment covers continuous dredging over the initial 8-day period, with regular deposits events every 4 hours at the IS102 site. Following this initial period, the model continues to run in order to model the subsequent predicted fate of the dredge plume and bed sedimentation.

With the model run scenario as described above, the maximum predicted increase in SSC and sedimentation (provided in ES Figure 6.8) is associated with a total of approximately 50,000 m^3 of material simulated for dredging/disposal. It is also noted here that, where suitable, the majority of material dredged from the planned new (and existing) berth pocket is proposed to be pumped directly ashore for use as infill for the reclaim.

NRW Advisory comment No. 48

"ES Chapter 6 Section 6.7.1 Spatial dispersion of dredge plume and sedimentation

Paragraph 7 states "Due to the timing of successive disposal events (and the subsequent tidal dispersal of the resultant plume), there is no evidence of cumulative increases in SSC (i.e. the impact from each disposal is dispersed sufficiently before the next disposal, such that there is no predicted positive trend in excess SSC with sequential disposal events)".

Please clarify what was the timing of successive disposal events? Is there a critical time at which there would be cumulative increase in SSC, given that we don't know at this stage the exact timing of the dredge/disposal activities? Timing of disposal will be critical to minimise cumulative increases in SSC and sedimentation on the seabed."

ABPmer response

As noted above, the model simulation represents continuous dredging over the initial 8 days of run period, with regular deposit events every 4 hours at the IS102 site.

Plumes arising from the deposit activity at IS102 tend to dissipate within a single peak tidal phase (flood or ebb and on both spring and neap tides), equating to a period of around 2 hours (as shown in ES Figure 6.9). Consequently, successive deposit events within a period of 2-3 hours could (potentially) lead to cumulative increases. However, it should be noted that the tidal phase would have moved on in that time period, such that the driving hydrodynamic forces acting on each plume will be different. Furthermore, given the time taken to transit from the dredge site to/ from the IS102 disposal ground, coupled with the time taken to refill the hopper, the assessed repeating 'dredge > disposal > dredge…' cycle (described above) is considered a conservative worst case with regards frequency of dredge inputs/ deposits.

NRW Advisory comment No. 49

"ES Chapter 6 Section 6.7.2 Changes to seabed bathymetry as a result of dredge disposal

States "At the Mostyn Deep (IS102) disposal site, the effect of the deposition of capital dredge arisings on the seabed bathymetry will be similar to that which already occurs as a result of ongoing maintenance dredging and disposal".

We require clarification as to what the dredge returns are at the Mostyn Deep site since renewal of the current licence in 2019? We have no dredge disposal records apart from 2021-22 annual monitoring report where all sediment dredged was pumped to shore and reused for beneficial use. We are concerned that Mostyn Deep has been infrequently used as a disposal site in recent years and since 2019 licence renewal "used for an annual average disposal quantity of 50,000 m^3" or 100,000 tonnes (using a specific gravity of 2). We require that the disposal site is assessed to determine if it is able to disperse such a large quantity of capital dredge over a short time period (see comment 1 above). Until our concerns are addressed, we cannot yet agree that the magnitude of change to the Mostyn Deep disposal site and surrounding banks is negligible."

ABPmer response

Table 3 provides the annual dredge disposal returns for the Port of Mostyn (relevant to IS102) since the renewal of the current licence in 2019 (and also covering prior licences since 2009). This shows that, between 2019 and February 2023, a total of 167,318 tonnes (83,659 m^3) of dredged material has been deposited within the IS102 (Mostyn Deep) disposal site, at an average rate of just over 40,000 tonnes/year (20,000 m^3/year). Over the longer history of disposal, a total of nearly 2.5 million tonnes (1.25 million m^3) has been deposited at IS102 since 2009 (under existing and previous licences) at an overall average rate of around 160,000 tonnes/year (80,000 m^3/year). This is in contrast to the present approved licensed tonnage (within DML1542), which allows for up to 900,000 tonnes/year (450,000 m^3 per year) to be deposited at the Mostyn Deep disposal site. The maximum amount of dredge arising placed in the Mostyn Deep site was in 2010, when just over 730,000 tonnes (365,000 m^3) were deposited.

Table 3. Annual dredge disposal (and landings) since 2009

Year (Licence)	Material Volume (metric tonnes)	
	Pumped to Shore	Placed in Mostyn Deep (IS102)
2009 (10/69/F)	0	178,950
2010 (10/69/F)	0	734,246
2011 (10/69/F)	0	357,322
2012 (10/69/F & 12/38/ML)	0	0
2013 (12/38/ML)	0	572,016
2014 (12/38/ML)	0	270,584
2015 (12/38/ML)	0	69,674
2016 (DML1542)	0	47,294
2017 (DML1542)	56,532	3,800
2018 (DML1542)	21,266	0
2019 (DML1542)	95,308	17,341
2020 (DML1542)	54,448	149,977
2021 (DML1542)	33,801	0
2022 (DML1542)	33,205	0
2023 (to Feb) (DML1542)	4,010	0
Total (Annual average)	**298,570** (42,627)	**2,401,204** (160,080)

Note:
Where dredged values are reported in cubic metres, a conversion factor of 2.0 has been applied to convert to metric tonnes (see Section 2.2).

As discussed in Section 2.3 of this report (in relation to the capacity of the Mostyn Deep disposal site), the Port has committed to continue to work within the presently licensed tonnage limits (up to 900,000 tpa or 450,000 m^3 per annum disposal at IS102), and can complete the proposed works for the MEPE project under these same (currently licensed) limits.

To provide further context, the following is taken from the ERM, 2007 Environmental Statement, describing the present approach to disposal site management and deposition depth within Mostyn Deep:

> *The disposal area (Site A) occupies approximately 15% of the area of Mostyn Deep defined as the area below 5 mCD. The deposition area is 250 m by 2,500 m (625,000 m^2) and is divided into 330 boxes each of 25 m by 75 m. Each box is sized to contain a deposited dredger load under typical operating conditions. Assuming 5 campaigns each depositing 100,000 m^3* [200,000 tonnes] *in a given year this would give a campaign mean thickness of deposition over the whole area of between 0.1 and 0.2 m. Average water depths are between 10 m and 15 m over the deposition area. The pattern of deposition is proposed to be random box selection with GPS-positioning to avoid double-dumping on the same grid location during any one campaign.*
>
> *Assuming a maximum single campaign volume of sediment of 150,000 m^3* [300,000 tonnes] *deposited in one month this would represent about 12% of the maximum monthly sediment movement recorded by survey for the Mostyn Deep area (SMP 2003).*

Further consideration of the capacity of the existing Mostyn Deep site to disperse of the deposited material is provided below, in response to comments at Section 2.3.

2.2 Volume to weight conversion factor

NRW Advisory comment No. 46

"Specific Gravity number for dredge material
There is a discrepancy in the agreed conversion between m^3 to tonnes. The current dredge and disposal licences DML1542v2 and DML2001 use a specific gravity of 2 to convert m^3 to tonnes. The new licence CML2283-MEPE-Dredge and Disposal Application Form Redacted No 13. Details of Material to be Dredged and/or Disposed, also uses a specific gravity of 2.

Please provide clarity as to why in the relevant chapters of the EIA (chapter 3, 6, 8) and also in the new licence application, the quoted amounts to be dredge and disposed of in m^3 are converted to tonnes using a specific gravity conversion of 1.5. We are concerned that the amount of sediment that will be disposed of under the current licence (DML1542v2) at Mostyn Deep are being underestimated in tonnage.

For example, using an agreed factor of 2 (see condition 9.20 DML1542v2) to convert 3 million m^3 of capital dredged sediment to tonnes equates to 6,000,000 tonnes of sediment which is in excess of the maximum agreeable amount to be deposited at Mostyn Deep which is 5,400,000 tonnes of sediment under licence DML1542v2.

It is also stated in ES chapter 3 section 3.2 Operational phase 3.2.1 Maintenance dredging and reuse/disposal of maintenance dredge material "The total volume of maintenance dredge material that is permitted to be dredged is up to 900,000 tonnes (approximately 600,000 m^3) per annum under the existing dredge marine licence (DML1542v2) and an additional 99,990 tonnes (approximately 66,660 m^3) per annum under the existing dredge marine licence (DML2001). The total volume of maintenance dredge material that needs to be removed from the new berth, harbour and navigation channel is estimated to be up to 600,000 m^3 per annum which remains within the cap set in the existing marine licences".

We are concerned that the agreed specific gravity of 2 has not been used in this assessment to determine the maintenance dredge/disposal allowable limit which, when converting correctly from 600,000 m^3 to tonnage is 1,200,000 tonnes and exceeds the annual allowable limit for Mostyn Deep which is currently set to 900,000 tonnes.

Please ensure that the amount of sediment to be disposed of or reused is considered in tonnage using a specific gravity conversion of 2 and not 1.5."

NRW MLT comment No. 133

"There is an inconsistency in the conversion factor used between m^3 and tonnes for dredge material. In email dated 23 February 2023 it was confirmed that this was due to the difference between in situ seabed material (2 tns/m^3) versus dredge material landed ashore (1.5 tns/m^3). However, this had led to inaccuracies within the Environmental Statement (ES) which must be rectified as this leads to confusion when referring to and comparing what has previously been consented under existing licences and what is being proposed. For example, as highlighted by NRW A, in their consultation response in reference to ES chapter 3 section 3.2.1, if the same conversion factor was used for the existing licences and the ES then the maintenance disposal tonnage would in fact exceed the limits of the current licence rather than be in line with it as stated in the ES. We request that the ES is reviewed, and a consistent conversion factor used, as your email dated 23 February 2023 suggests and as recommended by NRW A, we would ask that a specific gravity conversion of 2 is used, to remain consistent with the existing licences."

ABPmer response

The *in-situ* density of the surface sands and silts across the dredge areas is significantly lower than the 2 tonnes/m³ quoted in the existing licence. Typical values for these areas are, instead, between 1.3 t/m³ and 1.7 t/m³, with an average value of 1.5 t/m³.

This 'average' value is also the same as that used by The Crown Estate when calculating offtake for marine aggregate extraction activities across UK waters[1], whereby:

> *'All permitted and actual extraction figures are expressed in metric tonnes. A conversion factor of 1.73 for aggregate and 1.5 for sand, has been applied where necessary, to convert cubic metres to metric tonnes.'*

The variability in types of bed material (aggregate vs. sand) is accounted for in these calculations, whilst the nature of different types of bed can also influence *in situ* densities. For example, typical guidance values indicate 1.5-1.6 t/m³ for surface sand, 1.8-1.9 t/m³ for compacted sand and 2.0-2.1 t/m³ for geological sand (i.e., material locked in rock strata). With finer material (muds and silts), the increased pore water component typically provides even lower density values.

Furthermore, the Port has also undertaken load tests on bed material from the proposed dredge areas, using their weighbridge facility, concluding that a 1 m³ volume provided a weight of 1,500 kg (or 1.5 metric tonnes).

Notwithstanding the above, it is agreed that a consistent approach to conversion should be used and to provide consistency with the existing licence, a value of 2 t/m³ to the material volumes has been applied.

For the avoidance of any doubt, the maximum amounts of material (in both m³ and tonnes) that are required to be dredged, disposed and/or reused during the construction and operation of the MEPE Project are set out in Section 1.

2.3 Capacity of Mostyn Deep disposal site

NRW Advisory comment No.45

"ES Chapter 3 Project Methodology

It is noted that the main navigation channel (currently Salisbury Channel) will need to be deepened to a depth of – 4 m CD and the works will be conducted under the current dredge and disposal licence (DML1542v2). The total volume of capital dredge material that needs to be removed from the main navigation channel is estimated to be up to 3 million m³ and it is proposed that the material will be disposed of in Mostyn Deep. Please note the following:

DML1542v2 states in paragraph 1.3. The Licence Holder or any Agent or Contractor acting on their behalf under this Licence is permitted to deposit a quantity not exceeding 5,400,000 Tonnes of the substances or articles specified at sub-paragraph 1.2 of this Schedule, at the Deposit Area(s) detailed at paragraph 1.4 and up to the maximum quantity specified for each Deposit Area specified at paragraph 1.6.

[1] https://www.thecrownestate.co.uk/media/4097/2022-summary-statistics.pdf

Paragraph 1.6 states "Within the overall quantities authorised for deposit set out in paragraph 1.3, and the authorised Deposit Area set out in paragraph 1.4 the following limits also apply:

1.6.1 Up to 900,000 tonnes may be deposited annually at the following authorised Deposit Areas: IS102, Mostyn Deep (maintenance) maximum quantity tonnes 900,000 Main Site.

We are concerned that the capital dredge operation proposed, is scheduled to be completed over a 15-month period (chapter 3, Table 3.1) and the amount of capital dredge to be deposited exceeds the maximum allowable limit at Mostyn Deep. Has the Mostyn Deep site been environmentally assessed to confirm that the site is able to disperse such a large quantity of sediment (3 million m^3 or 6,000,000 tonnes) over the much shorter time period than is currently consented for under DML1542v2? We are concerned that deposition of 3 million m^3 at Mostyn Deep over a much shorter time period could alter the morphological and ecological features of the Mostyn Deep site and surrounding sand banks of the Dee Estuary through sediment transport and deposition."

NRW MLT comment No. 131

"Further assessment and evidence is required in order to provide confidence that Mostyn Deep disposal site is able to accept the volumes of material proposed, and that the potential impacts of disposal of this quantity of material over the time period proposed has been properly assessed. This concern has been raised by both Statutory Nature Conservation Bodies (SNCB): NRW Advisory (NRW A) and Natural England (NE). Further detail is provided below.

NRW A have raised concerns that the amount of capital dredge proposed to be deposited exceeds the volumes currently consented within existing licences. There is also concern whether the assessment has considered the ability of the disposal site to disperse the large quantity of material that would be produced during the construction period, which has the potential to alter the morphological and ecological features of the Mostyn Deep site as well as the surrounding sand banks and Dee Estuary through sediment transport and deposition".

We request that you provide disposal returns for the Mostyn Deep disposal site and any other evidence, in order to support the statement made in section 6.7.2 of the ES the effect of the deposition of capital dredge arisings on the seabed bathymetry will be similar to that which already occurs as a result of ongoing maintenance dredging and disposal. Based on disposal return held by the Marine Licensing Team It is considered that the disposal volumes proposed exceed the volumes that have been deposited at the Mostyn Deep site in recent years."

ABPmer response

Clarification on construction sequence and historic disposal

Further to the above information on deposit volumes at IS102 (Section 2.1, Table 3), please note that the statement '*the capital dredge operation proposed, is scheduled to be completed over a 15-month period*' is only relevant for the dredging of the new and existing berths and not the navigation channel (see example illustration provided in Table 2).

Instead, the Port of Mostyn (in discharging the requirements of the MEPE scheme – if/when consented) can complete the scheme whilst working within the annual tonnage disposal limits of the existing permitted licence (DML1542). In this way, all the dredging for the MEPE scheme can be undertaken (along with any existing maintenance dredge requirements), whilst continuing to dispose of up to 900,000 tonnes/year (450,000 m^3 per year) at the IS102 site.

Historic dredge records (see Table 3) and ongoing annual monitoring of the site (see Figure 1 and discussed further below) indicate that all material that has previously been deposited at the IS102 (Mostyn Deep) disposal site (under current and previous licences) has been dispersed. This is true under a range of annual disposal volumes from relatively little to upwards of 350,000 m^3 (700,000 tonnes, as in 2010; Table 3). Continued monitoring of the disposal site (as is presently undertaken) would continue to provide a valuable oversight of the operations and allow for an early warning intervention should the disposal site show evidence of a general accretionary trend.

In this case, in accepting the Port's commitment to continue to work within the present annual disposal limits, the MEPE deposits would (effectively) require another renewal of the existing DML1452 licence conditions for a period sufficient to complete the dredge (whilst depositing no more than 900,000 tpa to IS102). An illustration of how this could look over a 7-year licence term is provided in Table 2.

The Capacity of Mostyn Deep Site

There is a large body of evidence supporting the understanding around the capacity of the licenced Mostyn Deep disposal site. Some other disposal sites in UK waters are in lower energy environments and slowly fill to a capacity when material is deposited. By contrast, the Mostyn Deep area is a higher-energy site and a variety of studies have shown that, due to the dispersive nature of the location, it is self-sustaining, which results in the area maintaining near-consistent water depths over annual (and longer) timescales.

The disposal area, from a geomorphological point of view, maintains a dynamic-equilibrium. Along with other factors (including the influence of large-range equinoctial tides), when material is deposited at the site this temporarily increases the tidal flow speeds in the local area (and therefore the shear stresses), which are needed to remobilise deposited sediment and subsequently redistribute this material within the Dee Estuary. Several different types of evidence are available which support the morphodynamic understanding of the site; these include a physical tracer study, multiple numerical modelling studies, analysis to support previous marine licence applications and extensive post-dredge survey (monitoring). This very robust evidence base includes the following key studies, analysis and surveys.

Tracer Study:

SMP (2003). Monitoring of Trial Dredge and Deposition with Sediment Tracer Studies (3 volumes). Shoreline Management Partnership for the Port of Mostyn.

Numerical Modelling Reports:

Hydraulics Research Wallingford (HRW) (2002) Mostyn Deep Sediment Transport Studies. Report EX 4630. September 2002

HRW (2007). Dee Estuary Modelling. Port of Mostyn EIA 2007 Hydraulic Modelling Studies. HR Wallingford Report EX5514, Release 1.0 April 2007.

ABPmer (2021) (included as Appendix B). Mostyn Channel Dredge and Disposal – Hydraulic Modelling Studies 2021: Review of annual bathymetric survey and numerical modelling work for Marine Licence DML 1542v2. ABPmer Report No. R.3756. A report produced by ABPmer for The Port of Mostyn Limited, November 2021.

Previous Evidence to Support Marine Licence Applications

SMP (2002). Port Of Mostyn Re-Development (Work Undertaken Following Public Inquiry) Environmental Statement Update and Cumulative Impact Assessment

ERM (2009). Port of Mostyn Breakwater Quay Development Environmental Statement Final Report December 2009

ERM (2007). Port of Mostyn Dredging and Disposal Operations for Maintenance of Navigation Environmental Statement 18 October 2007

Post-dredge Surveys and Monitoring:

SMP (2008a). Maintenance Of Navigation Mostyn Channel Monitoring Protocols June 2008

SMP (2008b). Maintenance Of Navigation Mostyn Channel Monitoring Protocols June 2008

ABPmer (2017) (included as Appendix C). Review of Dredge and Disposal Monitoring, Overview of survey work carried out by the Port in the Dee Estuary from 2005 to 2016, ABPmer Report No. R.2713. A report produced by ABPmer for Port of Mostyn, March 2017

ABPmer (2022a) (included as Appendix D). Maintenance Dredge and Disposal Surveys, Year-end annual review of monitoring during 2022 (DML1542v2 and DML2001), ABPmer Report No. R.4082. A report produced by ABPmer for Port of Mostyn, December 2022.

