Connah's Quay Low Carbon Power

Environmental Statement Volume II
Chapter 16: Physical Processes

Planning Inspectorate Reference: EN010166
Document Reference: EN010166/APP/6.2.16
Planning Act 2008 (as amended)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)
Revision 00

August 2025

Prepared for:
Uniper UK Limited

Prepared by:
AECOM Limited

Table of Contents

Plates

Tables

16. Physical Processes

16.1 Introduction

Overview

16.1.1 This chapter of the Environmental Statement (ES) presents an assessment of the likely significant environmental effects of Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture Plant (CCP) (hereafter referred to as the Proposed Development) with respect to Physical Processes during the construction, operation (including maintenance), and decommissioning phases of the Proposed Development. A description of the Proposed Development, including details of maximum parameters, is set out in **Chapter 4: The Proposed Development (EN010166/APP/6.2.4).**

16.1.2 This chapter relates primarily to effects associated with the construction / upgrading and operation of the water intake and outfall structures located within the Water Connection Corridor. Proposed works within the Water Connection Corridor are described in **Chapter 4: The Proposed Development** (**EN010166/APP/6.2.4**) and **Chapter 5: Construction Management and Programme** (**EN010166/APP/6.2.5**) and are shown on **Figure 3-3: Areas Described in the ES** (**EN010166/APP/6.3**).

16.1.3 This chapter should be read in conjunction with, and is supported by, information presented within the following Chapters:

- **Chapter 4: The Proposed Development** (**EN010166/APP/6.2.4**);
- **Chapter 5: Construction Management and Programme** (**EN010166/APP/6.2.5**);
- **Chapter 12: Marine Ecology** (**EN010166/APP/6.2.12**);
- **Chapter 13: Water Environment and Flood Risk** (**EN010166/APP/6.2.13**); and
- **Chapter 14: Geology and Ground Conditions** (**EN010166/APP/6.2.14**).

16.1.4 This chapter is supported by the following appendices in **EN010166/APP/6.4**:

- **Appendix 1-A: EIA Scoping Report**;
- **Appendix 1-B: Scoping Opinion**;
- **Appendix 2-B: Scoping Opinion Responses**; and
- **Appendix 7-A: Legislative, Policy and Guidance Framework for Technical Topics**.

16.1.5 This chapter is supported by the following figures in **EN010166/APP/6.3**:

- **Figure 3-3: Areas Described in the ES**;

- **Figure 16-1: Designated Areas within the Dee Estuary**; and
- **Figure 16-2: Upstream and downstream Zone of Influence (ZoI)**.

Legislation, Policy and Guidance

16.1.6 Legislation, planning policy, and guidance relating to Physical Processes and pertinent to the Proposed Development are listed in **Table 16-1**. Further detail regarding these can be found in **Appendix 7-A: Legislative, Policy and Guidance Framework for Technical Topics** (**EN010166/APP/6.4**).

Table 16-1: Legislation, Planning Policy, and Guidance relating to Physical Processes

Type	Legislation, Policy and Guidance
Legislation	• The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 16-1); • Marine and Coastal Access Act 2009 (Ref 16-2); • The Marine Strategy Regulations 2010 (Ref 16-3); and • The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 16-4).
National Planning Policy	• The Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 16-5); • The NPS for Natural Gas Electricity Generating Infrastructure (EN-2) (Ref 16-6); • The NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 16-7); • The NPS for Electricity Networks Infrastructure (EN-5) (Ref 16-8); • Planning Policy Wales (PPW) (Ref 16-9). • UK Marine Policy Statement (MPS) (Ref 16-10); • Welsh National Marine Plan 2019 (Ref 16-11); and • Future Wales: The National Plan 2040 (Ref 16-12).
Local Planning Policy	• Flintshire County Council (FCC) Local Development Plan (LDP) (2015-2030) (Ref 16-13). Relevant policies include: – Policy STR13: Natural and Built Environment, Green Networks and Infrastructure; – Policy STR6: Services, Facilities and Infrastructure; – Policy EN2: Green Infrastructure; – Policy EN3: Undeveloped Coast and Dee Estuary Corridor; and – Policy EN6: Sites of Biodiversity Importance. – Policy EN13: Renewable and low carbon energy development; and • Shoreline Management Plans (SMP) (Ref 16-14) – the Proposed Development is located within the North West England and North Wales Coastal Group area called the Great Ormes Head to Solway Firth (SMP22).