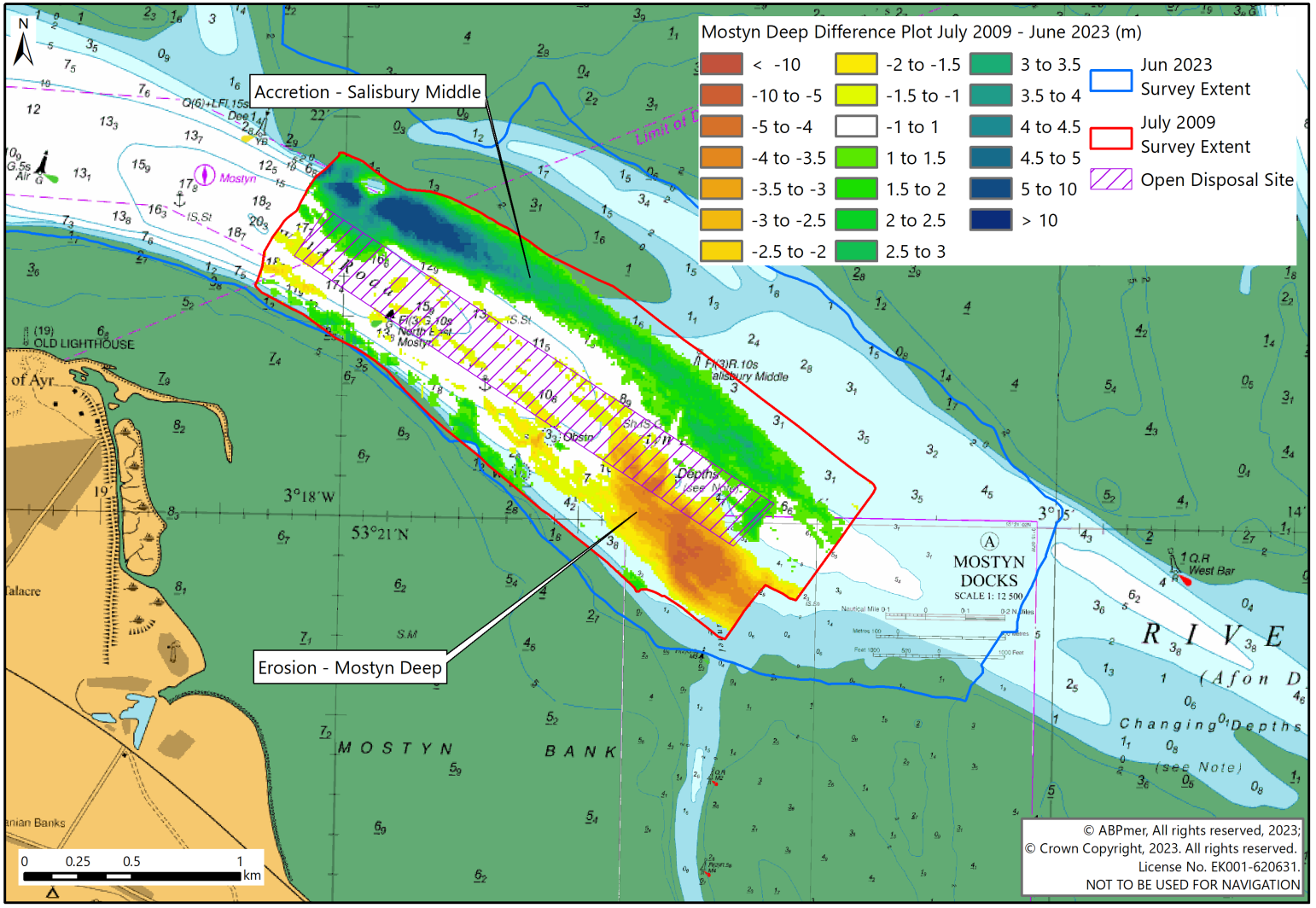

Figure 1. **Surveyed bed elevation change across Mostyn Deep (incl. IS102 disposal site between July 2009 (baseline) and June 2023**

The key evidence from the above studies and its specific relevance to the assessment of the proposed development that is being relied upon for the application CML2283 is summarised below. The key reference documents that were authored by ABPmer are provided in the appendices and those that were authored by external parties have been submitted as separate documents. These are provided for transparency following a request from NRW Advisory during a meeting held on 12 June 2023.

Drawing from the reports named above, and with specific regards to the dispersive nature of the IS102 site (which influences the overall capacity of the site to accommodate disposal material), repeat bathymetric surveys described in ERM, 2009, reveal that the 460,000 m^3 (920,000 tonnes) of sediment disposed of during the 2005 to 2007 consent period had all dispersed by (and likely well in advance of) the follow-up survey completed in March 2007. Subsequently, in July 2009, a dredge campaign was carried out by the Port with the removal of about 90,000 m^3 (180,000 tonnes) from the channel and berthing area. This material was all deposited in Site 'A' (Mostyn Deep). Pre- and post-dredge deposition area surveys were carried out and showed that within two weeks of the last deposition there was no significant detectable evidence of the deposition compared to areas adjacent to the deposition area in Mostyn Deep. It is also noted here that this deposition was carried out in the summer when prevailing conditions are relatively calm, in comparison to the higher-energy conditions which are observed to move a significantly higher amount of material over the spring and autumn equinoctial tides (SMP, 2002 & 2003; ERM, 2007 & 2009; HRW, 2002 & 2007).

These surveys have also been supplemented by a range of numerical modelling studies, which also support the understanding that the IS102 site is dispersive for deposited material and also that the material placed there is subsequently redistributed within the Dee Estuary (rather than being lost out of it). An example from ERM, 2007 reveals:

> *Sediment dispersion from Mostyn Deep to other parts of the estuary has been shown to be distributed widely ensuring there is no loss of sediment to the estuary system and no accumulation of material in particular areas (sediment sinks). Significant accretion in saltmarsh areas, cockle banks or the clay/piddock bank is not evident from modelling results and no impacts to these resources are predicted. Monitoring has not detected any effect on saltmarsh areas from dredging activities. No impacts to the areas of saltmarsh and intertidal sand and mud flats, which support the feeding, roosting and breeding waterbirds populations, are predicted.*

Analysis of the latest Mostyn Deep bathymetric survey (as reported in the June 2023 Annual Monitoring Progress Note; ABPmer, 2023 (included as Appendix E)), indicates very little variation in bed elevation between the 2009 (baseline) survey and the latest repeat survey from June 2023 (as shown in Figure 1). In fact, volumetric analysis of the differences between the two surveyed datasets indicates that the volume of bed material within the IS102 (Mostyn Deep) disposal site has actually reduced by around 340,000 m^3 in the 14-year period between surveys. That is despite a total of over 1.2 million m^3 (2.4 million tonnes) of material (in total) being deposited there, under the various maintenance dredging licences, over the same period (see summary information provided in Table 3).

As evidenced in the various reports quoted above (e.g., ERM, 2009), the dispersion of any dredged material actually occurs over significantly shorter timescales (matter of weeks) than that described within the overall change described in the annual monitoring surveys and associated analysis/ progress notes.

With regards the influence of historic morphological change in the wider Dee Estuary, a comparison of the modelled sediment flux through the Mostyn Deep channel, undertaken as part of the historic and ongoing monitoring tasks, is summarised here. The comparison reveals that the magnitude of flux over flood and ebb tidal states remains effectively unchanged between 2006 (HRW, 2007) and 2021 (ABPmer 2021) (Figure 2). This indicates that, despite the observed changes in the alignment and orientation of

the Mostyn Channel (and the opening up of the Salisbury Channel; see, e.g. ABPmer, 2022), the sediment flux through the Mostyn Deep has remained consistent throughout the period of disposal operations described in Table 3. This further supports the understanding that the IS102 (Mostyn Deep) disposal site has been dispersive for the deposited material placed there to date and continues to be dispersive under the current arrangement of the wider estuary banks and channels.

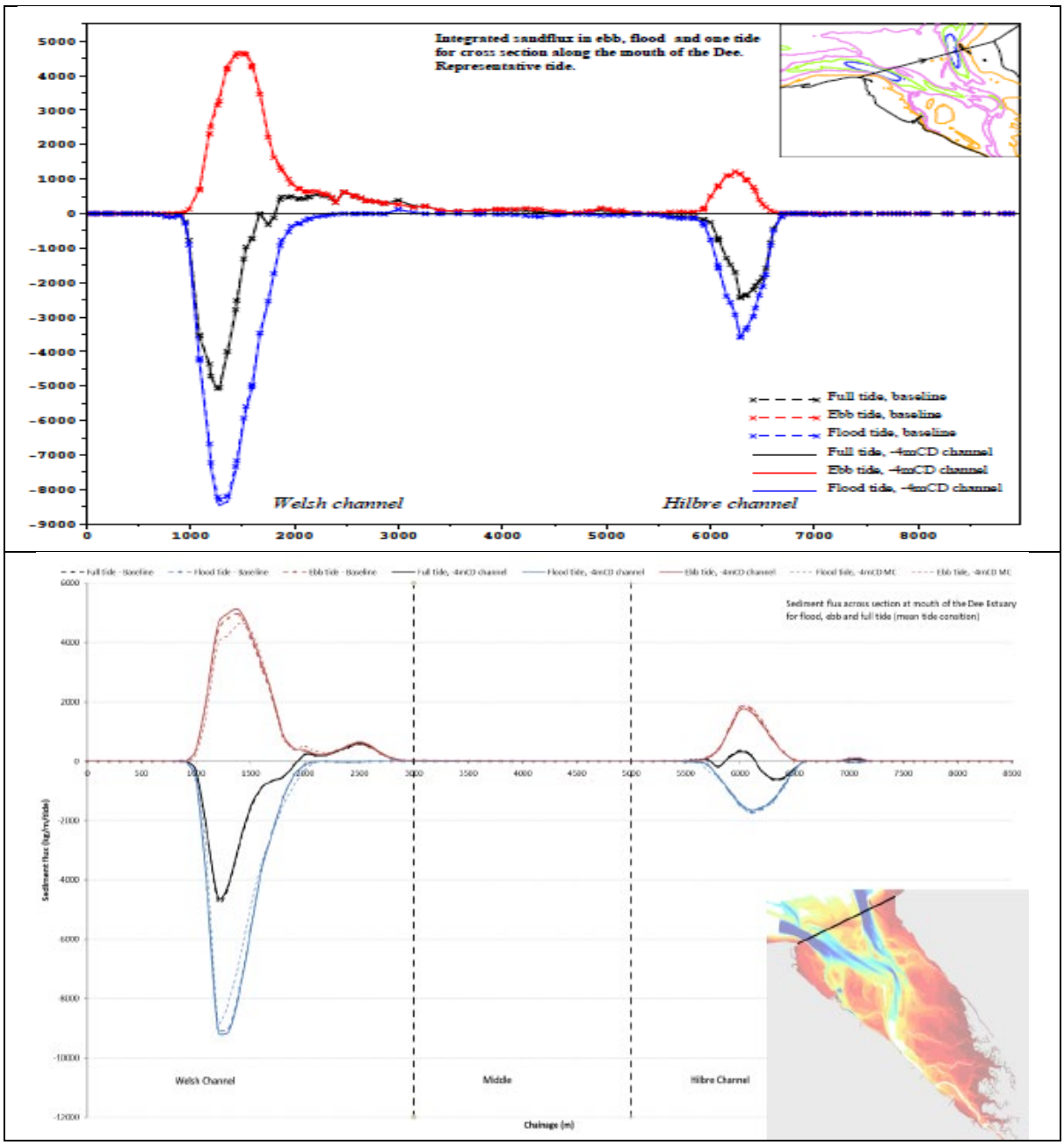

Figure 2. **Comparison of modelled sediment flux through Welsh Channel/Mostyn Deep and Hilbre Channel with bathymetric data from 2006 (top – HRW, 2007) and 2021 (bottom – ABPmer, 2021)**

Summary

The range of supporting information (as summarised above), along with comparisons between various studies undertaken throughout the existing and previous licence terms, reveals no evidence to indicate that continued disposal at the currently permitted maximum rate would result in anything other than the continued rapid dispersion of material back into the estuary.

Furthermore, contemporary evidence in the form of numerical modelling completed for this marine licence application (Chapter 6 of the MEPE ES, 2023) shows that although the Dee is generally morphologically active, the hydrodynamic environment (and even the water depth) at Mostyn Deep is consistent with previous studies and remains generally stable throughout the recent (since 2009) survey period. Consequently, the key findings of the ES (and supported by a large range of previous studies, listed above) – that the area is able to mobilise and re-distribute deposited sediment within the Dee Estuary – remains valid.

In conclusion, considering the supporting body of evidence provided in the MEPE ES, and summarised more widely above, assessment of the Mostyn Deep disposal site indicates that there remains sufficient capacity for subsequent dispersion of the up-to 900,000 tonnes per annum presently licensed for disposal there.

2.4 Sediment dispersion during dredging and disposal

NRW Senior Advisor Dee Conservancy comment No. 30

"We second Jo Ibrahim's comments regarding gaps in the sediment dispersal assessments, which should go further to show where dredged material moves to and settles in receiving receptors (e.g., cockle beds and navigable channel). In addition to Jo Ibrahim's comments, we recommend that supplementary sediment dispersal assessments includes potential indirect impacts on the navigable channel upstream of the development to Connah's Quay, Flintshire."

ABPmer response

The map outputs from the modelling provided in ES Figure 6.8 show the maximum extent of excess SSC and associated bed sedimentation arising from continuous dredge/disposal over an 8-day period, whilst Figure 6.9 describes the temporal signal at a number of locations across the study area. The modelling shows that subsequent disposal events do not interact with each; consequently, the impacts in this figure can be considered as the predicted change in SSC and sedimentation for the duration of the dredging works (noting – as above – that the Port can accomplish the implementation of MEPE whilst working within the disposal limits currently approved within the existing DML1542 licence).

Furthermore, the map plots show negligible impact (to SSC or sedimentation) across the existing cockle beds or within the navigation channels (including upstream, towards Connah's Quay).

To provide further illustration of the predicted extent of impacts (in relation to the identified receptors, Figure 3 shows the modelled increase in SSC and sedimentation, as a result of dredging and disposal activity, in relation to the mapped cockle beds.

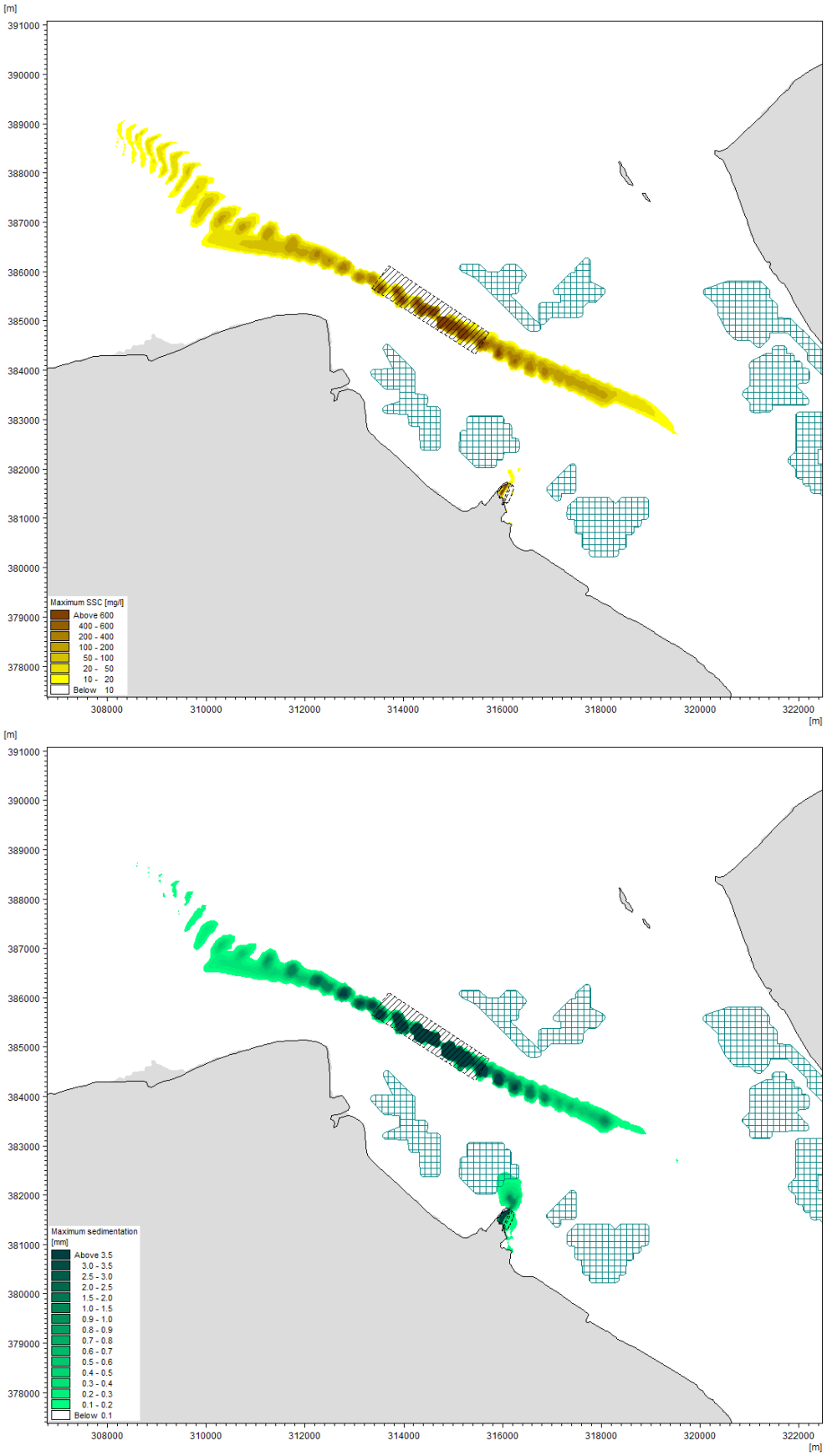

Figure 3. **Predicted excess SSC (top) and sedimentation (bottom) in relation to local and regional cockle bed features**

In addition to the summary findings of this assessment, the following is taken from ERM, 2007 Environmental Statement concerning the dredging and disposal of material for maintenance dredging:

> *The HR (2007) modelling studies show that there is no detectable risk of fines accumulations (sediment sinks). This work does not cover the potential for transient accumulations of fine material which may result from particular weather conditions or local seabed features. However, the results do confirm that there is no real risk of persistent fines accumulation within Mostyn Deep, Welsh Channel or a main section of the dredged channel which are the main dispersion corridors identified by the dispersion modelling (HR, 2007). It is therefore concluded that there is no detectable risk of fines accumulation as a result of disposal of dredge arisings in the deposition area within Mostyn Deep.*

These findings, as well as those from the modelling undertaken for the present application, are supported by the repeat annual monitoring surveys (and subsequent analysis), which (as described above) indicate no observed build-up of material within the Mostyn Deep disposal site, irrespective of how much material has been deposited there in any given year.

NRW Advisory comment No. 50

"It does not appear however, that the Salisbury Approach channel has been assessed particularly for SSC plume dispersal and deposition during the capital dredging operations to -4 m CD, only the Berth Pocket dredge and disposal at Mostyn Deep were presented (Figure 6.8). we advise that a SSC plume will be generated during the capital dredge of the approach channel, and an assessment should be carried out to show where this material advects to and whether the plume and subsequent settling of the sediment could have an indirect impact to receiving receptors (e.g. cockle beds) on the sand banks either side of the channel."

ABPmer response

Bed material within the Salisbury Channel (collected during annual benthic monitoring in July 2022) identifies the bed material within the channel as 'sand'. Particle Size Distribution and descriptive information is provided in Table 4.

Table 4. Descriptive statistics of bed grab samples within Salisbury Channel (July 2022)

Descriptive Parameter	Site A7	Site Y6
D10 (µm)	135	167
D50 (µm)	213	243
D90 (µm)	335	353
% silt	0	0
% sand fine medium coarse	 43 57 0	 25 75 0
% gravel	0	0

The results of the bed grab sample analysis indicate a consistent sandy bed with no fine component. Material is comprised entirely of fine to medium sand, with a mean grain diameter of around 200 to 250 µm. Individual particles of this size typically have a settling velocity of around 0.03 m/s (Soulsby, 1997; van Rijn, 1993).

The numerical modelling of the approach channel (described in the ES and also supplemented by the annual monitoring (modelling) studies; ABPmer, 2021, included in Appendix B), indicates flow vectors aligned with the orientation of the Salisbury Channel, with peak flow speeds of up to 0.9 m/s and 0.7 m/s on spring flood and ebb tides, respectively (see, e.g. ES Figure 6.11).

Dredging within the channel is proposed to be undertaken by Trailer Suction Hopper Dredger (TSHD). This method typically puts material into suspension at the drag head (generally around 2 m above the bed). In the case of overspill of hopper water, material could also be input at the water surface. On a mean spring tide, HW at Mostyn reaches 8.9 mCD; assuming a dredge depth to -4 mCD, this could lead to a maximum water depth (within the dredged channel) of up to 12.9 m.

Taking the above into consideration, a particle input to the water column 2 m above the bed would take around 1 minute to settle back to the bed. If this happened at the peak of the spring tide, the flow vectors could transport that particle up to 60 m from the point of origin, along the alignment of the channel. Considering a conservative case, whereby overspill material is put into the water column at the surface, on HW (mean spring tide), the particle would settle to the bed in around seven minutes. In this time, the flow vectors (noting these relate to peak flood, not HW tidal state) could transport the material up to a distance of 390 m from the point of origin, along the channel. At lower water levels, and during tidal states with slower flow speeds, these calculated transport distances will decrease.

Consequently, it is considered that any material put into suspension from the channel dredge, will settle back to the bed within the channel dredge area (and be re-dredged during the capital dredge campaign). The flow regime in and around the channel does not provide a pathway for any such material to be transported onto either the adjacent banks, any cockle beds in the proximity of the works, or the main navigation channel upstream of the Port of Mostyn.

2.5 Removal of dredge material ashore

NRW Advisory comment 75

"*Removal of 600,000 m^3 of sediment ashore to use in the reclamation (this has not been appropriately assessed).*"

ABPmer response

As noted above, Table 3 provides the annual dredge disposal returns for the Port of Mostyn since the renewal of the current licence in 2019. This shows that, up to February 2023, a total of 220,772 tonnes (110,386 m^3) of dredged material has been landed to shore, at an average rate of just under 54,000 tonnes/year (27,000 m^3). This is in contrast to the approved licensed tonnage (within DML1542), which allows for up to 100,000 tonnes/year (50,000 m^3 per year) to be landed to shore.

The overall net sediment input to the wider Dee Estuary is an important consideration in understanding the capacity of the system for removal of material. The below summary is taken from SMP, 2002 and refers to the wider sediment budget and transport pathways across the system.

> *By examining the results of both local and regional work it can be estimated that there is a net input into the estuary of around 1.5 million m^3* [3 million tonnes] *of sand-sized sediments through Mostyn Deep every year. This represents an overall raising of seabed levels in the estuary by around 2 mm/yr. Clearly there will be other contributions to overall input from flows over the sand banks and maybe from Hilbre Channel but these contributions are likely to be less than through the Welsh Channel and Mostyn Deep. Such predicted inputs accord with changes likely due to sea level rise in an area with offshore sediment supply as applies to the Dee Estuary.*

Over the planned (~15-month) construction period, the required infill volume of material from the capital dredge works represents around 26% of the net amount of material input to the estuary in that time. By association, the remaining material (subtracting the infill material from the input volume) would still represent an overall raising of seabed levels in the estuary by around 1.8 mm over the planned construction period.

This analysis has been further extending over the full 7-year licence term, whilst also accounting for the additional applied-for 150,000 tonnes per year beneficial use (increased from 100,000 tonnes currently). The total, maximum removal of material over the 7-year term equates to 2,050,000 tonnes (comprising 1,000,000 tonnes for infill of the reclaim and an additional 1,050,000 tonnes for 'other' beneficial use). On the basis of the supporting information described above, the associated total input of sand-sized material to the wider estuary (through the Welsh Channel/ Mostyn Deep alone) equates to 21,000,000 tonnes over the same period (three million tonnes per year over 7 years). Thus, the total maximum removal of material from the wider system represents 9.7% of the Welsh Channel inputs over the proposed licence term. In the same way as calculated above (for the construction period), over the 7-year licence term the remaining material (subtracting the maximum volume of material removed from the input volume) would still represent an overall raising of seabed levels in the estuary by over 1.8 mm/yr.

The Waste Hierarchy Assessment (WHA) that was undertaken in support of the marine licence application concluded that the Best Practical Environmental Option (BPEO) for the capital dredge material is the beneficial reuse of the dredge arisings as engineering grade fill within the MEPE reclamation (or in other projects), and the disposal at sea at a licensed disposal ground for the remainder of the dredge material (see Appendix 6.1 of the ES). If the engineering fill required for the reclamation were to be imported to the area via land it would involve a significant number of truck movements on the existing road network (approximately 33,300 deliveries using a large tipper truck with a maximum authorised mass of 30 tonnes and a carrying capacity of 15 m^3). This same volume of infill would involve 250 barge movements with a 2,000 m^3 capacity if it were to be imported to the area via sea. Both of these options are likely to have potentially significant environmental and cost implications. Furthermore, the retention of the majority of dredged material within the wider Dee Estuary sediment budget (through placement at the IS102 disposal site) and the sediment transport effects of the proposed dredge and infill elements of the scheme, were assessed in the Physical Processes assessment as **insignificant** (Sections 6.7.5 and 6.7.6 in Chapter 6 of the ES).

Summary

Based on the range of supporting information (as summarised above), the potential impact of the proposed removal of material from the estuary (for a combination of infill for the planned reclaim and additional 'other' beneficial use), over the 7-year licence term, is considered to be **minor**. The annual input through Welsh Channel alone (noting there will be additional inputs from other sources into the estuary), far outweigh the removal volumes (both over the construction period and, latterly, for the applied-for 'other' beneficial use).

Based on the analysis described above, coupled with the continued practice of maintaining the vast majority of dredged material within the estuary, through deposit at the Mostyn Deep site) it is considered that the Dee Estuary will remain generally accretionary and accretion rates across the wider system will remain consistent with the present (baseline) conditions.

3 Water and Sediment Quality

3.1 Water Framework Directive Compliance Assessment

NRW Advisory comment No. 89

"The Water Framework Directive (WFD) compliance assessment (CA) has not considered the impact of the proposed development on the mitigation measures of the Dee (N. Wales) transitional water body which is a Heavily Modified Water Body (HMWB). The WFD CA must be able to show that the development will not compromise the effectiveness of the mitigation measures. The mitigation measures ('HMWB uses and mitigation measures July 2022') can be found on Water Watch Wales via the 3-bar menu at the top right of the screen."

ABPmer response

The impact of the proposed development on the mitigation measures of the Dee (N. Wales) transitional water body is provided in Table 5.

Table 5. Consideration of mitigation measures for the Dee (N. Wales) transitional water body

Mitigation Measure		Is the Measure in Place?	Would the Measure be Compromised by the Proposed Development?
Measure Tier 1	Measure Tier 2		
Navigation	49. Modify vessel design	In place	No. There would be no change to the existing situation and this measure can continue.
Navigation	50. Vessel Management	In place	No. There would be no change to the existing situation and this measure can continue.
Operations and maintenance	21. Avoid the need to dredge	In place	No. Dredge requirement has been reduced as far as possible whilst still meeting the need for the proposed development (see Appendix 6.1 – Waste Hierarchy Assessment). The impacts of dredging have been assessed in the ES and no significant effects are anticipated.
Operations and maintenance	22. Dredging disposal strategy	In place	No. The proposed disposal of material is in line with existing practices, using existing licenced disposal sites within the estuary. Disposal options have been considered in the context of the Waste Hierarchy Assessment (Appendix 6.1). The impacts of dredge disposal have been assessed in the ES and no significant effects are anticipated.

Mitigation Measure		Is the Measure in Place?	Would the Measure be Compromised by the Proposed Development?
Measure Tier 1	Measure Tier 2		
Operations and maintenance	23. Reduce impact of dredging	In place	No. The impacts of dredging have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Operations and maintenance	24. Reduce sediment resuspension	In place	No. The impacts of dredging have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Operations and maintenance	25. Retime dredging or disposal	In place	No. The impacts of dredging have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Operations and maintenance	26. Sediment management	In place	No. The proposed development would not prevent this measure from being implemented in the future.
Operations and maintenance	27. Dredge disposal site selection	In place	No. the selected disposal sites are considered most appropriate based on practical, environmental and economic parameters (see Appendix 6.1 – Waste Hierarchy Assessment).
Operations and maintenance	28. Manage disturbance	In place	No. The impacts of the proposed development have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Structural modification	14. Modify structure	In place	No. The impacts of the proposed development have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Structural modification	15. Flow manipulation	In place	No. The impacts of the proposed development have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.

Mitigation Measure		Is the Measure in Place?	Would the Measure be Compromised by the Proposed Development?
Measure Tier 1	Measure Tier 2		
Working with physical form and function	1. Modify channel	In place	No. The impacts of the proposed development have been assessed in the ES and mitigation measures applied where necessary. No significant effects are anticipated.
Working with physical form and function	2. Remove obsolete structure	In place	No. The proposed development would not prevent this measure from being implemented in the future.

NRW Advisory comment No. 90

"The WFD CA does not include details of the exceedances of the "biology – habitats" metrics as listed in Table 4 (pp11). These must be provided in order to make an assessment of the scale of impact to the water body and its habitats. The metrics must include all areas, summed together, within the water bodies that will be impacted by the development. The 1.5 x dredge area must also be included."

ABPmer response

Please see below Table 6 which provides the exceedances of the biology (habitats) metrics. This includes the sum of all elements of the proposed development in each water body, including the dredge area multiplied by 1.5.

Table 6. Biology (Habitats) risk issues in the study area water bodies

Biology (Habitats) Considerations	Biology (Habitats) Risk Issue(s)	
	Dee (N. Wales)	North Wales
Is the footprint of the activity 0.5 km^2 or larger?	No (the footprint for the works totals 0.41 km^2)*. Impact assessment not required.	No (footprint of works do not overlap with this waterbody). Impact assessment not required.
Is the footprint of the activity 1% or more of the water body's area?	No (the footprint comprises 0.4% of water body area). Requires impact assessment.	No (footprint of works do not overlap with this waterbody). Impact assessment not required.
Is the footprint of the activity within 500 m of any higher sensitivity habitat?	Yes (Mussel beds including blue and horse mussel, and Saltmarsh, within 500 m). Requires impact assessment.	No. Impact assessment not required.
Is the footprint of the activity 1% or more of any lower sensitivity habitat?	Yes (footprint covers 6% of 'soft subtidal sediment' based on information provided in the 'water body summary table' in Clearing the Waters for All guidance). Requires impact assessment.	No (footprint of works do not overlap with this waterbody). Impact assessment not required.

* The 1.5 x area calculation does not include the existing licenced disposal sites.

NRW Advisory comment No. 114

"We advise that the WFD assessment considers upstream river WFD water bodies. This is because of the potential for the project to impact diadromous migrant species (sea trout, Atlantic salmon, European eel, river lamprey and sea lamprey) whose river populations are used as part of the FCS2 classification of the fish quality element in river water bodies. Therefore, impacts in the Dee Estuary could affect the fish quality element classification of upstream river water bodies."

ABPmer response

Elevated underwater noise and vibration levels during construction activities can potentially disturb fish by causing physiological damage and/or inducing adverse behavioural reactions. A detailed underwater noise assessment has been undertaken for the proposed development (Appendix 8.4 of the ES) and is summarised in Section 4.3 of the WFD Compliance Assessment (Appendix 7.1 of the ES).

The effects of piling, and dredging and disposal on fish are considered in Sections 4.3.1 and 4.3.2 of the WFD Compliance Assessment (Appendix 7.1 of the ES), respectively. It is concluded, based on the evidence provided in the assessment, that the proposed development is not expected to lead to a deterioration of the assessed fish elements within the Dee (N. Wales) transitional water body or North Wales coastal water body, nor prevent these water bodies from meeting their WFD objectives. In addition, further piling restrictions for migratory fish are proposed in Section 4.5 of this report. These will further avoid and/or minimise adverse effects during sensitive fish migration periods.

In light of the above, the fish quality element classifications of upstream WFD river water bodies from the proposed works (such as the Y Garth River water body, and the Nant Sir Roger (Dee estuary) river water body) are not expected to deteriorate as a result of the proposed works. The proposed works are also not expected to prevent these water bodies from meeting their WFD objectives.

3.2 Suspended sediments and dissolved oxygen

NRW Advisory comment No. 94

"Environmental Statement Chapter 7: Marine water and sediment quality

We cannot agree the conclusions with respect to Dissolve Oxygen as we have not been provided with sufficient evidence regarding suspended sediment. In particular, the dredge and disposal regime has not been sufficiently described and evidenced to enable us to assess that turbidity will remain at background levels for the 15 months of dredge and disposal. Furthermore, we understand that significant amounts of the current maintenance dredge are used on land and therefore not released into the water environment. Therefore, we need to understand any deviation from this approach and what it's impacts will be. Any impacts to background turbidity could have further consequences for phytoplankton and dissolved oxygen."

ABPmer response

Further clarifications on the dredge and disposal regime and resulting changes in SSC are provided in Sections 2.1 and 2.4 of this report.

As stated in Section 6.7.1 and 6.7.6 of Chapter 6 of the ES (and cross referred in Chapter 7 of the ES), maximum SSCs are associated with the disposal activities (with relatively small increases in SSC arising from the dredge itself or the piling activity). SSC levels within the dynamic plume during disposal of dredge material will initially be high but, given the existing high natural levels within the estuary, excess

levels are likely to be reduced to below natural storm disturbance conditions very quickly (and before the next disposal operation commences). The measurable plume from each disposal operation is only likely to persist for a single tidal cycle (less than 6 hours from disposal). After this time, the dispersion under the peak flood or ebb tidal flows means concentrations will have reverted to background levels.

Based on this, the conclusions reached in Chapter 7 of the ES on marine water and sediment quality remain the same; any reduction in dissolved oxygen concentration will be localised, short-lived and replenished over the subsequent tidal cycle. Therefore, changes to dissolved oxygen concentrations during construction or operation are not considered significant.

4 Nature Conservation and Marine Ecology

4.1 Direct habitat effects

NRW Advisory comment No. 62a

"…Based on the evidence presented the magnitude of the impact is considered to be small with respect to the intertidal hard substrate habitat. We disagree with the assessment of low magnitude as the duration of the impact is long-term and non-reversible. We advise this impact should be considered medium based on the above and the spatial scale (0.27 ha). The probability of occurrence is high thus giving a Medium exposure to change. The importance of this habitat has been presented as low. We agree with this assessment as the habitat does not qualify as a sub-feature of the Dee Estuary SAC or as a Section 7 habitat under the Environment Wales Act. Based on the standard assessment matrix, the impact of direct habitat loss as a result of the new quay wall would therefore be minor adverse with regards to the intertidal hard substrate habitat."

ABPmer response

The revised assessment that has been undertaken by NRW Advisory with respect to intertidal hard substrate habitat is considered reasonable. Although the spatial scale of the loss of this habitat is localised and small, given it will be a permanent change, it is considered appropriate to revise the magnitude of change to medium in line with the definitions for magnitude of change provided in the Nature Conservation and Marine Ecology Chapter 8 of the ES. Following the standard assessment matrix set out in the EIA methodology (Chapter 5 of the ES), the impact of the direct loss of this intertidal hard substrate habitat is, therefore, now assessed as **minor adverse**.

NRW Advisory comment No. 62b

"With respect to the intertidal mudflat and sandflat habitat, the applicant has assessed this as negligible magnitude. We disagree with this assessment. The impact is long-term, non-reversible and over a large scale (2.57 ha). We therefore advise this should be assessed as Large magnitude of change. The probability of occurrence is high, thus giving a High exposure to change result. The importance of this habitat has been presented as moderate due to the poor quality of the feature. We disagree with this assessment. Whilst the number of species and abundance levels recorded in the samples are lower than those that have been recorded in other areas, the feature is still a qualifying Annex I feature of the Dee Estuary SAC and has not been subject to continuous dredging as other areas discussed in more detail below. We therefore advise the importance of this habitat should be presented as High. Based on the standard assessment matrix, resultant effect is major adverse with regards to the intertidal mudflat habitat. We note the applicant is proposing to scrape back rubble from the toe of the rubble along the western side of the dock estate to expose mudflat habitat on the Mostyn Bank. This could be used as mitigation for the major adverse effect on the intertidal mudflat habitat. However further information is required on the exact extent that this area provides compared to the 2.57 ha of intertidal mudflat and sandflat loss?"

ABPmer response

With respect to the intertidal mudflat and sandflat habitat, the Port of Mostyn already has an existing licence (DML2001) to dredge part of the area within the footprint for the proposed MEPE reclamation and new berth which is valid until 31 March 2026 (Figure 4). In addition, the Port has a licence to construct a new quay (CML1343v3) which is valid until 14 August 2025. CML1343v3 allows material to be deposited and/or removed from the area of the quay referred to as Areas A1 and A2 in the licence (Figure 4).

The areas covered by existing permissions overlap the majority of the intertidal mud habitat (2.24 ha) under the footprint of the proposed MEPE reclamation. The remaining area of intertidal mud habitat (0.33 ha) under the footprint of the proposed MEPE reclamation that is not covered by either DML2001 or CML1343v3 is shown on Figure 5.

It is important to note that the Port of Mostyn recently had a licence (DML1663) to dredge the entire Statutory Harbour Authority (SHA) area up until 5 April 2020 (Figure 6). Following the cessation of the Airbus A380 aircraft wing shipments utilising the (Roll-on/Roll-off) RoRo Terminal and berth in October 2019, production of the aircraft ceased and the RoRo berth was no longer needed for this purpose. The area around the RoRo berth was allowed to accrete naturally to reduce the volume of infill required for the proposed MEPE reclamation and thus also avoid any unnecessary dredging and associated environmental impact. In other words, the 'intertidal mud' at this location is material that has recently deposited in the last 2-3 years given the cessation of dredging activity and is therefore fluid/soft and unconsolidated in nature and is not representative of the intertidal mudflat located elsewhere in the Dee Estuary.

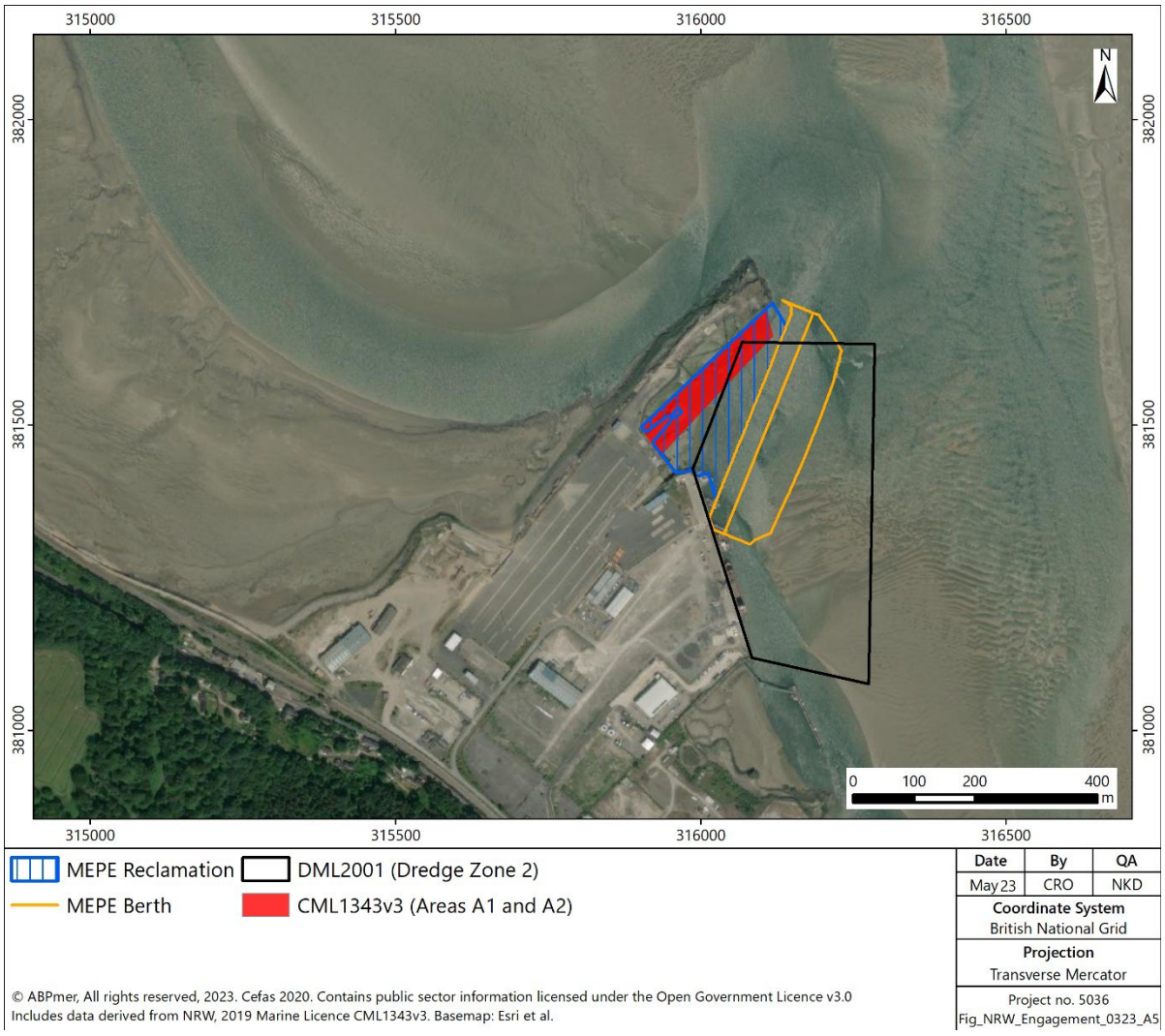

Figure 4. Existing permissions to remove and/or deposit materials within proposed MEPE reclamation and new berth