Type	Legislation, Policy and Guidance
	– Sub Group: Flint Marsh to Chester Weir to Sealand Rifle Range (Inner Dee estuary, both banks) 11A5.3. – For the short (2005-2025), medium (2025-2055) and long term (2055-2105), the management approach for sub-cell 11A5.3 is to hold the line.
National Guidance	• Environment Agency, 2016. Flood risk assessments: climate change allowances, Guidance (Ref 16-15) Natural Resource Wales (NRW) (Ref 16-16), Guidance Note. Marine Physical Processes Guidance to inform Environmental Impact Assessment (Ref 16-17). • NRW guidance: 243 Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform the EIAs of Major Development Projects (Ref 16-18) • Welsh Government, 2021. Climate change allowances and flood consequence assessments (Ref 16-19) • The National Strategy for Flood and Coastal Erosion Risk Management in Wales (2024-2025) (Ref 16-20). Marine sediment quality guidelines: • Cefas Guideline Action Levels (Ref 16-21)

16.2 Consultation and Scope of Assessment

Consultation

Scoping Opinion

16.2.1 A request for an Environmental Impact Assessment (EIA) Scoping Opinion was sought from the Secretary of State (SoS) through the Planning Inspectorate (PINS) in February 2024 as part of the EIA Scoping Process. The EIA Scoping Opinion was adopted on 20 March 2024 (**Appendix 1-B: Scoping Opinion EN010166/APP/6.4**).

16.2.2 Key issues raised in the EIA Scoping Opinion are summarised and responded to in **Appendix 2-B: Scoping Opinion Responses** (**EN010166/APP/6.4**). A summary of consultation undertaken in relation to the physical processes assessment through the Scoping process is provided in **Table 16-2**.

Statutory Consultation

16.2.3 A summary of consultation undertaken in relation to the Physical Processes assessment through the Statutory Consultation is provided in **Table 16-3**.

Targeted Consultation

16.2.4 Following Statutory Consultation changes were made to the heights of the proposed absorber and HRSG stacks and the Applicant undertook further targeted consultation. This consultation included a Supporting Information Report which detailed the environmental considerations associated with these changes. This Targeted Consultation was held between Thursday 8 May to Friday 6 June 2025. Responses to this targeted consultation are presented in the **Consultation Report (EN010166/APP/5.1)** and **Table 16-4** below outlines how and where these comments have been addressed within this chapter of the ES.

Additional Technical Engagement

16.2.5 A summary of consultation undertaken outside of the EIA Scoping process and Statutory Consultation in relation to the Physical Processes assessment is provided in **Table 16-3, Table 16-4 and Table 16-5**.

Table 16-2: Scoping Opinion Responses

Comment ID	Consultee	Comment	Response
3.9.1	PINS	'*The Scoping Report sets out that the Proposed Development does not include any works beyond routine maintenance for the Repurposed CO_2 Connection Corridor and it has not been considered further within the assessment. However, it is not explicitly summarised as being scoped out within Table 14-3 of the Scoping Report. Noting this, PINS is content to scope this matter out for the construction. However, it is noted that the Scoping Report does not define the terms post-construction and post-decommissioning. Without this information, PINS does not at this stage agree to the scoping of for these phases. PINS advises that this matter should be assessed for operation and decommissioning phases, or justification provided to demonstrates that there will be no LSE.*'	The Repurposed CO_2 Connection Corridor and Proposed CO_2 Connection Corridor are not located within the marine environment (they are above Mean High Water Springs (MHWS)). Therefore, these corridors have not been considered in the Physical Processes assessment presented in this chapter.
3.9.2	PINS	*'PINS has considered the information included in the Scoping Report regarding disturbance to the seabed caused by the cofferdam and temporary structures and advice provided by NRW. NRW consider that this matter should not be scoped out at this stage, requiring further information. PINS concurs with this view. The Applicant's attention is directed to the response of NRW (see Appendix 2) which highlights information regarding disturbance to the bed morphology which the Applicant should have regard to.'*	Following the reduced scope of works in the Water Connection Corridor, a cofferdam will no longer be used and is therefore no longer assessed in this chapter. (**Chapter 4: The Proposed Development** (**EN010166/APP/6.2.4**))
3.9.3	PINS	*'PINS notes that there are uncertainties in the works proposed for the water connection corridor, referenced in paragraph 14.3.2 of the Scoping Report. PINS is not content to scope out this matter based on the*	Following scoping stage, the scope of works in the Water Connection

Comment ID	Consultee	Comment	Response
		information available. It is deemed that the information provided is not sufficient to make an informed assessment of potential impacts to seabed morphology and other receptors. The maximum volume of water proposed to be abstracted and discharged should be assessed within the ES, as well as the LSE.'	Corridor is now confirmed. Paragraph 16.6.9 assesses the impact of the abstracted and discharged water.
3.9.4	PINS	*'PINS has considered the information included in the Scoping Report regarding scouring due to the presence of new outfall structures affecting local flows and seabed levels during operation and advice provided by NRW response. PINS considers that this matter should not be scoped out at this stage. Further information should be provided on potential impacts to sensitive receptors caused by scouring and/ or sediment redeposition. The Applicant's attention is directed to the response of NRW (see Appendix 2) which highlights information regarding disturbance to the bed morphology which the Applicant should have regard to.'*	The updated scope of works within the Water Connection Corridor confirms the Proposed Development would utilise the existing Connah's Quay Power Station cooling water abstraction and discharge infrastructure potentially requiring only minor modification and alteration (see Paragraph 16.6.3).
3.9.5	PINS	*'PINS notes that the ZoI extends beyond the water connection corridor; however, limited information has been provided to explain how the study area was selected. The Environmental Statement (ES) should include an explanation, noting that the ZoI should be based upon receptors and potential impact pathways to LSE and not a nominal area or distance. The Applicant is advised that the maximum spring tide excursion should be used in determining the ZoI.'*	The potential ZoI using the maximum spring tide excursion distance is included in paragraph 16.4.3 16.4.3 and in **Figure 16-2**: **Upstream and downstream ZoI** (**EN010166/APP/6.3**).
3.9.6	PINS	*'NRW provides advice (see Appendix 2) referring to information that it deems necessary to understand the baseline and assess LSE. The*	The ES methodology is in line with the NRW

Comment ID	Consultee	Comment	Response
		Applicant is directed to this response and encouraged to agree the methodology with NRW.'	guidance: 243 Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform the EIAs of Major Development Projects (Ref 16-22). Further information on the assessment methodology can be found in Section 16.3.
3.9.7	PINS	*'The ES should set out maximum parameters for the proposed temporary cofferdam, including if/ how it could lead to increased levels of suspended sediment. Any LSE should be assessed.'*	Following the reduced scope of works in the Water Connection Corridor, a cofferdam would no longer be used.
3.9.8	PINS	*'The disposal of spoil following maintenance dredging should be considered within the ES and include details of the disposal location, amount, and type of material, as well as an assessment into the potential impacts to the receiving site and surrounding area.'*	No maintenance dredging would take place within the Water Connection Corridor. Paragraph 16.6.15 assesses the potential impact of air blast cleaning and jet washing used to

Comment ID	Consultee	Comment	Response
			remove sediment from the eel screens.
3.9.9	PINS	*'The Scoping Report is not clear in relation to the impact pathway referred to in this paragraph [14.7.5 of the Scoping Report]. This should be clarified within the ES. The ES should confirm which receptors will be affected by suspended sediment concentration (SSC) plumes and potential release of contamination from the seabed.'*	Following the reduced scope of works in the Water Connection Corridor a sediment sampling study is no longer required as there are no planned works that might lead to the release of contaminants from the riverbed.
3.9.10	PINS	*'PINS has considered the information included in the Scoping Report regarding scour of the seabed and the response from NRW, which queries the assumption that minimal impact would occur with discharge taking place during high tide and the effects of discharging water. PINS advises that scouring of the seabed caused by water discharge should be scoped into the ES at this stage.* *The Applicant is encouraged to discuss this and agree the approach with relevant consultation bodies.'*	Scour of the riverbed caused by discharging water from the outfall is assessed in Paragraph 16.6.11.
N/A	NRW	*'Given the uncertainties in the works proposed for the Water Connection Corridor and the construction methodology, all potential impacts relating to physical processes should remain scoped in until more information is available to make an informed assessment of impacts to seabed morphology and other receptors.'*	Confirmation of the scope of works within the Water Connection Corridor has now been provided. These works have been