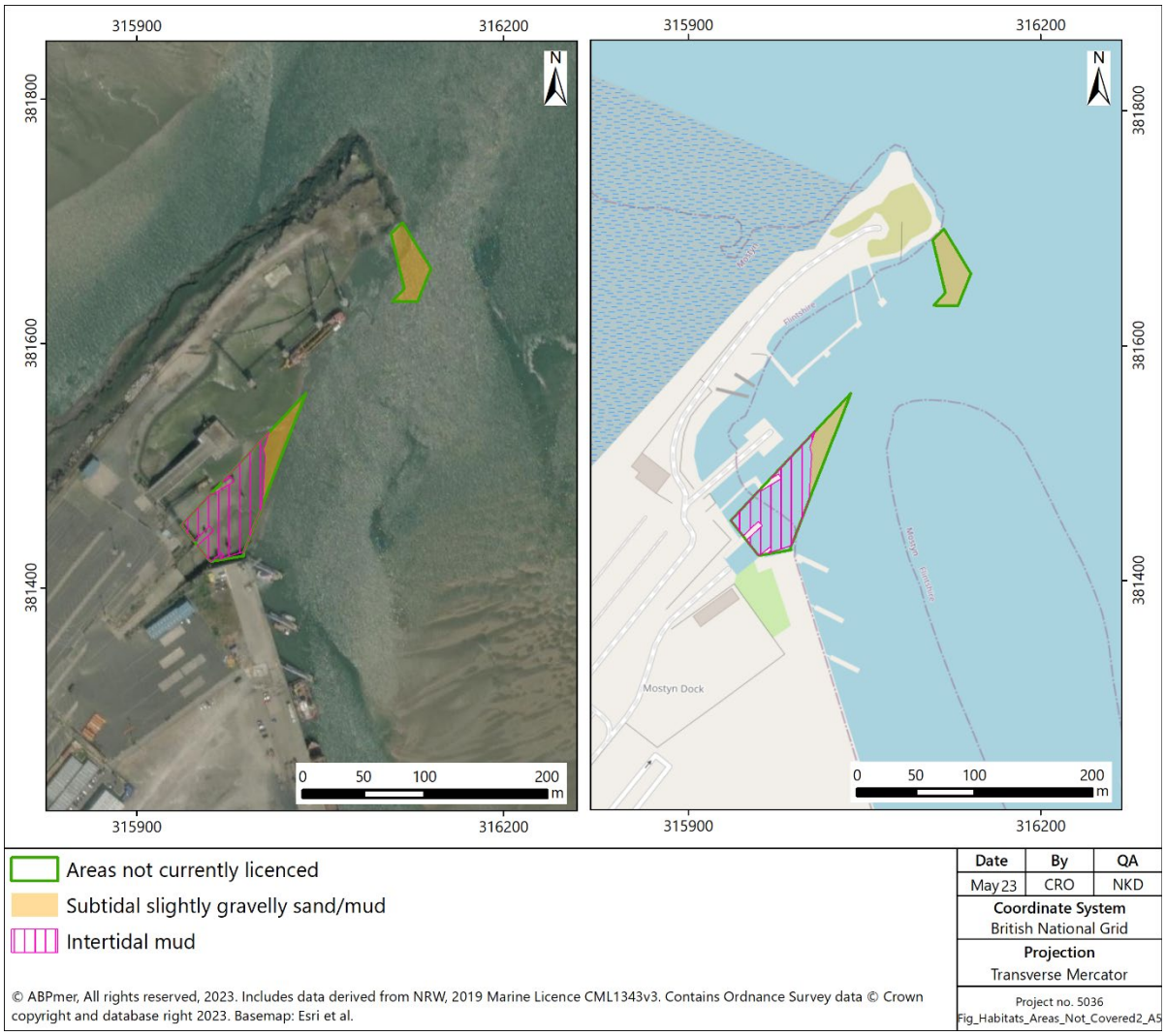

Figure 5. Habitats within MEPE reclamation that are not covered by existing permissions

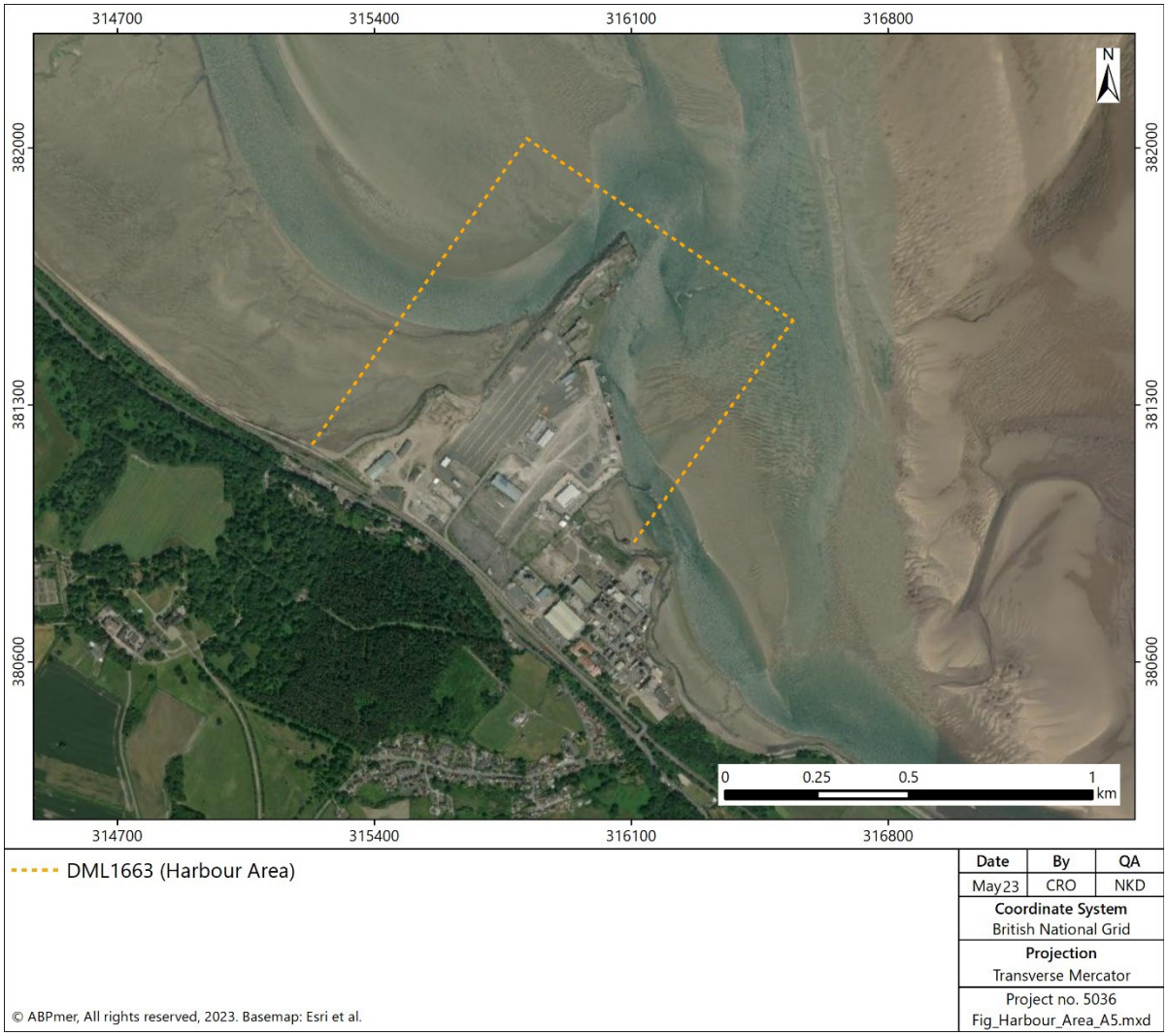

Figure 6. **Recent permission to dredge within entire Port of Mostyn's Statutory Harbour Authority (SHA) area**

Furthermore, the annex to the schedule included in the Port of Mostyn's maintenance dredge and disposal licence for the main navigational channel (DML1542v2) states the following:

"*The conservation objective for the "mudflats and sandflats" feature of the Dee Estuary SAC is to maintain the feature in favourable condition, as defined below:*

The "mudflats and sandflats" feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:
i. the total extent of mudflat and sandflat communities within the site is maintained…"

DML1542v2 is dated 2019 when the area of the harbour around the RoRo berth was still licenced to be dredged under DML1663 and also before the intertidal mud material had accreted in this area. The material that has accreted since 2019 is, therefore, not considered relevant to meeting the conservation objective for the mudflat and sandflats feature as this feature was already considered to be in favourable condition before this accretion took place.

In summary, based on the above considerations and following the standard impact assessment matrix, the magnitude of the change in intertidal mud habitat is considered to be negligible and so, while the probability of occurrence is high, the overall exposure is assessed as negligible. The sensitivity of species to direct habitat loss is assessed as high given the lack of recoverability following reclamation and the importance has been amended from moderate to high, on the advice of NRW Advisory, given that while this specific area of intertidal mud is of poor ecological value and provides a limited function for coastal birds, it is a qualifying feature of the Dee Estuary SAC. Overall, therefore, the impact of the direct loss of intertidal mud as a result of the new quay wall and reclamation is assessed as **insignificant** and remains the same as in the ES and the HRA.

Following further discussion with the benthic ecology specialist at NRW Advisory during a meeting held on 12 June 2023, it was advised that this conclusion for the Annex 1 mudflat and sands feature may be acceptable. However, the loss of Annex 1 Estuaries feature under the footprint of the MEPE reclamation which comprises both intertidal and subtidal sub-features would be unavoidable (see Section 4.7 of this report).

NRW Advisory comment No. 62c

"The magnitude, probability and resultant exposure to change has not been assessed for the 0.65 ha of Subtidal habitat that will be lost under the footprint of development. We advise this should be assessed. The importance of this habitat has been assessed as low. We disagree with this assessment as subtidal habitat is a sub-feature of the Annex I Estuaries feature of the Dee Estuary SAC. We therefore advise this should be assessed as Moderate importance. From our assessment, we advise the magnitude of change should also be rated as Medium. This is based on the non-reversible, long-term and scale of the impact. The probability of occurrence is high thus resulting in a High exposure to change. The sensitivity of the feature is high and the exposure to change is medium, resulting in a high vulnerability. The importance of the feature is considered moderate, thus resulting in a Moderate adverse effect."

ABPmer response

In terms of the subtidal habitat that is present within the footprint of the proposed development, this is not considered to comprise any of the sub-features of the estuary feature of the Dee Estuary SAC, as defined in Box 1 of the Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010), which are listed as follows:

- Individual estuarine habitat features:

  - Intertidal mudflats and sandflats communities;
  - *Salicornia* and other annual plants colonising mud and sand;
  - Atlantic salt meadow;
  - Annual vegetation of drift lines;
- Notable subtidal sediment communities;
  - Any notable subtidal sediment communities that may be identified including those important for estuarine fish.
- Notable intertidal hard substrata communities.
  - *Mytilus edulis* and piddocks on eulittoral firm clay;
  - *Sabellaria alveolata* reefs on sand-abraded eulittoral rock;
  - Hydroids, ephemeral seaweeds and *Littorina littorea* in shallow eulittoral mixed substrata pools; and
  - Any other notable intertidal hard substrate communities that may be identified

The subtidal habitat that is present within the footprint of the reclamation forms part of an operational harbour and does not comprise any notable subtidal sediment communities that are important in supporting estuarine fish. As noted in the ES (Section 8.7, Chapter 8 of the ES), the subtidal benthic samples from within this area of subtidal habitat consisted predominantly of slightly gravelly sand or slightly gravelly muddy sand mud. Samples were typically impoverished and characterised by low numbers of the species. No subtidal species considered nationally rare or protected were recorded.

The importance of this subtidal habitat according to the standard impact assessment matrix should therefore remain low. Although the spatial scale of the loss of habitat is considered negligible in the context of the extent of the overall amount of similar subtidal habitat found locally in the Dee Estuary, given the loss will be a permanent change, it is appropriate to revise the magnitude of change to medium. Following the impact assessment matrix, the probability of occurrence is high thus resulting in a medium exposure to change. The sensitivity of the feature is high, and the importance of the feature is considered low, therefore, the impact of the direct loss of this subtidal habitat is now assessed as **minor adverse**. Further evidence in support of the assessment of the loss of Annex I Estuaries habitat feature for the HRA is provided in Section 4.7 of this report.

NRW Advisory comment No. 63

"*Capital dredging will cause a direct loss of 1.34 ha of intertidal habitat which will change to subtidal habitat as a result of the deepening of the berth pocket. The magnitude of potential impacts is considered to be negligible. We disagree with this assessment as the duration of the impact will be long-term, non-reversible and over a large scale. Based on the above we advise the magnitude of change should be assessed as large. The probability of occurrence is high thus resulting in a High exposure to change. The sensitivity of the feature is high, thus resulting in a High vulnerability. The importance of the feature has been assessed as moderate based on the highly impoverished faunal assemblage and the ongoing maintenance dredging of Bug bank. We agree with this assessment. Based on the standard assessment matrix the resulting impact is Moderate adverse*."

ABPmer response

The Port of Mostyn already has an existing licence (DML2001) which is valid until 31 March 2026 to entirely dredge this intertidal area known as Bug Bank down to -5.5 mCD (which may be increased to -8 m CD with agreement from NRW MLT). The assessment conclusions presented for this pathway in the ES and HRA are considered to remain valid. The intertidal habitat in this area comprises a highly impoverished faunal assemblage typical of highly disturbed and tide swept sandflat habitat. This area is also already characterised by ongoing maintenance dredging. The intertidal habitat loss as a result of the capital dredge represents approximately 0.008 % the Dee Estuary SAC and 0.013 % of the

'mudflats and sandflats not covered by seawater at low tide' feature of the Dee Estuary SAC. This loss also represents 0.009 % of the Dee Estuary SPA/Ramsar site. This habitat loss is, therefore, considered to be negligible in the context of the Dee Estuary SAC and SPA/Ramsar. Overall, the impact, is assessed as **insignificant** and remains the same as in the ES and the HRA.

NRW Advisory comment No. 64

"*A capital dredge will be required to create a new berth pocket alongside the new quay wall and to deepen the existing berth pocket along the existing quay wall. The dredging will result in changes to approximately 3.16 ha of subtidal habitat as a direct result of the physical removal of subtidal sediment which is what is assessed in this section.*

It is expected that following the capital dredge from the berth pocket, the dredge pockets will provide a similar habitat to that occurring under pre-dredge conditions which would then be expected to be colonised by a similar assemblage. We advise the magnitude of the change to subtidal habitats should be assessed as medium. This based on the impact occurring over a large scale (3.5 ha) but noting that recovery is expected over the short-term. The sensitivity of subtidal habitats, more specifically the biotopes present within the dredge area LS.LSa.MoSa: Barren amphipod-dominated mobile sand shores with patches of LS.LSa.FiSa:Polychaete/amphipod-dominated fine sand shores should be rated as medium sensitivity in line the assessment provided in MarESA. Based on the standard assessment matrix the resulting impact is minor/insignificant which is not significant in EIA terms.

However, the main navigation channel will also need to be dredged to a maximum depth of – 4 m CD. The total volume of capital dredge material that needs to be removed from the main navigation channel is estimated to be up to 3 million m^3. We are unclear if the assessment under this section has included the potential impacts to subtidal habitats from dredging the main navigational channel. The references to the habitats present in the area relate to those closest to the quay wall (Appendix 8.1), not those on the main navigation channel (See Chapter 3, Figure 3.1 for spatial reference). Survey data is probably available from the annual benthic monitoring that is undertaken to assess what the impacts to the habitats from the capital dredge are, but this data has not been presented. We advise impacts from capital dredging the navigational channel should be assessed."

ABPmer response

With respect to potential effects on subtidal habitats due to the removal of seabed material during the berth capital dredging, the NRW response suggest that sensitivity of habitats should be based on intertidal biotopes (LS.LSa.MoSa: Barren amphipod-dominated mobile sand shores with patches of LS.LSa.FiSa:Polychaete/amphipod-dominated fine sand shores). However, while these biotopes are present in intertidal areas of the footprint, this specific impact pathway assessment relates to subtidal habitats. On this basis, the assessment used information from appropriate Marine Evidence based Sensitivity Assessment (MarESA) assessments based on the species assemblages recorded to understand rates of recoverability. Given the high recoverability rates expected, sensitivity was considered to be low on this basis. The assessment conclusion reported within the ES is, therefore, considered to remain the same.

With respect to the removal of seabed material during capital dredging of the navigational channel, the navigation channels consist of tide-swept shallow sublittoral sand habitat with an impoverished fauna (characterised by species such as catworms *Nephtys* spp., mysid shrimp *Gastrosaccus spinifera* and amphipods (such as *Bathyporeia* spp.) (Section 8.6, Chapter 8 of the ES). This habitat is subject to high levels of disturbance as a result of the strong tidal flows and mobility of bed substratum. This is reflected in the opportunistic infaunal assemblage with species adapted to disturbance through physical robustness, mobility and ability to re-position or able to recover rapidly to sustain population losses. In

this respect, populations are considered to recover within days or weeks (Tillin, 2019). On this basis, following the capital dredge, the navigation channel will provide a similar habitat to that occurring under pre-dredge conditions which would then be expected to be recolonised very rapidly allowing populations to fully re-establish to baseline conditions quickly. Therefore, the changes to subtidal habitats and species as a result of the removal of seabed material during dredging of the main navigation channel is considered to be **insignificant** and remains the same as reported within the ES.

It should be noted that the ongoing Mostyn Dredge and Disposal Ecological Monitoring Work is focused on surveying the potential change to intertidal habitats in the vicinity of the navigation channel and this information has been used to help assess potential effects on these habitats as a result of capital dredging of the navigation channel (see Section 4.3.1 of this report).

4.2 Effects on protected sites and species (including Section 7 species)

NRW Advisory comments No. 81 and No. 88

"*Further information is required to be able to understand how the proposed development (including construction, operation and maintenance) may impact the condition of protected sites and protected species. This should include the Dee Estuary SPA, Liverpool Bay SPA, the Dee Estuary SSSI, Gronant Dunes and Talacre Warren SSSI and Shotton Lagoons and Reedbeds SSSI. Effects on priority species included in Section 7 of the Environment (Wales) Act 2016 should also be assessed.*"

ABPmer response

Potential effects on Dee Estuary SPA interest features, as well as their supporting habitats and prey resources, are assessed in the ES (Chapter 8 of the ES), HRA (Appendix 8.5 of the ES) and Sections 4.1, 4.3, 4.4, 4.6 and 4.7 of this report.

Potential effects on Liverpool Bay SPA interest features are assessed in the HRA (Appendix 8.5 of the ES).

Potential effects on Dee Estuary SSSI waterbird features (many of which are also SPA cited species), and supporting habitats and prey resources, are assessed within the ES (Chapter 8 of the ES), HRA (Appendix 8.5 of the ES) and Sections 4.1, 4.3, 4.4, 4.6 and 4.7 of this report.

Breeding Little Tern is a notified feature of the Gronant Dunes and Talacre Warren SSSI. Data suggests that this species forages within 5 km of nesting sites (Woodward *et al.*, 2019). The Gronant breeding colony is located over 5 km from the MEPE Project (including the navigational channel capital dredge area), with the Mostyn Deep disposal site on the margins of a 5 km buffer around the colony. Given the distance from the colony and the magnitude of potential direct and indirect habitat changes associated with the proposed development (as assessed within the ES, HRA and Sections 4.1 and 4.3 of this report), any effects on this feature as a result of changes in prey resource are assessed as **insignificant**.