Comment ID	Consultee	Comment	Response
			assessed within the ES accordingly.
N/A	NRW	*'The project's ZoI should be defined for each physical processes receptor and a description provided to show how the ZoI has been determined.'*	Following the reduced scope of works in the Water Connection Corridor there are no adverse impacts associated with the Proposed Development within the Water Connection Corridor. However, the potential ZOI using the maximum spring tide excursion distance is included in Paragraph 16.4.1 16.4.3and in **Figure 16-2**: **Upstream and downstream ZoI** (**EN010166/APP/6.3**).
N/A	NRW	*'Baseline Understanding: a more comprehensive understanding of circulation within the Dee estuary should be included in the ES and should consider the influence that freshwater input into the River Dee and estuary will have on the estuarine stratification and vertical mixing processes as well as the sediment transport and deposition processes. For the physical processes chapter, we advise that the applicant follows the recommendations outlined in:*	Paragraph 16.4.23 provides an up to date understanding of the baseline tidal currents.

Comment ID	Consultee	Comment	Response
		GN 041: Natural Resources Wales / Marine physical processes and Environmental Impact Assessment (EIA). The guidance includes two evidence reports: • *evidence Report No: 243 Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects.* • *evidence Report No: 208 Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Physical Processes Numerical Modelling Assessments.'*	
N/A	NRW	*'Maintenance Dredging: no consideration appears to have been given to the disposal of dredge spoil if maintenance dredging is conducted during project operation. At present the quantities and type of sediment to be dredged are unknown. If it is intended to deposit dredge spoil at a licensed disposal site, we advise that an assessment should be completed to determine whether the disposal site can receive the required amount of dredge spoil in the first instance. Potential impacts on receptors caused by both the dredging and disposal activities should be included in the ES. Please also consider NRW's position note regarding this: PS 012 Sustainable management of marine and coastal sediment (naturalresources.wales).'*	No maintenance dredging would take place within the Water Connection Corridor. Section 16.6 assesses the potential impact of air blast cleaning and jet washing used to remove sediment from the eel screens.
N/A	NRW	*'Toxic Contamination: we advise that the sheltered, low energy environment of the upper Dee estuary will function as a muddy sediment sink where contaminants can bind to the muddy sediment. Contaminants may be remobilised if the sediment is disturbed e.g. dredging, making them available as potential pollutants in the water column, and being carried away from the site with the currents. We are concerned that contaminants released into the water column will not be adequately assessed in the correct chapter as there is currently incorrect signposting*	Following the reduced scope of works in the Water Connection Corridor a sediment sampling study is no longer required as there are no planned works that might lead to the release

Comment ID	Consultee	Comment	Response
		to Chapter 12 (Geology and Ground Conditions) which only deals with land contamination and not in-river contamination. We therefore advise that toxic contamination in the water column from sediment-bound contaminants is considered wholly in Chapter 11 (Water Resources and Flood Risk) under water quality and not signposted to other chapters.'	of contaminants from the riverbed.
N/A	NRW	*'We advise that where supporting literature is used to describe the baseline environment, the evidence should include an in-text citation with author and reference details next to the figure or text that is being referred to.'*	Where supporting literature has been referenced, this has been included in a reference list at the end of this chapter.
N/A	NRW	*'Paragraph 14.4.12: the tidal excursion distance is an important parameter that needs to be fully understood for the Dee estuary, particularly when determining the fate of Suspended Sediment Concentration (SSC) plumes and potential contaminants derived from construction and operational works in the upper estuary. We advise that the maximum spring tide excursion should be used to determine the ZoI relating to the spatial extent of potential impacts in relation to physical processes (e.g. SSC plumes and transport of remobilised contaminants). We advise that the applicant follows the recommendations outlined in NRW Guidance Note (GN) 041 (Natural Resources Wales / Marine physical processes and Environmental Impact Assessment (EIA)), which provides best practice guidance on coastal processes modelling.'*	Following the reduced scope of works in the Water Connection Corridor there are no adverse impacts associated with the Proposed Development within the Water Connection Corridor. However, the potential ZoI using the maximum spring tide excursion distance is included in Section 16.4.3. Following the reduced scope of works in the Water Connection

Comment ID	Consultee	Comment	Response
			Corridor, it has been agreed with NRW that no dispersion modelling is required (see **Table 16-5**).
N/A	NRW	*'Paragraph 14.4.30: we advise that sediment samples and core samples are collected in the Water Connection Corridor to determine the presence of contaminants and the size and distribution of seabed sediments. These data are required to inform the assessment of impacts to other receptors caused by maintenance dredging and/or construction works remobilising sediment into suspension to be transported by the current regime and redeposited.'*	Following the reduced scope of works in the Water Connection Corridor a sediment sampling study is no longer required as there are no planned works that might lead to the release of contaminants from the riverbed.
N/A	NRW	*'Paragraph 14.5.2: we advise that it is not only modified flows which may mobilise sediment. Maintenance dredging activities and excavation works could also disturb sediment off the seabed with the potential for SSC plumes to develop as a result. We welcome the intention to model the dispersion of suspended sediment from works carried out below MHWS associated with the project.'*	No maintenance dredging would take place within the Water Connection Corridor. Section 16.6 assesses the potential impact of air blast cleaning and jet washing used to remove sediment from the eel screens. Following the reduced scope of works in the

Comment ID	Consultee	Comment	Response
			Water Connection Corridor, it has been agreed with NRW that no dispersion modelling is required (see **Table 16-5**).
N/A	NRW	*'Paragraph 14.5.3: the applicant is advised to note and consider NRW Guidance Note GN 041.'*	Reference to the guidance note is acknowledged and referred to in Section 16.2.
N/A	NRW	*'Paragraph 14.7.3: clarification should be provided on how and where the cofferdam will be installed, how long it will be in place and how it will lead to increased levels of suspended sediment and contaminant dispersion.'*	Following the reduced scope of works in the Water Connection Corridor, a cofferdam would no longer be used.
N/A	NRW	*'Paragraph 14.7.4: we advise that consideration should be given to the resultant SSC plumes caused by the maintenance dredging and the potential for SSC plume dispersion and sediment redeposition onto habitats which could be sensitive to sediment smothering and chemical contamination. The SSC plumes will also change the water clarity and, if present, the contaminants will lead to water quality deterioration.'*	No maintenance dredging would take place within the Water Connection Corridor. Section 16.6 assesses the potential impact of air blast cleaning and jet washing used to remove sediment from the eel screens.

Comment ID	Consultee	Comment	Response
			Following the reduced scope of works in the Water Connection Corridor, it has been agreed with NRW that no modelling is required.
N/A	NRW	*'Clarification should be provided on the disposal location of the maintenance dredged material. The amount and type of material to be dredged should be confirmed and detail of the disposal site provided. We advise that if the maintenance dredge material is to be disposed of in a marine disposal site, an assessment should be completed to determine any potential impacts to the receiving site and surrounding area from disposal of the maintenance dredge material.'*	No maintenance dredging would take place within the Water Connection Corridor. Paragraph 16.6.7 assesses the potential impact of air blast cleaning and jet washing used to remove sediment from the eel screens.
N/A	NRW	*'Clarification should also be provided with regards to which impact pathway is referred to in paragraph 14.7.5, as it is unclear if the applicant is referring to sediment disturbance leading to SSC plumes. We advise that the potential release of contaminants should be treated separately. Clarification should be provided on which receptors will be affected by the SSC plumes and subsequent deposition and what receptors will be affected by the potential release of contaminants from the seabed sediments. We advise that a summary table is included in the ES to describe the activities affecting physical processes and the receptors potentially affected by each impact pathway.'*	This has been considered within Section 16.6.18.

Comment ID	Consultee	Comment	Response
N/A	NRW	*'Paragraph 14.7.6 (Changes to seabed/riverbed morphology): we note that it is unknown how long the cofferdam will be in place. However, scour pits could potentially develop due to alteration in flow i.e. flow acceleration effects against the cofferdam. Depressions in the seabed may also persist following excavation works during the construction of the intake and outfall structures. At this stage there are uncertainties in the works proposed for the Water Connection Corridor. We therefore advise that changes to seabed/riverbed morphology from scour or excavation during construction works should not be scoped out at this stage, until a more informed assessment can be completed.'*	Following the reduced scope of works in the Water Connection Corridor, a cofferdam would no longer be used. Scour of the riverbed caused by discharging water from the outfall is assessed in Paragraph 16.6.11.
N/A	NRW	*'Paragraphs 14.7.7 – 14.7.9 (scour of the seabed caused by water discharge): based on the information presented we note that cooling water discharge will not occur at high water but towards low water (HW +1 to HW +4 i.e. on the ebb tide). We therefore consider the assumption that the impact is expected to be minimal due to the discharge taking place during high tide to be incorrect. The discharge of water will increase flow velocity and potentially cause scouring of the seabed and sediment suspension and redeposition. We therefore advise that scouring of the seabed caused by discharge of cooling water is scoped in as a continual impact over the operational phase of the project.'*	Scour of the riverbed caused by discharging water from the outfall is assessed in Paragraph 16.6.11.
N/A	NRW	*'We advise that the impact on the seabed/riverbed levels caused by cooling water discharge should remain scoped in until a scour assessment is completed which considers the volume and velocity of*	Scour of the riverbed caused by discharging water from the outfall is