The presence of vessels or dredgers (during construction or operation) has the potential to cause visual and noise disturbance stimuli. However, Little Tern are considered to have a low sensitivity to potential disturbance caused by vessels (MMO, 2018; MacArthur Green Ltd, 2012). On this basis and given the distance from the colony at Gronant Dunes and Talacre Warren SSSI, the magnitude of the disturbance associated with the development will be negligible and, therefore, the impact is assessed as **insignificant**.

Plumes caused by dredging and dredge disposal could increase suspended sediments and reduce the potential foraging success of this species. However, as summarised in the ES, HRA and Section 4.3 of this report, elevated suspended sediment plumes are anticipated to be very-short term and localised with Little Terns observed foraging in areas with high suspended levels. On this basis, potential effects on Gronant Dunes and Talacre Warren SSSI are assessed as **insignificant**.

Breeding Common Tern is a notified feature of the Shotton Lagoons and Reedbeds SSSI. The SSSI is located approximately 16 km from the MEPE Project (including the navigational channel capital dredge area). The current average maximum foraging range recorded is 18 km (Woodward *et al*., 2019). However, research suggests that the majority of Common Tern foraging occurs closer to nesting colonies (Wilson *et al*., 2014). This is reflected in relatively low sightings rates of Common Tern in the vicinity of the proposed development; for example, no Common Terns were recorded in the Port of Mostyn Ornithology Surveys from September 2017 to April 2021 (see Section 8.6 and Appendix 8.3 of the ES). Given the distance from the colony and the magnitude of potential direct and indirect habitat changes associated with the proposed development (as assessed within the ES, HRA and Sections 4.1 and 4.3 of this report), any effects on this feature as a result of changes in prey resource are anticipated to be **insignificant**.

The presence of vessels or dredgers (during construction or operation) has the potential to cause visual and noise disturbance stimuli. However, Common Tern are considered to have a low sensitivity to potential disturbance caused by vessels (Fliessbach *et al*., 2019, MMO, 2018; Goodship and Furness, 2022; MacArthur Green Ltd, 2012). On this basis and given the distance from the colony at Shotton Lagoons and Reedbeds SSSI, the magnitude of the disturbance associated with the development will be negligible and, therefore, the impact is assessed as **insignificant**.

Plumes caused by dredging and dredge disposal could increase suspended sediments and reduce the potential foraging success of this species. However, as summarised in the ES, HRA and Section 4.3 of this report, elevated suspended sediment plumes are anticipated to be very-short term and localised. In addition, terns are relatively well adapted to foraging in highly turbid conditions as summarised above and have been observed showing a preference for foraging in more turbid water (e.g. Holbech *et al*., 2018; Haney and Stone 1988; Henkel 2006; Russell *et al*., 2014) with colonies situated nearby to areas which typically have high background suspended sediment levels (including the Dee Estuary). On this basis, potential effects on Gronant Dunes and Talacre Warren SSSI are assessed as **insignificant**.

Section 7 of the Environment (Wales) Act 2016 waterbird species which occur in the Dee Estuary include the waders Eurasian Curlew, Ringed Plover, Bar-tailed Godwit, Northern Lapwing and Golden Plover. Potential effects on Eurasian Curlew (including effects on supporting habitat and prey species) are considered in the ES, HRA and Sections 4.1, 4.3, 4.4, 4.6 and 4.7 of this report. All other species of wading bird only occur in very low numbers, infrequently in the zone of influence of the proposed development and have therefore not been considered further. Other waterbirds such as Herring Gull and Black-headed Gull have been considered more generally with respect to key potential pathways such as bird disturbance (noting these species are considered to be of low sensitivity to anthropogenic disturbance).

Section 7 of the Environment (Wales) Act 2016 fish species which occur in the Dee Estuary include twaite shad, European eel, river lamprey, sea lamprey, smelt, Atlantic salmon, sea trout, sandeel, herring, cod, tope shark, whiting, plaice, thornback ray, mackerel and sole. Potential effects on the fish assemblage of the Dee Estuary are considered in the ES and HRA. Further detail of the potential effects on sandeels is included in Section 4.4 of this report. The overall importance of certain fish (i.e., fish species of conservation interest, including Section 7 fish species) is recognised to be high. The assessment of potential effects on fish reported in the ES remains the same, apart from the significance of underwater

noise and vibration disturbance during percussive piling. The assessment presented below specifically considers all of the Section 7 fish species and their varying sensitivity to noise.

The overall impact of underwater noise and disturbance during impact piling is assessed as **minor adverse** for Section 7 fish species that have a low sensitivity to noise based on the Popper *et al.* (2014) fish noise exposure criteria and in accordance with the sensitivity criteria set out in the impact assessment methodology (Section 8.3.2 of the ES), namely river lamprey, sea lamprey, sandeel, tope shark, plaice, thornback ray and sole.

The overall impact of underwater noise and disturbance during impact piling is assessed as **moderate adverse** for Section 7 fish species that have a moderate sensitivity to noise based on the Popper *et al.* (2014) fish noise exposure criteria and in accordance with the sensitivity criteria set out in the impact assessment methodology (Section 8.3.2 of the ES), namely twaite shad, European eel, smelt, Atlantic salmon, sea trout, herring, cod, whiting and mackerel. The mitigation measures that are proposed for migratory fish will also help to avoid and/or minimise significant adverse effects on these Section 7 fish species (i.e. soft start and vibro piling as much as possible and further restrictions which are proposed in Section 4.5 of this report).

4.3 Indirect effects on benthic habitats and species (including cockles)

4.3.1 Changes to habitat and species as a result of sediment deposition (capital dredging and dredge disposal)

NRW Advisory comment No. 65

"We agree with the assessment that the potential impact of deposition from capital dredging of the berth pocket on benthic features is insignificant. Increased sedimentation above 10 mm is predicted within around 500 m, mainly across the proposed reclamation area, with sedimentation reducing to 1-2 mm off the end of the breakwater. The predicted sedimentation is below the pressure benchmark for the habitats immediately adjacent to the works. However, it is unclear whether the plume will reach the cockle beds. Chapter 6, Figure 6.8 shows the maximum sedimentation plume extending north of the breakwater. How far is the New bed cockle bed from the plume? It would be useful to overlay Figure 6.8 (in Chapter 6) with the known cockle beds to understand the potential interactions. If the plume extends to the cockle beds, any potential impacts from sediment deposition should be assessed.

Furthermore, we are concerned the potential impacts from sediment deposition to benthic habitats from the capital dredging of the main navigational channel have not been assessed. The assessment presented here seems to relate only to the capital dredging of the berth pockets discussed above. Potential impacts to benthic habitats from the capital dredging of the main navigational channel should also be assessed."

NRW Dee Cockle Fishery Senior Cockle Fishery Management Officer comment No. 41

"*There is inadequate information on hydrodynamic changes, effects of dredging on harvesting beds and any hydro geomorphological changes to sediments as a result of the works and the impact on the harvesting areas and cockle spat settlement and growth. Cockles are extremely sensitive to changes in sediment type, deposition and a wide range of other physical factors which could affect the population in different ways*."

ABPmer response

The plume from the capital dredge of the berth pockets will reach the New Bed but total sedimentation for all modelled dredge/disposal activity is predicted to be less than 0.4 mm in this area. With specific respect to cockles, this species is considered tolerant to sedimentation up to at least 5 cm (50 mm) (based on MarESA assessment for cockle beds (Tillin and Tyler-Walters, 2016)). Therefore, the predicted levels of deposition are not predicted to cause smothering effects in this species.

Potential effects of sediment deposition due to the capital dredge and dredge disposal was considered in Section 8.7.1 of the Nature Conservation and Marine Ecology Chapter 8 of the ES, although it is acknowledged that this focused on the berth pocket capital dredge area rather than the main navigation channel. On this basis, a more detailed assessment on the effects to benthic habitats and species due to sediment deposition as a result of dredging of the main navigation channel is provided below. A more detailed assessment on the potential effects of sediment deposition (smothering effects) on cockle bed areas is also provided.

In summary, increased sedimentation above 0.5 mm is predicted to only occur within the actual berth pockets (and, to a lesser extent, the navigation channels) with sedimentation at greater distances predicted in the range of 0.1 to 0.4 mm.

Peak sedimentation depths within the Mostyn Deep disposal site (IS102 disposal site) are predicted to be around 50-60 mm, reducing to around 4-6 mm within the plume at distances of approximately 1 km from the disposal site. However, it should also be noted due to the flow direction at this location, no sedimentation on adjacent intertidal areas (including cockle harvesting areas) is predicted (Figure 3).

Subtidal channel habitats and adjacent intertidal habitats in the area of the proposed capital dredging and dredge disposal are already subject to high levels of deposition naturally. This is as a result of high background SSC and strong hydrodynamic conditions (due to tidal flows and the exposed nature of the Dee Estuary) causing the resuspension and deposition of sediments on a daily basis and the regular movement of morphological features such as sand waves which are often dynamic in nature (ABPmer, 2017, included in Appendix C; ABPmer, 2021, included in Appendix B). Therefore, deposition outside of the berths, channel and dredge disposal areas is considered immeasurable from natural background variation in deposition (i.e., negligible in magnitude).

Large areas of habitat in close proximity to the navigation channel capital dredge footprint consist of lower elevation tide-swept sandflat habitat which comprises a clean sand substratum with a relatively species poor, macrofaunal community comprising low numbers of mobile crustaceans (such as *Bathyporeia pilosa* and *Eurydice pulchra*) and polychaetes (such as *Nephtys* spp.) (ABPmer, 2022, included in Appendix F).

Areas of richer and more stable mudflat habitat are recorded throughout much of the Mostyn Bank. In addition, areas of ecologically richer and more stable habitat (consisting of sandy mud and muddy sand) also occur on patches on the Salisbury Bank (ABPmer, 2022, see Appendix F). To help better understand the location of these areas on the Salisbury Bank and Mostyn Bank, information from the Mostyn Dredge and Disposal Ecological Monitoring Work (ABPmer, 2022, see Appendix F) and the location of commercial cockle beds identified in NRW (2022) has been used. The location of intertidal monitoring sites and cockle beds is shown in Figure 7 for reference. In summary, richer sandy mud and muddy sand habitats on the Salisbury Bank occurs in the following areas:

- **The area around Stations B3:** An emerging shoal of deposited material on the eastern margins of the Mostyn Channel which is also broadly the same area as 'New Bed' cockle bed);

- **The area around of C3, C4, W3 and W4:** These areas are broadly in the same location as 'Number 3 Buoy' cockle bed; and
- **Habitat to the west of B6**: This area overlaps with the 'Salisbury' cockle bed.

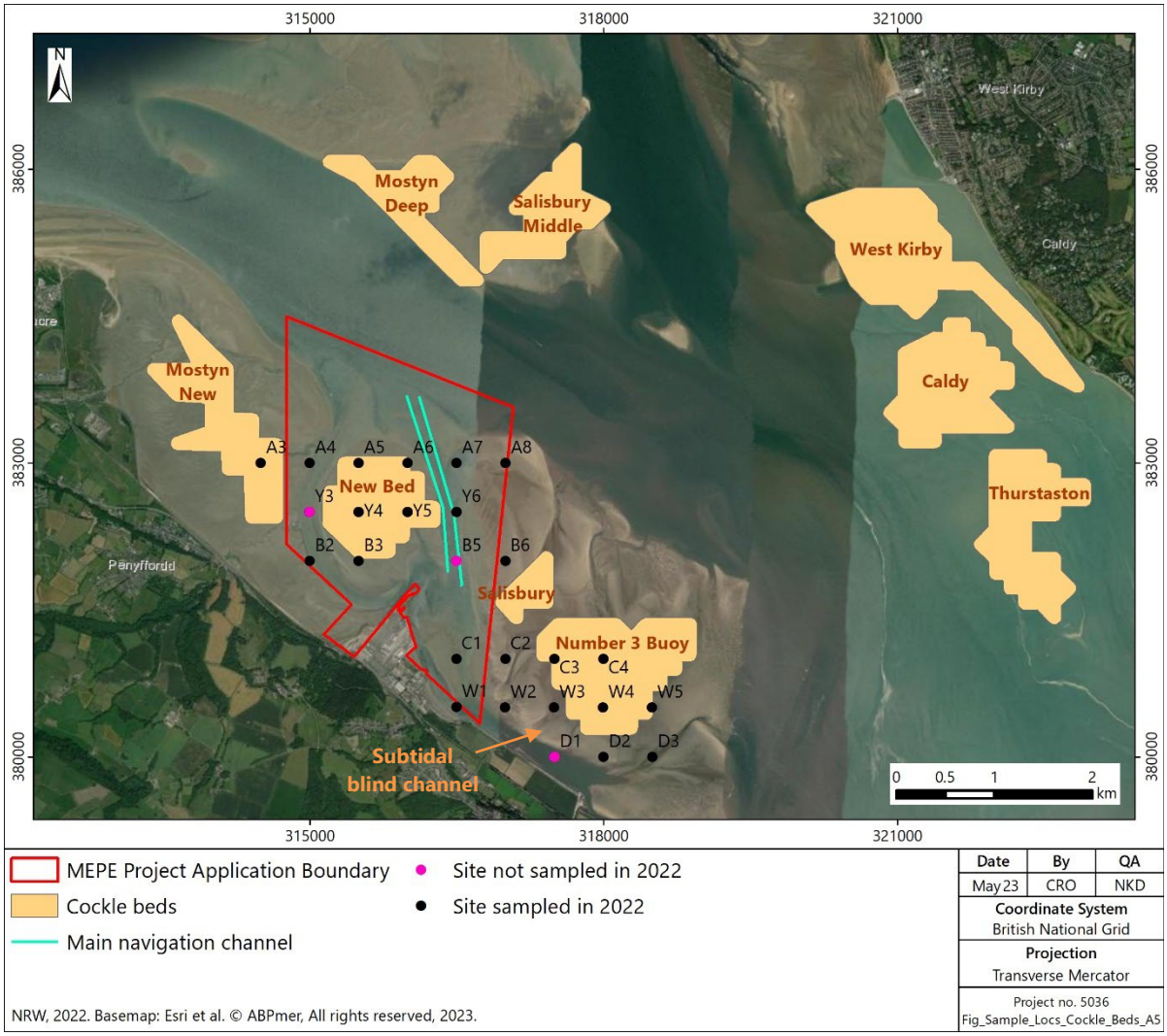

Figure 7. Location of ecological monitoring stations and cockle harvesting beds

These muddier habitats are typically characterised by high densities of cockles *Cerastoderma edule* along with other mud dwelling species such as bivalves (peppery furrow shell *Scrobicularia plana*, Baltic tellin *Limecola balthica*), polychaetes (such as *Hediste diversicolor)*, mud snail *Peringia ulvae,* mud shrimp *Corophium volutator,* and the oligochaete *Tubificoides* spp. (Section 8.6.2, Chapter 8 of the ES).
These burrowing infaunal species are considered tolerant to some sediment deposition. The predicted millimetric changes in deposition are, therefore, not considered to cause smothering effects as described in the scientific review in Section 8.7.1, Chapter 8 of the ES. In addition, many of the species recorded in the benthic invertebrate surveys are fast growing and/or have rapid reproductive rates which allow populations to typically rapidly recolonise disturbed habitats, many within a few months following the disturbance events (Ashley and Budd, 2020; Ashley, 2016; Tillin, 2018).

With specific respect to cockles, the nearest cockle bed to the navigation channel is located directly adjacent (New Bed) and with respect to the Mostyn Deep disposal site (IS102), the nearest cockle bed (Mostyn Deep) is located appropriately 600 m away. As described above, sedimentation is predicted to

be <0.5 mm outside of the navigation channel due to the capital dredging and no sedimentation on adjacent intertidal areas (including cockle harvesting areas) is predicted as a result of dredge disposal at the Mostyn Deep disposal site (IS102).

This species is considered tolerant to sedimentation up to at least 5 cm (50 mm) (based on MarESA assessment for cockle beds (Tillin and Tyler-Walters, 2016)). Therefore, the predicted levels of deposition outside of the navigation channel and dredge disposal site are well within the tolerance range of these species and not predicted to cause any potential smothering effects in this species (including at commercial harvesting areas).

Deposition of sediment as a result of dredging outside of the immediate berths, channel and dredge disposal areas will be immeasurable and within the range of natural background variability. Magnitude of change is, therefore, assessed as negligible. Probability of occurrence is high and thus the overall exposure to change is negligible. Based on the evidence provided above, sensitivity of habitats within the vicinity of the capital dredge to increased smothering is considered to be low given that these habitats and associated benthic species are well adapted to survival under fluctuating sediment conditions and have high recoverability rates. Vulnerability is therefore assessed as none. Intertidal habitats in the study area are considered to be of low to high importance with variations taking into account not only their designated status (such as if they are a qualifying/sub-feature of the Dee Estuary SAC, supporting habitat of the Dee Estuary SPA or a NERC Habitat of Principle Importance) but also how representative they are of the physical form and ecological structure and function of the qualifying feature and/or the ecological value and functional importance they provide in terms of benthic prey resources for intertidal birds. Importance is, therefore, considered to range from low to high. Taking all these factors into consideration, the overall potential impact of deposition on benthic features is assessed as **insignificant**.

4.3.2 Indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes (capital dredging and dredge disposal)

NRW Advisory comment No. 61

"Table 8.19 "Indirect changes to seabed habitats and species as a result of changes to hydrodynamics and sedimentary processes marine works (capital dredging and quayside)" and "Indirect changes to seabed habitats and species as a result of changes to hydrodynamics and sedimentary processes (dredge disposal)"

These impacts have been scoped out on the basis that the Physical Processes chapter has concluded that any impact would be insignificant/minor adverse to Physical Processes and thus negligible to benthic habitats. Any changes are expected to the negligible and the highly localised changes in bathymetry at the disposal site is not expected to cause significant changes to seabed morphology. However, the applicant should assess whether these changes although negligible from a Physical Process context have any impacts on benthic habitats and the nearby cockle beds e.g., from smothering. We therefore advise these impacts are scoped in and assessed and/or further justification is provided to scope them out."

ABPmer response

As detailed in Table 8.19 in Chapter 8 of the ES, the impact pathway 'indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes' was scoped out of further assessment as the predicted changes were expected to be negligible based on the outcomes of the physical processes assessment (Chapter 6 of the ES). However, a more comprehensive assessment on benthic habitats and species (including cockles) is provided below based on further physical processes analysis and assessment with a specific focus on key habitat areas in the vicinity of the

navigation channel. The assessment has also been based on habitat information presented in the most recent Mostyn Dredge and Disposal Ecological Monitoring Work (ABPmer, 2022, see Appendix F) and using the location of commercial cockle beds identified in NRW (2022). This background information has been summarised above in the '*Changes to habitat and species as a result of sediment deposition during dredging (capital dredging)* pathway (Section 4.3.1 of this report) and so has not been repeated here.

An assessment on the three broad main habitat types found in the vicinity of the navigation channel is provided below:

- **Mostyn Bank mudflat:** Capital dredge and dredge disposal is not expected to cause an increase in the rate of erosion of the Mostyn Bank edge beyond that which is currently occurring under pre-dredge conditions. In addition, the capital dredge and dredge disposal is only expected to cause negligible changes in accretion and seabed morphology (i.e., not discernible against background variability) with any change to surface sediment characteristics (including sediment type) also expected be negligible. On this basis, any change to intertidal habitats and species assemblages on the Mostyn Bank is expected to be limited and not of a magnitude that will impact the condition status of benthic habitat features.

- **Muddy sand/sandy mud habitats of the Salisbury Bank (including cockle rich habitats and cockle beds).** Changes in erosion or accretion rates as well as seabed morphology in areas of siltier habitat (including cockle beds) on the Salisbury Bank as a result of the capital dredge and disposal is predicted to be negligible (i.e., not discernible against baseline background conditions). Furthermore, surface sediment characteristics (including sediment type) will also remain broadly comparable to existing pre-dredge conditions[2]. On this basis, any change to benthic habitats and species assemblages in these areas due to indirect effects is expected to be limited and not of a magnitude that will impact the condition status of benthic habitat features.

- **Tide swept clean sand habitat:** These areas are typically highly dynamic and subject to regular natural disturbance due to strong tidal flows and shifting morphological features (such as sand waves). Any infauna colonising these areas are considered to have rapid recoverability rates (Tillin, 2018). This habitat is also considered to be of limited value in terms of prey resources (for wading birds) and does not support commercially exploitable cockle beds. Change to seabed morphology in these areas will also be negligible and unlikely to be detectable against natural background variation. Furthermore, surface sediment characteristics (including sediment type) will remain broadly comparable to existing pre-dredge conditions. On this basis, any change to benthic habitats and species assemblages in these areas due to indirect effects is expected to be limited and not of a magnitude that will impact the condition status of benthic habitat features.

Based on the information provided above and applying the impact assessment matrix, magnitude of change is, therefore, assessed as negligible. Probability of occurrence is high and, thus, the overall exposure to change is negligible. Sensitivity of benthic habitats to changes to hydrodynamic and sedimentary processes due to capital dredging of the navigational channel is considered to be moderate. Vulnerability is therefore assessed as none. Intertidal habitats in the study area are considered to be of low to high importance with variations taking into account not only their designated

[2] Data from the long-term dredge ecological monitoring shows that these habitats typically show some inter annual variability in silt content due to natural variation. Changes in habitat type have typically been observed due to large shifts in sediment type (e.g., as a result of the movement of sand waves into an area which was previously siltier in nature).

status (such as if they are a qualifying/sub-feature of the Dee Estuary SAC, supporting habitat of the Dee Estuary SPA or a NERC Habitat of Principle Importance) but also how representative they are of the physical form and ecological structure and function of the qualifying feature and/or the ecological value and functional importance they provide in terms of benthic prey resources for intertidal birds. Importance is, therefore, considered to range from low to high. Taking all these factors into consideration, the overall potential impact of changes to hydrodynamic and sedimentary processes on benthic features due to capital dredging of the navigational channel is assessed as **insignificant.**

NRW Advisory comment No. 69

"*Potential impacts to benthic habitats from changes to hydrodynamics and sedimentary processes from the presence of the new quay wall during the operation of the project have not been assessed. In particular whether the presence of the quay wall during the operation of the project will have an impact on benthic habitats and species and on the nearby cockle beds. Figure 6.10, Chapter 6 shows some localised changes during the ebb tide: an increase in velocity along the quay wall and Salisbury channel and a reduction in velocity on the adjacent mudflat and sandflat. What are the implications of these changes from a benthic habitats perspective? This could lead to indirect loss and/or impact the condition status of Annex I features of the Dee Estuary SAC. We advise this is scoped in and assessed appropriately*"'.

ABPmer response

The predicted impacts to hydrodynamics (flows) as a result of the operational phase (with the new quay wall and dredged berth pockets in place) are described in Section 6.7.3 (Chapter 6 of the ES), and summarised in Figure 6.10, which shows a variable pattern of increased and decreased current speed on peak flood and ebb tidal states. Associated changes to sediment transport pathways are discussed in Section 6.7.5 (Chapter 6 of the ES) and illustrated in Figure 6.13. These results show a range of small changes to transport pathways as a new equilibrium is reached in response to the MEPE scheme elements.

The predicted changes in sediment transport tend to be small in magnitude and limited in extent to the berth pockets, the approach channel and a short distance up-estuary of the Port, along the subtidal blind channel shown on Figure 7. Outside of these areas, including the wider intertidal banks (including the cockle harvesting areas), changes in flow speed are very small and, consequently, no changes to the sediment transport regime are predicted. On this basis, no indirect loss to intertidal habitats due to erosion is predicted, with any habitat change expected to be limited and not of a magnitude that will impact the condition status of benthic habitat features.

Based on the information provided above and applying the impact assessment matrix, magnitude of change on benthic habitats is, therefore, assessed as negligible. Probability of occurrence is high and thus the overall exposure to change is negligible. Sensitivity of benthic habitats to changes to hydrodynamic and sedimentary processes due to the new quay wall is considered to be moderate. Vulnerability is therefore assessed as none. Intertidal habitats in the study area are considered to be of low to high importance with variations taking into account not only their designated status (such as if they are a qualifying/sub-feature of the Dee Estuary SAC, supporting habitat of the Dee Estuary SPA or a NERC Habitat of Principle Importance) but also how representative they are of the physical form and ecological structure and function of the qualifying feature and/or the ecological value and functional importance they provide in terms of benthic prey resources for intertidal birds. Importance is, therefore, considered to range from low to high. Taking all these factors into consideration, the overall potential impact of changes to hydrodynamic and sedimentary processes on benthic features due to quay wall is assessed as **insignificant.**

4.3.3 Indirect changes to seabed habitats and species as a result of changes to hydrodynamics and sedimentary processes (maintenance dredging and disposal)

NRW Advisory comment No. 70

"This impact has been scoped out on the basis that the monitoring work undertaken over the last 15 years has not identified any changes attributable to the maintenance work. However, to our knowledge the maximum depth that has been dredge to date is up to -2.0 m CD. We are also unsure how much material has been deposited in Mostyn Deep over the duration of the current licence. Clarification is sought as the 2022 annual monitoring report noted all sediment dredged was pumped to shore. The justification to scope this out also notes that the Physical Process chapter concluded that only changes in hydrodynamic and sedimentary processes that are of negligible magnitude are predicted. However, the applicant should still assess whether these changes although negligible from a Physical Process context have any impacts on benthic habitats. Based on the above, we advise this impact is scoped in and assessed."

ABPmer response

Indirect effects during maintenance dredge and dredge disposal are predicted to be comparable or less than predicted for the capital dredge and disposal (please see further details in the *'Indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes (capital dredging and dredge disposal)'* pathway above (Section 4.3.2 of this report). On this basis, potential effects are considered to be **insignificant.**

4.3.4 Changes to benthic habitats and species as result of seabed removal during dredging (maintenance dredging and disposal)

NRW Advisory comment No. 71

"*The maintenance dredge quantities and depth assessed in this section and proposed are within the cap set in the existing marine licences. However, it must be noted that a dredge to -4 m CD has not taken place to our knowledge and as such, the results of the monitoring programme to date should be interpreted with caution. The assessment here has been carried out only against the habitats present directly adjacent to the new quay wall (as these are the results provided in Appendix 8.1). No consideration has been given to the habitats present and adjacent to the navigation channel (shown as a polygon in Chapter 3, Figure 3.3) that will also be subject to the impacts of maintenance dredging. Data for these habitats is probably available from the annual monitoring the port carries out. We are unable to agree with the conclusions presented here until those assessments are carried out.*

We agree with the applicant that for those habitats present directly adjacent to the new quay wall, the impacts of maintenance dredging are likely to be minor however uncertainty remains over what the impacts to these habitats will be from maintaining the dredge to -4.0 m CD as this has not been carried out to date. Therefore, we advise the current monitoring requirements listed under marine licence DML1542v2 should remain in place to ascertain the assumptions made in the ES. That is that any impact on benthic habitats will be minor and that the balance of the spatial distribution of different habitats (e.g., mudflat and sandflat) within the estuary is maintained. The monitoring requirements should include the specific thresholds and actions to take place if a change is detected."

ABPmer response

With respect to the removal of seabed material during maintenance dredging of the navigational channel, the navigation channels consist of tide-swept shallow sublittoral sand habitat with an impoverished fauna (consisting of species such as catworms *Nephtys* spp., mysid shrimp *Gastrosaccus spinifera* and amphipods (such as *Bathyporeia* spp.) (Section 8.6, Chapter 8 of ES). This habitat is subject to high levels of disturbance as a result of the strong tidal flows and mobility of bed substratum. This is reflected in an opportunistic infaunal assemblage with species adapted to disturbance through physical robustness, mobility and ability to re-position or able to recover rapidly to sustain population losses. In this respect, populations are considered to recover with days or weeks (Tillin *et al*., 2019).

On this basis, following maintenance dredging, the navigation channel will provide a similar habitat to that occurring under pre-dredge conditions which would then be expected to be recolonised very rapidly allowing populations to re-establish to baseline conditions between maintenance dredging campaigns.

Based on the evidence provided above and applying the project impact assessment methodology, the magnitude of the change to the subtidal habitats and associated benthic species is considered to be small and although the probability of occurrence is high, the overall exposure is assessed as low. The sensitivity of subtidal habitats to seabed disturbance within the dredge footprint is considered to be low given the high recoverability rates. Vulnerability is, therefore, assessed as low. Subtidal species in the area are considered to be commonly occurring and of low conservation concern with the habitats not characteristic of any of the qualifying features of overlapping designated sites although it is noted that subtidal habitats form a component of the 'Estuaries' feature of the SAC. Importance is, therefore, considered to be moderate for subtidal habitats. Overall, the potential effect is assessed as **insignificant to minor adverse**.

The monitoring that is proposed to be undertaken for the MEPE Project is set out in Section 5 of this report.

4.4 Effects on sandeels

NRW Advisory comment No. 109

"We advise further assessment of the magnitude of change upon sandeels is conducted. We advise that this further assessment considers the amount of preferred/marginal or prime/sub-prime sandeel habitat that will be affected by construction, capital dredging, maintenance dredging and disposal activities within the Dee Estuary, both directly and indirectly. The impact upon sandeels via habitat loss, habitat damage, direct uptake and smothering has not been sufficiently assessed in the Environmental Statement, because insufficient evidence has been presented to justify a negligible/small (depending on the impact pathway being assessed) magnitude of change. Sandeels are particularly vulnerable to habitat loss and dredging/disposal effects due to their benthic spawning, burrowing/hibernating, and high site fidelity behaviours. As a result, the magnitude of change may not be negligible/small for this species. We consider that the sensitivity of sandeels to the impact pathways from the project is moderate as there could be damage to individuals or populations with recoverability over short to moderate timescales, and we consider that the importance of the species is high given it is a Section 7 species, a key ecosystem species and a key prey item of many bird and mammal features in the ecosystem including of the breeding common tern feature of the Dee Estuary SPA. We advise that the amount of sandeel habitat affected is placed in the context of the available sandeel habitat within wider Dee Estuary, and also considered in-combination with other potentially impacting activities in the vicinity of the Dee Estuary, such as any other ongoing dredging activities (e.g., Area 392/393 or other capital or maintenance dredging)."

ABPmer response

The entire estuary overlaps sandeel "high intensity spawning grounds" dataset provided in Ellis *et al.* (2012). Fish survey data suggests that sandeels are recorded in subtidal and lower intertidal sand habitat in the Dee Estuary (Appendix 8.2 of the ES). This habitat overlaps the proposed capital and maintenance dredging areas and disposal sites. An assessment of the potential effects on sandeels as a result of the proposed development (including dredging and disposal activities) is provided below:

- **Direct habitat loss:** It is noted that sandeels could be potentially present in the intertidal sand habitat which will change to subtidal sand habitat as a result of the capital dredge deepening of the new berth pocket. The Port of Mostyn already has an existing licence (DML2001) which is valid until 31 March 2026 to entirely dredge this intertidal area known as Bug Bank down to -5.5 mCD (which may be increased to -8 m CD with agreement from NRW MLT). The evidence in support of this licence application is detailed in Section 2 of this report.

- **Direct effects of sediment smothering due to dredging and disposal activity:** As highlighted in Section 4.3.1 of this report, increased sedimentation above 0.5 mm is predicted to only occur within the actual berth pockets (and, to a lesser extent, the navigation channels) during capital dredging, with sedimentation at greater distances predicted in the range of 0.1 to 0.4 mm. Peak sedimentation depths within the Mostyn Deep disposal site (IS102 disposal site) are predicted to be around 50-60 mm, reducing to around 4-6 mm within the plume at distances of approximately 1 km from the disposal site. Sandeel are considered capable of burrowing through over 50 cm (500 mm) of sediment and so are not considered sensitive to the direct effects of sedimentation (Latto *et al.*, 2013). Effects during maintenance dredge and dredge disposal are predicted to be comparable or less than predicted for the capital dredge and disposal (Section 4.3.3).

- **Direct removal of sandeel/entrainment by the dredger draghead:** During dredging, there is the potential for fish and fish eggs to be directly taken up by the action of the draghead which could be damaged as a result. This is likely to particularly be the case when sandeels are buried in the sediment (whilst resting, during the night and in the colder autumn and winter months). Sandeels have the potential to be present in at least low densities, in most areas of suitable habitat across the navigation channel. However, areas of the channel that will be required to be capital or maintenance dredged are already subject to regular disturbance due to existing channel maintenance dredge commitments, ongoing vessel movements and strong hydrodynamic conditions causing the resuspension and deposition of sediments and the regular movement of morphological features such as sand waves which are often dynamic in nature (ABPmer, 2017, included in Appendix C; ABPmer, 2021, included in Appendix B). These increasingly disturbed areas are therefore likely to provide sub optimal conditions in terms of sandeel spawning and nursery functions. During spawning, sandeels produce a large batch of sticky eggs which attach to the seabed. The larvae tend to hatch a couple of weeks later, after which they float around in the currents for up to 3 months before settling down into the seabed. In addition, only small areas of the navigation channel are likely to be dredged at any one time. The maximum area to be dredged over a campaign would be associated with the capital dredge of the navigation channel (an area covering up to approximately 21 ha) which only represents

a very small fraction of the total area of potentially suitable sand habitat for sandeels in the Dee Estuary (0.33 %)[3].

- **Habitat change due to dredging and disposal activity:** Sandeels show a preference for sand habitat with low silt/clay content. Sediment deposition during dredging and disposal activity and changes in habitat due to as a result of changes to hydrodynamic and sedimentary processes could potentially cause changes in sediment type. However, the millimetric changes in sediment deposition predicted to occur away from the direct dredge footprint/disposal site along with the negligible changes to hydrodynamic and sedimentary processes predicted are not anticipated to be discernible against baseline background conditions with sediment type also expected to remain broadly comparable to existing pre-dredge conditions as a result (see Section 4.3).

Based on the information provided above and applying the impact assessment matrix, magnitude of change is, therefore, assessed as small. Probability of occurrence is high and, thus, the overall exposure to change is low. Sensitivity of sandeels is considered to be moderate. Vulnerability is therefore assessed as low. Sandeels are considered to be of high importance given they are a Section 7 species and are an important prey resource for a wide variety of species. Taking all these factors into consideration, the overall potential impact of the MEPE Project on sandeels is assessed as **minor adverse**.

Other potentially impacting activities on sandeel habitat in the vicinity of the Dee Estuary are primarily related to ongoing marine aggregate dredging activities which take place along the north coast of Wales in Liverpool Bay. The nearest areas licensed for aggregate dredging and extraction are Area 392/393, known as Hilbre Swash. Aggregate dredging has taken place in this existing licence area and previously in an area immediately to the south for over 50 years (NRW, 2013). Area 392/393, is located more than 10 km from the MEPE Project and is in a region considered to be potentially important for sandeel.

An analysis of the sandeel spawning habitat available in the vicinity of Area 392/393 was undertaken by the aggregate operators following a request for further information during the consultation phase of the EIA determination (NRW, 2013). The main areas of potential sandeel spawning habitat were mapped using the sandeel "high intensity spawning grounds" dataset provided in Ellis *et al*. (2012). The combined active dredge zones and 500 m buffer areas within Area 392/393 where potential dredging effects may occur were calculated to cover approximately 0.38 % of the area identified as "*high intensity sandeel spawning habitat*" by Ellis *et al*. (2012). It was noted that sandeel occur much more widely than in their main spawning grounds and will occupy a much larger area of the Irish Sea over their life cycles. The optimal sandeel spawning habitat within the areas of "*high intensity spawning grounds*" was then mapped using British Geological Survey (BGS) sediment type data. The mapping indicated that Area 392/393 does not overlap with any areas which may support optimal sandeel spawning habitat. It was therefore concluded that there will be no significant impacts on sandeels (NRW, 2013).

In summary, other activities are unlikely to act in-combination with the MEPE Project and further exacerbate the potential minor adverse effects that have been assessed as a result of the MEPE Project alone.

[3] EMODnet EUNIS Habitat Map MESH Atlantic dataset (https://emodnet.ec.europa.eu/en/seabed-habitats) was used to estimate the total area of potentially suitable sand habitat within the Dee Estuary (6,418 ha). Relevant EUNIS Habitat codes that are considered to represent preferred/marginal or prime/sub-prime habitat for sandeels within the estuary are A5.2, A5.233, A2.24, A2.2, A2.2232, A2.242, A2.241, A5.241, A2.245, A2.231, A2.244 and A2.221.

4.5 Piling restrictions for migratory fish

Environment Agency comment No. 17

"*… the Habitats Regulations Assessment does identify potential disruption to the migration of Atlantic Salmon through the estuary due to noise from percussive piling. We expect this would be covered within your assessment of the proposed works; however our suggested mitigation would be a 'soft start up' and a default to 'vibratory piling method'. Whilst these methods will help mitigate impacts, it is anticipated that louder percussive piling will be needed when piles meet bedrock. As such a timing restriction could be considered by NRW, to avoid periods of sensitive migration of salmon as they pass upstream as adults and downstream as smolts*."

NRW Advisory comment No. 110

"*We advise that timing restrictions are applied to percussive piling activities to minimise potential impacts upon diadromous migrant fish species in the Dee Estuary. This is because of the predicted noise levels from percussive piling activities required to construct the new quay wall, and the limited evidence of the effectiveness of the soft-start piling mitigation at deterring fish from the area where they will be killed, injured or subject to TTS, masking or disturbance effects. We advise that timing restrictions could involve preventing percussive piling during night-time all year and preventing percussive piling entirely during the smolt migration period from mid-April to mid-June. We note that similar conditions were applied to piling activities in Marine Licence CML1343 for the Mostyn Energy Park development. These timing restrictions would protect the majority of key migratory periods for the diadromous fish species using the Dee Estuary. Alternatively, we advise a timing restriction to limit piling to a period either side of low tide would also be effective at minimising noise impacts to all diadromous fish species using the Dee Estuary. We advise the period either side of low tide could be defined using the same water level models used in Environmental Statement Appendix 8.4: Underwater Noise Assessment*."

ABPmer response

Restrictions to avoid and/or minimise adverse effects during sensitive fish migration periods have been given further consideration.

The following conditions are included in the existing marine licence (CML1343v3) for the Marine Energy Park (MEP):

- The Licence Holder must ensure no percussive / hammer piling should be undertaken during May in any given year to protect outward migrating salmon and sea trout smolts.
- The Licence Holder must ensure there is a 12-hour break in piling activities in any 24-hour period to allow a window of passage to migratory fish.

Given the longer programme of piling that is required for the MEPE Project and the outputs of the underwater noise assessment (Appendix 8.4 of the ES), we would suggest that a tidal restriction may be more appropriate than a seasonal restriction. The Salisbury bank is exposed/dry at around 2.5 to 3 hours before and after Mean Low Water Neaps (MLWN) and around 3 to 3.5 hours before and after Mean Low Water Springs (MLWS), whereby MLWN is 2.9 m CD and MLWS is 1.1 m CD. The propagation of noise will be restricted to the immediate vicinity of the Port (within approximately 550 m) during these periods. The Dee Estuary is around 7 km wide at the location of the proposed development at high water and therefore the area exposed to noise will be very small during these periods (around 8 %). We therefore suggest the following tidal piling restriction to be a condition of the licence:

- No percussive piling is to be undertaken 3 hours either side of high water [mid-April to mid-June] in any given year. Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice.

In addition, a night time piling restriction (7pm to 7am) may be more appropriate than a 12-hour daily break in piling given that there are a number of fish species that migrate exclusively or preferentially at night (e.g., river lamprey and glass eel). We therefore suggest the following night time piling restriction to be a condition of the licence:

- No percussive piling is to take place between 7pm and 7am on any given day. Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice.

4.6 Disturbance of waterbirds

NRW Advisory comment No. 85

"… the proposed works may cause disturbance impacts both during construction, as well as during operation and maintenance. The Environmental Statement considers the probability of noise and visual disturbance during construction to be high, and these impacts have been assessed by the applicant to be minor to moderate adverse. The applicant has also assessed the disturbance during operational use of the port to be minor adverse. The area is already in use as a port and according to the Environmental Statement it is expected that disturbance to waterbirds in addition to the baseline conditions will be limited, whether from noise or visual stimuli. The Environmental Statement also provides general information on disturbance effects to birds from the literature. However, the information provided by the applicant for the proposed development does not adequately quantify 1) types and levels of disturbance and effects on different species and protected site(s) features of the Dee Estuary and surrounding areas, 2) effects of disturbance at locations throughout the Dee Estuary SPA and an assessment of sensitive locations, 3) seasonal impacts to birds, 4) which activity will cause which effect, or 5) assessment of the effects on birds of vessel traffic levels over the expected lifespan of the development, based on planned and proposed offshore developments to be serviced by the port, 6) where birds will go if disturbed. NRW advises that this information is required to understand the potential effects on birds. We also suggest a sensitivity assessment for the area of proposed works is undertaken, please see for example, work by Cutts et al. (2009).

References:

Cutts, N., Phelps, A. & Burdon D. 2009. Construction and waterfowl: Defining sensitivity, response, impacts and guidance. Report to Humber INCA."

RSPB comment No. 126

"We are concerned over the potential disturbance to nearby roosts and feeding areas, particularly during construction but also during operation. However, the ES lacks the detailed assessment of the likely effects of disturbance and sensitivity at various locations on the estuary, for example noise modelling in relation to feeding/roosting/breeding sites of SPA bird species.

We welcome the proposed mitigation measures to address noise and visual disturbance although it is not clear what mitigation is needed until further information on disturbance levels is provided, both during construction and operational phases. We request further details on how such measures would be implemented, as well how they would be legally secured. This is to ensure that appropriate mitigation

measures are in place to ensure the predicted disturbance will not have an adverse effect on the integrity of the SPA/Ramsar waterbird features. With the benefit of additional information on disturbance levels, further measures could be considered, for example restrictions on piling linked to certain tidal states, or a shorter period of adverse/cold weather before ceasing operations."

ABPmer response

Potential effects during construction (in advance of mitigation)

As highlighted in the ES, the proposed development will involve a range of activities, which will result in a temporary source of noise and visual disturbance to roosting and feeding waterbirds during construction. These include the following:

- Piling: Noise stimuli caused by the percussive and vibro piling activity. Piling has the potential to create the highest noise-related disturbance levels during construction. The assessment has assumed that piling works will be carried out 24/7 (although limited to up to 240 minutes of percussive piling and 40 minutes of vibro piling per 24-hour period) and the overall programme for the piling works is approximately 12 months. It is noted that the proposed piling restrictions for migratory fish set out in Section 4.5 of this report will also reduce the potential temporal exposure to disturbance for birds, in particular the proposed night time piling restriction (7pm to 7am);
- Jack-up barges: The potential presence of jack-up barges (for the piling rigs) used in construction will potentially cause both noise and visual disturbance;
- The use of the cutter suction dredger for the capital dredge of the berths and for pumping the dredged material as fill into the reclamation area; and
- The operation of plant machinery such as rollers/dozers or potentially dynamic/hammer impact compaction techniques.

Section 8.7.1 of the ES provides a detailed review of potential disturbance effects during construction (including identifying the sensitivity of different key species to disturbance). This included data and literature from a wide variety of sources, including the Cutts *et al*., 2009 report (which is referenced in the ES as "IECS, 2009a") and the IECS (2013) disturbance toolkit which was developed based on the Cutts *et al.* (2009) report. This established evidence supported the assessment, with the following key principles used to help better understand potential effects:

- The response of waterbirds to disturbance stimuli is relatively limited at distances over 200-300 m even for more sensitive species, particularly in areas subject to already high levels of existing anthropogenic activity (as found in the Port of Mostyn area)[4]; and

- High level responses to noise (such as dispersal away from marine works) are typically associated with sudden or irregular noise over 70 to 80 dB at the receptor (i.e., bird) (IECS, 2013; Cutts *et al*., 2009).

Piling activity in particular is considered likely to produce noise levels which are well in excess of 70 dB on nearby mudflat/roosts on Mostyn Bank (without noise reducing measures in place). The ES concluded that disturbance is considered possible for waterbirds on nearby functionally important areas

[4] Evidence suggests, that waterbirds generally show a flight response to anthropogenic activities such as construction and a presence of people (such as workers) on or near the foreshore at distances <200 -300 m (and more typically between 20 m and 100 m for certain species such as Turnstone or Dunlin) although distances over 300 m have been recorded more occasionally for some sensitive species such as Curlew or Shelduck (ABPmer, 2002; Ruddock and Whitfield, 2007; IECS, 2009a; Wilson, 2009; IECS, 2009b; Dwyer, 2010; IECS, 2013; Ross and Liley, 2014; Goodship and Furness, 2022; Collop *et al*., 2016; Goodship and Furness, 2019; ABPmer, 2013).

(i.e., the ledge roost on the western side of the breakwater and nearby feeding mudflat of the Mostyn Bank).

As set out in the Project Methodology Chapter of the ES (Chapter 3), a reasonable worst case project risk envelope has been used for the assessment to address any potential uncertainty in the scheme design and construction methodology. Due to a lack of detailed information on the construction design, airborne noise modelling of different construction activities (such as piling) was not possible or appropriate. It is acknowledged that such information is valuable in terms of producing noise contour maps (showing dB levels at different distances from the development) and the applying the noise threshold criteria identified in IECS (2013) and Cutts *et al*., 2009 to understand potential effects. On this basis, an updated assessment has been provided based on a precautionary approach and the following key considerations:

- The nearest functionally important waterbird habitat to the construction activity is the mid to upper shore ledge roost on the western side of the breakwater (next to the Mostyn Bank). As described in Section 8.6.5 of the ES, the breakwater is considered an important roost for Oystercatcher and is also used by large numbers of Redshank in some years during September (an important month for the movement of passage birds), as well as by lower numbers of other species roosting such as Curlew. Construction activity on the breakwater itself is expected to be relatively limited with most of the works primarily being undertaken in the harbour (such as the piling and pumping of dredged material). However, given some construction activity will be undertaken on the top of the breakwater, disturbance to birds as a result of this activity is possible. Disturbance to birds using the roost is also considered possible as a result of noise associated with piling (which will be undertaken within a minimum of approximately 100-150 m of the ledge roost).
- The Mostyn Bank and mudflat habitat between the Mostyn Channel and Salisbury Channel are important areas for feeding birds. These areas are located over 200 m from piling activity and within 50 m of the breakwater. Therefore, disturbance to birds in these areas is also considered possible.
- Habitat to the north and north east of the proposed development on Salisbury Bank, which is located approximately 250 to 300 m away, consists of low elevation sandflat habitat (which is highly dynamic and impoverished with a low prey availability for waterbirds). This is reflected in its use by relatively low numbers of waterbirds. Given the low functionality of this area and the distance away from construction activity, disturbance responses would be expected to be limited in this area.

An assessment of potential effects on SPA qualifying species regularly recorded in the vicinity of the proposed development is provided in Table 7.

Based on this review, the conclusions reached in Chapter 8 of the ES remain the same; the effects of airborne noise and visual disturbance on waterbirds during construction is assessed as **minor to moderate adverse** in advance of mitigation.

Table 7. Potential effects on SPA qualifying species during construction

Species	Abundance and Distribution (Based on Data Presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
Redshank	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. The largest numbers of Redshank have been typically during the period September to November. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port as well as roosting on the ledge on the western side of the breakwater in numbers approaching or exceeding nationally important numbers. The largest number of Redshank have been recorded using the roost in Autumn passage periods (particularly September).	Redshank and Oystercatcher are known to occur in large numbers feeding on the Mostyn Bank with both species also known to roost on the ledge on the western side of the breakwater (which is particularly used by Redshank during Autumn passage periods). Both species are considered to be of moderate sensitivity to disturbance. Without mitigation, evidence suggests that disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. Key sources of potential disturbance include construction activity on top of the breakwater (which is located just above the rock ledge roost and within approximately 50 m from feeding habitat on the Mostyn Bank) and piling (which will be undertaken over 200 m away from the Mostyn Bank). Within this zone, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during these elements of construction cannot be ruled out. Any responses at greater distances would be expected to only occur infrequently but is still considered possible for piling activity.
Oystercatcher	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. Peak counts of Oystercatcher typically occurred during the winter months of November to February. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port as well as roosting on the ledge on the western side of the breakwater.	
Shelduck	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances near or approaching nationally important numbers. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port.	These species are known to occur in large numbers on the foreshore in the local area. Shelduck and Curlew are known to be particularly sensitive to anthropogenic disturbance. Without mitigation, evidence suggests that disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200-300 m around construction activities is

Species	Abundance and Distribution (Based on Data Presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
Curlew	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	considered possible. Key sources of potential disturbance include construction activity on top of the breakwater (which is located within approximately 50 m from feeding habitat on the Mostyn Bank) and piling (which will be undertaken over 200 m away from the Mostyn Bank). Within this zone, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during these elements of construction cannot be ruled out. Any responses at greater distances would be expected to only occur infrequently but is still considered possible for piling activity.
Black-tailed Godwit	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. Peak counts of Black-tailed Godwit typically occurred from September to December. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port.	Black-tailed Godwit (and to a lesser extent Pintail) are known to regularly occur feeding on the Mostyn Bank. Both species are considered to be of moderate sensitivity to disturbance. Without mitigation, evidence suggests that disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. Key sources of potential disturbance include construction activity on top of the breakwater (which is located within approximately 50 m from feeding habitat on the Mostyn Bank) and piling (which will be undertaken over 200 m away from the Mostyn Bank). Within this zone, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during these elements of construction cannot be ruled out. Any responses at greater distances would be expected to only occur infrequently but is still considered possible for piling activity.
Pintail	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector).	

Species	Abundance and Distribution (Based on Data Presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
Knot	Ornithology data suggests this species is regularly recorded feeding and roosting on inner the Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	Based on the information provided, Knot and Dunlin typically occur in large numbers on the foreshore in the local area but are also known to be relatively tolerant to anthropogenic disturbance. Evidence suggests these species can occur in relatively close proximity to potential disturbance stimuli before responses are recorded (often within 50-100 m or less of a disturbance sources). Nevertheless, any birds present could be susceptible to potential disturbance and displacement at these distances without mitigation. However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Mostyn Bank area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary.
Dunlin	Ornithology data suggests this species is regularly recorded feeding and roosting on inner the Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	

Proposed mitigation and residual effects

As a result of the potential to cause significant environmental effects (in an EIA context) or a potential Adverse Effect on Integrity (AEOI, in an HRA context in advance of mitigation), the following mitigation measures were proposed in the ES and HRA:

- **Soft starts:** Using soft starts will allow birds to become more tolerant to piling noise by allowing a more gradual increase in noise levels which will reduce the potential for birds to become startled;
- **Cold weather construction restriction:** Coastal waterbirds are considered particularly vulnerable to bird disturbance during periods of extreme winter weather. On this basis, it is proposed that a temporary cessation of piling and any activities taking place along the new quay wall is implemented following seven consecutive days of freezing (zero or sub-zero temperature) weather conditions. The restriction should not be lifted until after 24 hours of above freezing temperatures and also that Metrological Office weather forecasts indicate that freezing conditions will not return for the next five days. Similar measures have been implemented for other port developments and also as part of the JNCC scheme to reduce disturbance to waterfowl due to shooting activity during severe winter weather;
- **Acoustic barrier/visual screening:** In order to reduce potential visual and/or noise disturbance stimuli to waterbirds on the Mostyn Bank or breakwater roost, an acoustic barrier/visual screen will be installed along the breakwater prior to the commencement of construction so that movements of construction workers or vehicles will not be as visible and the levels of noise will be attenuated. Screens (such as fences and other barriers) are a widely used measure to help reduce potential disturbance to coastal waterbirds (Ikuta and Blumstein, 2003; Liley and Tyldesley, 2013; Hockin *et al*., 1992) and have been successfully applied as mitigation to reduce disturbance at a number of port locations including the Port of Mostyn (GoBe Consultants Ltd, 2011, ABPmer, 2014; MMO, 2018). These screens should be opaque or made out of material that distorts outlines of anthropogenic activity; and
- **Noise suppression system:** It is proposed that a noise suppression system (consisting of a pile shroud or sleeve with noise insulating properties) is used during percussive piling activities of the tube piles for the new quay wall to reduce noise levels on the Mostyn Bank or breakwater roost. Airborne noise modelling for other developments for which this measure has been proposed suggests that such systems can reduce noise levels to <70 dB L_{max} at distances greater than approximately 200 m from the piling.

Following consideration of NRW Advisory and RSPB comments, and taking a precautionary approach given the uncertainties with respect to certain construction design elements, the following additional mitigation measures are also proposed (which are based on existing licence conditions in marine licence CML1343v3 which was for a very similar type and scale of development, in broadly the same development footprint and using similar construction techniques including piling):

- **Piling activities are not to be undertaken between August and September (autumn bird passage) in any given year**. This measure will help minimise potential disturbance as a result of piling related noise on the ledge roost on the western side of the breakwater with data suggesting this roost is used most extensively during passage months by Redshank (noting that the acoustic/visual screens proposed above will help minimise noise and visual related disturbance stimuli associated with other construction nearby to the roost); and
- **L_{max} noise levels for the piling works is to be less than 70 dB on the intertidal mudflat of the Mostyn Bank during October to March (overwintering period).** This will help minimise potential noise disturbance during the winter months (when waterbirds are considered particularly

vulnerable to the effects of disturbance[5] and when large numbers of many species are recorded feeding). The visual/acoustic screens proposed above will help minimise noise and visual related disturbance stimuli associated with other construction activity nearby to feeding habitat of the Mostyn Bank.

With the application of these mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbance that does occur is expected to be highly localised, mild (i.e., short flights or avoidance walking with birds rapidly resuming feeding or roosting nearby) and with responses restricted to nearby waterbird habitat in close proximity to the Port area on the Mostyn Bank or Salisbury Middle. Furthermore, bird distribution is not expected to change in the wider area and population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected. Residual effects are therefore considered to be **insignificant.**

In HRA terms, in the context of the site's conservation objectives, the population size of a number of bird interest features of the Dee Estuary SPA/Ramsar site and Liverpool Bay SPA will be maintained with the application of these mitigation measures. In other words, there is not expected to be a discernible change to occur to the overall populations of these bird interest features. Overall, there is considered to be no potential for an AEOI on these bird interest features of the Dee Estuary SPA/Ramsar site and Liverpool Bay SPA with the proposed mitigation.

Potential effects during operation

Section 8.7.2 of the ES provides a detailed review of potential disturbance effects during operation (including assessing the effects on birds of vessel traffic levels during operation).

The projected marine traffic from the MEPE Project is detailed in Section 10.7.1 of the ES. The projected shipping movements during operation will equate to 11 commercial vessel movements per week during the construction of the AyM OWF between 2025 and 2026 and to 25 movements per week during the construction of Morgan/Mona OWFs between 2027 and 2030. These levels should be compared against the 32 vessel movements per week in 2003 when general cargo ships and a twice daily ferry service was in operation. Furthermore, ongoing dredging operations account for the majority of vessel movements in the aera. In practice, the dredger will operate on a continuous basis up and down the channel and will not actually enter the Port except for crew changes and bunkering.

As described in Section 8.7.1 of the ES, the breakwater (which is higher in elevation than the proposed development) will act as a natural screen for waterbirds on the Mostyn Bank and other habitats downstream of the Port of Mostyn. On this basis, operational activity along the quay and vessel movements during berthing will not be visible to feeding and roosting birds in these areas. In addition, as noted above for the construction phase, disturbance responses would be expected to be limited on the Salisbury Bank given the low functionality of this area and the distance away from the proposed development.

[5] Coastal waterbirds are more susceptible to disturbance during colder winter months due to higher energetic costs and greater feeding requirements for thermoregulation. Furthermore, very cold winter weather can cause mudflats and adjacent functionally linked terrestrial habitats used for feeding (such as agricultural land and wet grassland) to freeze. In addition, cold conditions can also cause an influx of waterbirds from continental Europe which have flown to Britain to escape from even colder conditions. This can further increase competition for feeding resources in an area. The increased difficulty obtaining enough food and greater energy required for thermoregulation can in some situations cause reduced survival rates and appear to make birds seem more tolerant to disturbance as birds avoid using excess energy reserves (Goss-Custard, *et al*., 2006; JNCC, 2021, RSPB, 2010; Collop *et al*., 2016; Davidson and Rothwell, 1993). In addition, wintering waterbirds typically show a high level of site fidelity and utilise relatively small home ranges. This can make them vulnerable to the effects of disturbance as they can sometimes either show reluctance to avoid disturbance and move to alternative sites or choose the nearest alternative site, despite potentially being of lower quality habitat (Woodward *et al*. 2014; Wright *et al*., 2014; Méndez *et al*, 2018; Burton, 2000).

Furthermore, the Port of Mostyn is already used by large numbers of vessels on a daily basis, year-round, as described in Section 10.6.3 of the ES. This includes vessels operating from existing Operations and Maintenance (O&M) Bases and include Service Operation Vessels (SOVs) and Crew Transfer Vessels (CTVs). There will, therefore, be no significant changes to the visual or noise stimuli generated by the windfarm supporting activities. Observations suggest generally limited disturbance to bird on nearby mudflats as they transit to and from the Port of Mostyn (ABPmer, 2015, included in Appendix G).

This assessment has focused on potential effects within the Port of Mostyn area as a result of the anticipated operational activity along the quay (such as workers/personnel during vessel mooring and disembarkation), as well as projected vessel movements that will require berthing at the Port, and maintenance dredging and disposal activities. The operational vessel movements in the wider outer Dee Estuary/Liverpool Bay area associated with the construction and O&M of OWFs are assessed in more detail alone and cumulatively/in-combination within the EIAs and HRAs of these respective OWF projects.

Based on this, the conclusions reached in Chapter 8 of the ES remain the same; disturbance of waterbirds during operation, including as a result of vessel traffic levels at the Port of Mostyn over the expected lifespan of the development, based on planned and proposed offshore developments to be serviced by the Port, is assessed as **minor adverse**.

As discussed in Section 8.8 of the ES, it is recommended as a precaution that the screens which are proposed to be installed as mitigation during the construction phase remain in place initially during the operational phase also to minimise potential disturbance to nearby roosting habitat on the breakwater ledge roost and feeding/roosting habitat on the Mostyn Bank. The use of screens is considered likely to be most effective initially during operation when birds are less likely to be as habituated to any sources of new operational noise and visual disturbance stimuli. Over time, as the birds would be expected to become habituated to operations, a phased removal of the screens is proposed after 2 years.

4.7 Habitats Regulations Assessment

NRW Advisory comment No. 72

"*An appropriate assessment has not been carried out against the conservation objectives of the Dee Estuary SAC. It is also unclear from Table 2 which potential impacts have been screened in and taken through the to the appropriate assessment stage. The conservation objectives should be taken from the Regulation 33 Advice document as these are the agreed conservation objectives for cross boundary sites. It must be noted that the Annex I Estuaries feature has a specific conservation objective related to physical processes (see conservation objective vii further below) that is relevant to some of the potential impacts listed in this table. We also note a potential impact pathway from Accidental pollution has not been screened in. We advise this should be screened in and taken through to the appropriate assessment stage where the relevant mitigation can then be applied e.g., the production and adherence to a CEMP.*

We are unable to agree with the conclusions of the HRA until the appropriate assessments are carried out for all relevant features of the Dee Estuary SAC. Furthermore, please note there are outstanding queries in the ES where further assessments and/or information is required that have implications for the HRA assessment."

ABPmer response

An HRA (Appendix 8.5 of the ES) was submitted in support of the marine licence application to assist the competent authority, in this case NRW MLT, with the preparation of an Appropriate Assessment.

An example HRA that NRW had previously prepared on behalf of Welsh Government (Proposal for the annual opening of the 2019/20 Welsh Scallop Fishery, October 2019) was provided to ABPmer by NRW Advisory during the pre-application stage of the project to demonstrate the structure and level of detail that was considered appropriate for the HRA (email from Rowland Sharp, NRW Advisory Case Manager, dated 20 May 2022). A very similar structure and tabular approach to the screening and AA stages of the HRA that NRW Advisory use in their HRAs was therefore followed in the HRA that was prepared for the MEPE Project. This included the exact shorthand manner that the conservation objectives for the Dee Estuary SAC (and other sites) are presented and considered in the screening stage of the HRA (Table 2 of Appendix 8.5 of the ES) and assessment stage of the HRA (Tables 3 and 4 of Appendix 8.5 of the ES). Furthermore, the relevant SNCB advice documents produced under Regulation 37 of the Conservation of Habitats and Species Regulations 2017 which provide the full conservation objectives are referenced in Section 3.2 of the HRA. It is our view, therefore, that the assessment has been carried out in recognition of and against the conservation objectives. In order to provide some further clarity, the specific conservation objectives of the relevant sites and features screened into the assessment and how the relate to the generic shorthand conservation objectives that are used by NRW Advisory in their HRAs and were included in Table 2 of the HRA (Appendix 8.5 of the ES) are set out in Table 8.

As per the example HRA that was provided by NRW Advisory, the key to the colour and number(s) included in "Potential impact pathway" column of Table 2 of the HRA (Appendix 8.5 of the ES) signifies the impact pathways that are considered relevant and require further consideration. The cells in the table coloured ‘yellow’ signify that there is an impact pathway and significant effects cannot be ruled out (i.e., that they need to be considered and are screened into the assessment stage of the HRA).

The full conservation objective related to physical processes is reflected in the 'range' and 'structure and function' shorthand conservation objectives as these are the implications of changes in physical processes (Table 8). Furthermore, the HRA has fully taken account of the outcomes of the physical processes assessment presented in detail in the ES.

Potential accidental releases and marine pollution incidents have been taken account of in the assessment stage of the process (see Section 4.2, p. 39, Appendix 8.5 of the HRA). We agree that relevant mitigation should be in the form of a CEMP.

Table 8. Relevant conservation objectives for the HRA

Site Screened into the HRA	Interest Features Screened into the HRA	Full Conservation Objectives	Shorthand Conservation Objectives Included in HRA
Dee Estuary/ Aber Dyfrdwy SAC	Mudflats and sandflats not covered by seawater at low tide Estuaries	▪ The extent and distribution of qualifying natural habitats and habitats of qualifying species ▪ The structure and function (including typical species) of qualifying natural habitats ▪ The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely	▪ Range ▪ Structure and function ▪ Typical species
	River lamprey *Lampreta fluviatilis* Sea lamprey *Petromyzon marinus*	▪ The populations of qualifying species ▪ The distribution of qualifying species within the site ▪ The extent and distribution of qualifying natural habitats and habitats of qualifying species ▪ The structure and function of the habitats of qualifying species ▪ The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely	▪ Populations ▪ Range ▪ Supporting habitat and species ▪ Restoration and recovery
Dee Estuary SPA	Little Tern *Sterna albifrons* Common Tern *Sterna hirundo* Sandwich Tern *Sterna sandvicensis* Pintail *Anas acuta* Teal *Anas crecca* Dunlin *Calidris alpina* Red Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus* Black-tailed Godwit *Limosa limosa islandica* Curlew *Numenius arquata* Shelduck *Tadorna* Redshank *Tringa totanus* Waterbird assemblage	▪ The extent and distribution of the habitats of the qualifying features ▪ The structure and function of the habitats of the qualifying features ▪ The supporting processes on which the habitats of the qualifying features rely ▪ The population of each of the qualifying features ▪ The distribution of the qualifying features within the site	▪ Population size ▪ Habitat extent

Site Screened into the HRA	Interest Features Screened into the HRA	Full Conservation Objectives	Shorthand Conservation Objectives Included in HRA
Dee Estuary Ramsar site	Same interest features screened in as the Dee Estuary SAC/SPA.	Same conservation objectives as the Dee Estuary SAC/SPA.	Same shorthand conservation objectives as the Dee Estuary SAC/SPA.
Liverpool Bay / Bae Lerpwl SPA	Red-throated Diver *Gavia stellata* Little Gull *Hydrocoloeus minutus* Common Scoter *Melanitta nigra* Little Tern *Sterna albifrons* Common Tern *Sterna hirundo* Waterbird assemblage	▪ The extent and distribution of the habitats of the qualifying features ▪ The structure and function of the habitats of the qualifying features ▪ The supporting processes on which the habitats of the qualifying features rely ▪ The population of each of the qualifying features ▪ The distribution of the qualifying features within the site	▪ Population size ▪ Habitat extent
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC	River lamprey *Lampetra fluviatilis* Sea Lamprey *Petromyzon marinus* Atlantic salmon *Salmo salar* Otter *Lutra lutra*	▪ The extent and distribution of qualifying natural habitats and habitats of qualifying species ▪ The structure and function (including typical species) of qualifying natural habitats ▪ The structure and function of the habitats of qualifying species ▪ The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely ▪ The populations of qualifying species ▪ The distribution of qualifying species within the site	▪ Populations ▪ Range ▪ Supporting habitat and species ▪ Restoration and recovery
Gogledd Môn Forol / North Anglesey Marine SAC	Harbour porpoise *Phocoena phocoena*	▪ Harbour porpoise is a viable component of the site ▪ There is no significant disturbance of the species ▪ The condition of supporting habitats and processes, and the availability of prey is maintained	▪ Species is a viable component of the site ▪ No significant disturbance of the site ▪ Supporting habitat and species are maintained

Site Screened into the HRA	Interest Features Screened into the HRA	Full Conservation Objectives	Shorthand Conservation Objectives Included in HRA
Gorllewin Cymru Forol / West Wales Marine SAC	Harbour porpoise *Phocoena phocoena*	▪ Harbour porpoise is a viable component of the site ▪ There is no significant disturbance of the species ▪ The condition of supporting habitats and processes, and the availability of prey is maintained	▪ Species is a viable component of the site ▪ No significant disturbance of the site ▪ Supporting habitat and species are maintained
Dynesfeydd Môr Hafren / Bristol Channel Approaches SAC	Harbour porpoise *Phocoena phocoena*	▪ Harbour porpoise is a viable component of the site ▪ There is no significant disturbance of the species ▪ The condition of supporting habitats and processes, and the availability of prey is maintained	▪ Species is a viable component of the site ▪ No significant disturbance of the site ▪ Supporting habitat and species are maintained
Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC	Bottlenose dolphin *Tursiops truncates* Grey seal *Halichoerus grypus*	▪ Population - The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements are population size, structure, production, and condition of the species within the site ▪ Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future ▪ Supporting habitats and species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include; distribution; extent; structure; function and quality of habitat; prey availability and quality	▪ Populations ▪ Range ▪ Supporting habitat and species ▪ Restoration and Recovery

Site Screened into the HRA	Interest Features Screened into the HRA	Full Conservation Objectives	Shorthand Conservation Objectives Included in HRA
		▪ Restoration and recovery - As part of this objective it should be noted that for the bottlenose dolphin, populations should be increasing.	
Cardigan Bay / Bae Ceredigion SAC	Bottlenose dolphin *Tursiops truncates* Grey seal *Halichoerus grypus*	▪ Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include population size; structure, production; condition of the species within the site ▪ Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future ▪ Supporting habitats and species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include; distribution; extent; structure; function and quality of habitat; prey availability and quality ▪ Restoration and recovery - As part of this objective it should be noted that for the bottlenose dolphin, populations should be increasing	Populations Range Supporting habitat and species Restoration and Recovery

Site Screened into the HRA	Interest Features Screened into the HRA	Full Conservation Objectives	Shorthand Conservation Objectives Included in HRA
Pembrokeshire Marine / Sir Benfro Forol SAC	Grey seal *Halichoerus grypus*	▪ Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include population size; structure, production; condition of the species within the site ▪ Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future ▪ Supporting habitats and species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include; distribution; extent; structure; function and quality of habitat; prey availability and quality ▪ Restoration and recovery - As part of this objective it should be noted that for the otter, populations should be increasing	Populations Range Supporting habitat and species Restoration and Recovery

NRW Advisory comment No. 74

"*The applicant has presented an assessment (although noting this has not been carried out against all the conservation objectives for the SAC) for the potential permanent loss of Annex I Estuaries feature of the Dee Estuary SAC as a result of the new quay wall. The development will result in the permanent loss of 0.65 hectares of subtidal habitat corresponding to the Annex I Estuaries feature. We are unsure what percentage of the feature and of the SAC this loss would equate to as this information has not been provided in the ES or the HRA.*

The potential permanent loss of 0.65 hectares of Annex I Estuaries feature would undermine the conservation objectives as defined in the Regulation 33 advice package:

The "estuaries" feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:

- *the aggregate total extent of all estuarine communities within the site is maintained;*
- *the spatial distribution of estuarine communities within the site is maintained;*
- *the extent of individual estuarine habitat features within the site is maintained;*
- *the variety and relative proportions of sediment and rocky substrates within the estuary is maintained;*
- *the variety and extent of any notable subtidal sediment communities is maintained;*
- *the variety and extent of notable intertidal hard substrata communities is maintained;*
- *the spatial and temporal patterns of salinity, suspended sediments and nutrients concentrations are maintained within limits sufficient to satisfy the requirements of statements (i) to (vi) above.*

We advise that the permanent loss of Estuaries feature would undermine conservation objectives (ii), (iii) and (iv) as the construction of the quay wall would not allow the area to recover and thus maintain the spatial distribution and extent of estuarine habitats and communities. Whilst we note the permanent loss of 1.34 ha of intertidal mudflat and sandflat habitat as a result of the capital dredging will result in an area close to the quay wall becoming subtidal and therefore part of the Estuaries feature, we do not believe this offsets the Annex I Estuaries feature loss assessed here. This is because the area gained will not perform the same function as the area lost as it will be modified and maintained through on-going dredging.

In consideration of the impacts to both Annex 1 Mudflat and sandflat and Estuaries features, we advise that an Adverse Effect on Site Integrity cannot be ruled out for this project."

ABPmer response

Following further discussion with the benthic ecology specialist at NRW Advisory during a meeting held on 12 June 2023, it was advised that the footprint of the MEPE reclamation will result in a permanent direct loss and change in the extent of the Annex I Estuaries feature of the Dee Estuary SAC which covers both intertidal and subtidal habitat sub-features.

The total area of this habitat feature that will be lost under the footprint of the reclamation is 3.22 ha, comprising 2.57 ha of intertidal habitat and 0.65 ha of subtidal habitat. According to the Dee Estuary Standard Data Form (JNCC, 2015), the Annex I Estuaries feature covers 83.87 % (13,255.88 ha) of the Dee Estuary SAC (total site area is 15,805.27 ha). The loss of this feature as a result of the MEPE reclamation represents 0.02 % of the total extent of this feature within the site. This area of the existing harbour overlaps the RoRo Terminal and berth which was in operation and dredged until recently (2019/2020). The 2.57 ha of intertidal habitat that will be lost, therefore, comprises recently accreted and ephemeral soft/fluid sandy mud. This unconsolidated habitat is highly impoverished with a very low number of species recorded within it and does not represent the standard and more stable physical

form and ecological structure and function of the intertidal mudflat that is found in the Dee Estuary beyond the immediate area of the harbour and existing berths which is more consolidated, stable and ecologically diverse. The benthic community associated with the area 0.65 ha of subtidal habitat that will be lost is also impoverished and characterised by low numbers of species. This subtidal habitat is of low conservation concern with the habitats not characteristic of any protected habitats.

In the context of the conservation objectives for the Dee Estuary SAC, and taking account of the advice of NRW Advisory, the range of this habitat feature will be maintained and there will be no discernible change to the extent of this feature taking account of the negligible value of this area to the functioning and evolution of the estuary, and in the context of "natural processes", as defined in Box 1 of the cross-border advice document produced under Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010). Overall, therefore, it is concluded that there will be **no Adverse Effect on Integrity (AEOI)** on the Annex 1 Estuaries feature of the Dee Estuary/Aber Dyfrdwy SAC and Dee Estuary Ramsar site as a result of the MEPE Project.

5 Mitigation and Monitoring

As set out in the ES and this Further Information Report, a number of secondary mitigation measures (actions that will require further activity in order to achieve the anticipated outcome and identified as necessary through the assessment process) and tertiary mitigation measures (actions that would occur with or without input from an environmental impact assessment process) are proposed for the MEPE Project. These are as follows:

- **Even disposal deposition**: Targeting disposal loads in the central/deeper area of the Mostyn Deep disposal site (IS102) site to reduce depth reductions. This will minimise the initial reduction in water depth and any environmental changes at this site (see Section 6.8.2 of the ES);
- **Adhering to environmental best practice and guidance**: The potential risk from accidents and spillages/leaks during construction will be avoided or minimised by ensuring that the construction methods, proposed design, and the contractual arrangements follow pollution prevention legislation and environmental management best practice (see Section 7.8.1 of the ES);
- **Soft start**: The gradual increase of piling power, incrementally, until full operational power is achieved will be used as part of the piling methodology in line with JNCC piling protocol (JNCC, 2010) to give fish and marine mammals the opportunity to move away from the area before the onset of full impact strikes. Using soft starts will allow birds to become more tolerant to piling noise by allowing a more gradual increase in noise levels which will reduce the potential for birds to become startled (see Section 8.8.1 of the ES);
- **Vibro piling**: The use of vibro piling where possible (which produces lower peak source noise levels than percussive piling) recognising that in certain circumstances percussive piling is likely to be required to drive the piles to the required design level (see Section 8.8.1 of the ES);
- **Tidal piling restriction:** No percussive piling is to be undertaken 3 hours either side of high water [mid-April to mid-June] in any given year to avoid and/or minimise adverse effects on fish. Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice (see Section 4.6 of this report);
- **Night time piling restriction**: No percussive piling is to take place between 7pm and 7am on any given day to avoid and/or minimise adverse effects on fish that migrate exclusively or preferentially at night (e.g. river lamprey and glass eel). Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice (see Section 4.6 of this report);
- **Marine Mammal Observer**: Adherence to the JNCC "Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals during piling" (JNCC, 2010) during percussive piling to further reduce the significance of the impact to marine mammals (see Section 8.8.1 of the ES);
- **Cold weather construction restriction**: A temporary cessation of piling and any activities taking place along the new quay wall to be implemented following seven consecutive days of freezing (zero or sub-zero temperature) weather conditions to minimise disturbance to coastal waterbirds which are considered particularly vulnerable during periods of extreme winter weather (see Section 8.8.1 of the ES and Section 4.6 of this report);
- **Acoustic barrier/visual screening**: Installing an acoustic barrier/visual screen along the breakwater prior to the commencement of construction to reduce potential visual and/or noise disturbance stimuli to waterbirds on the Mostyn Bank or breakwater roost. This screen is proposed to remain in place initially during the operational phase, with a phased removal of the screens after 2 years (see Section 8.8.1 of the ES and Section 4.6 of this report);

- **Noise suppression system**: A noise suppression system (consisting of a pile shroud or sleeve with noise insulating properties) is proposed to be used during percussive piling activities of the tube piles for the new quay wall to reduce noise levels on the Mostyn Bank or breakwater roost (see Section 8.8.1 of the ES and Section 4.6 of this report);
- **Piling activities are not to be undertaken between August and September (autumn bird passage) in any given year**: This measure will help minimise potential disturbance as a result of piling related noise on the ledge roost on the western side of the breakwater (see Section 4.6 of this report);
- **L_{max} noise levels for the piling works is to be less than 70 dB on the intertidal mudflat of the Mostyn Bank during October to March (overwintering period)**: This will help minimise potential noise disturbance during the winter months (see Section 4.6 of this report);
- **Following biosecurity management procedures**: Biosecurity control measures during construction will be included within the CEMP. The Port of Mostyn will continue to manage biosecurity risk of ongoing port operations in accordance with existing procedures to minimise the risk of introduction and/or spread of non-native species where possible (see Section 8.8.2 of the ES);
- **Marine Safety Management System (SMS)**: the potential interference with fishing activities and loss of or restricted access to fishing grounds during construction will be managed by following the existing Port of Mostyn's and Dee Conservancy's Marine SMS, including issuing Local Notices to Mariners (see Section 9.8.1 of the ES);
- **Review of risk assessments**: The Port of Mostyn will continue to review all relevant risk assessments of marine related activities and introduce further navigation control measures as necessary in agreement with the Dee Conservancy (see Section 10.8.2 of the ES);
- **Surface water management during operation**: Surface water runoff generated within the MEPE Project will be allowed to disperse naturally via infiltration, or else intercepted and managed within a formal surface water drainage scheme to minimise the risk of surface water flooding (see Section 11.8.2 of the ES);
- **Surface water management during construction**: The management of surface water runoff during construction, if required, would be incorporated into standard existing working procedures at the Port, for instance by constructing a sump or informal channel to divert runoff away from working areas (see Section 11.8.2 of the ES);
- **Archaeological Exclusion Zone (AEZ)**: To protect a record of potential archaeological interest, namely a charted wreck located on the edge of the maintenance dredge area, a precautionary AEZ of 100 m is recommended (see Section 12.8.2 of the ES); and
- **Implementation of a Written Scheme of Investigation (WSI)**: A WSI, which includes a Protocol for Archaeological Discoveries (PAD), will be developed in line with guidance. This will detail the mitigation that will be in place during the construction and operation of the proposed development to minimise and/or avoid impacts on potential marine heritage receptors. The WSI will be subject to approval by the Archaeological Curators (see Section 12.8.2 of the ES).

As set out in Section 6.8.3 of the ES, the future monitoring schedule is proposed for the MEPE Project:

- Continued repeat multibeam bathymetric survey of the Port Harbour and approach channel at a frequency dictated by the Port's operational requirements, but with a minimum of three surveys per annum:
    - Bathymetric analysis will be undertaken three times per year and reported only if an issue is identified. Otherwise, analysis of the bathymetric datasets will be reported in an Annual Monitoring Summary report;
- Repeat bathymetric survey of the Mostyn Deep disposal site, carried out annually, to help inform the placing of subsequent maintenance dredge material:
    - Bathymetric analysis will be undertaken on the annual survey dataset and reported in an Annual Monitoring Summary report;

- Repeat benthic sampling (following the sample locations of the existing LA5 monitoring survey) initially annually, with aim to reduce frequency to every other year after 4-years (informed by the findings of the interim surveys):
    - Particle Size Analysis (PSA) for comparison against historic sampling, with results and analysis reported in an Annual Monitoring Summary report.

The proposed approach would maintain a proportionate ongoing monitoring of the local estuary morphology, over the anticipated extent of potential impact arising from the Port operations. Conditions could be included to increase frequency or extent of any given survey in the event of any issues being flagged by the data collection or analysis.

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7 Abbreviations/Acronyms

AA	Appropriate Assessment
ABP	Associated British Ports
AEOI	Adverse Effect on Integrity
ANSI	American National Standards Institute
ASA	Advertising Standards Authority
BGS	British Geological Society
BMAPA	British Marine Aggregate Producers Association
BPEO	Best Practicable Environmental Option
BTO	British Trust for Ornithology
CA	Compliance Assessment
CD	Chart Datum
CEMP	Construction Environmental Management Plan
DLUHC	Department for Levelling Up, Housing and Communities
DML	Dredge Marine Licence
EIA	Environmental Impact Assessment
ELC	Energy Low Carbon
ES	Environmental Statement
GW	Gigawatts
HM	Her Majesty's
HMSO	Her Majesty's Stationary Office
HMWB	Highly Modified Water Body
HRA	Habitats Regulations Assessment
HRW	Hydraulics Research Wallingford
HW	High Water
IECS	International Estuarine & Coastal Specialists
INCA	Industry Nature Conservation Association
IROPI	Imperative Reasons for Overriding Public Interest
ISSN	International Standard Serial Number
JNCC	Joint Nature Conservation Committee
LLP	limited liability partnership
LS	Littoral Sand
MEP	Mostyn Energy Park
MEPE	Mostyn Energy Park Extension
MLT	Marine Licensing Team
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatts
NE	Natural England
NERC	Natural Environment and Rural Communities
NRW	Natural Resources Wales
OWF	Offshore Wind Farm
PINS	Planning Inspectorate for England
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SHA	Statutory Harbour Authority
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area

SSC	Suspended Sediment Concentrations
SSSI	Special Site of Scientific Interest
TSHD	Trailing Suction Hopper Dredger
TTS	Temporary Threshold Shift
UK	United Kingdom
WFD	Water Framework Directive
WHA	Waste Hierarchy Assessment

Cardinal points/directions are used unless otherwise stated.
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