Comment ID	Consultee	Comment	Response
		discharge and the seabed sediment type, bedload morphology along with the presence of sensitive receptors which could be affected by the scouring and increase in water velocity.'	assessed in Paragraph 16.6.11.
N/A	NRW	*'Paragraphs 14.7.10 – 14.7.11: we advise that changes to morphology caused by scour around the intake and outfall channels should not be scoped out until a scour assessment has been undertaken considering the potential impact to sensitive receptors caused by scouring and/or sediment redeposition.'*	Scour of the riverbed caused by discharging water from the outfall is assessed in Paragraph 16.6.11.

Table 16-3: Statutory Consultee Responses

Consultee	Comment	Response
FCC	*'The submitted environmental statement will need to have regard for Planning Policy Wales (PPW) (edition 12, 2024) and any relevant legislation and guidance such as relevant Technical Advice Notes that is in force/adopted in Wales. Also, the application should have regard to the respective and relevant policies within the Flintshire Local Development Plan (LDP) adopted by the Council on 24 January 2023.'*	The assessment in this chapter has had due regard of policies covered by PPW (2024) and the FCC LDP. Both policy documents are referenced in **Table 16-1**.

Table 16-4: Targeted Consultation

Consultee	Summary of Comment	Response
Flint Town Council	The Council expects: - Transparent, accountable mitigation strategies for all identified environmental risks—including noise and vibration (e.g., from pile driving) in relation to nearby Listed Buildings; - Clear summaries of these assessments for public understanding; Full details of compensation mechanisms available to adversely affected residents and businesses, including: - How compensation will be calculated, - Who will administer the scheme, - How the public will be made aware of it. Additionally, the Council requests: - Clarification on how often the project's environmental performance will be reviewed, and - How local residents will be kept informed of those findings.	Details of all mitigation and monitoring proposed is included within the **Commitments Register** (**EN010166/APP/6.10**).

Table 16-5: Additional Relevant Engagement

Consultee	Summary of Comment	Response
NRW	*'A meeting with NRW was held on 1 July 2024 during which aspects of the scoping opinion were discussed in more detail, including the proposed approach for hydrodynamic and sediment dispersion modelling associated with sediment disturbance as a result of scour due to the presence of a*	It was agreed that an assessment of circulation and stratification within the Dee Estuary could be based on available information rather than requiring a three-

Consultee	Summary of Comment	Response
	proposed cofferdam during the construction phase. The requirements associated with sediment sampling data needed to carry out the modelling study and sediment contaminant analysis were also discussed. The requirement for thermal plume modelling was confirmed not to be required on the basis that the thermal load from the proposed new power station would not exceed the current permit limits.'	dimensional (3D) model to investigate these specific issues. It was also agreed that a particle-tracking approach would be suitable for modelling of sediment and contaminant dispersion processes. This advice was superseded by later project discussions (see below meeting dated 12 December 2024).
NRW	A meeting was held with NRW on 12 December 2024 during which details of changes to the design of the water connection corridor were provided. Most significantly it was confirmed that this would be limited to replacing the existing eel screens on the intake structures. There is therefore no requirement for a cofferdam or other temporary structures in the river.	Following issue of minutes from the meeting, NRW provided confirmation by email on 21 January 2025 that since there would be no interaction with the riverbed during the works, there would be no requirement for sediment sampling or modelling of sediment dispersion processes.

Scope of the Assessment

16.2.6 This chapter assesses the potential impacts of the proposed works within the Water Connection Corridor on physical processes.

16.2.7 Following Statutory Consultation, the Water Connection Corridor has been reduced in scale and scope of works, which are now limited to:

- the construction phase;
  - upgrades to the existing cooling water intake equipment to meet current legislative requirements, including the installation of new 2 mm eel screens on existing and additional inlets (The Eels (England and Wales) Regulations 2009 (Ref 16-23)).
  - minor refurbishment of the existing assets (concrete repairs, replacement of worn timbers or steelwork, etc.).
  - materials, tools, and staff brought to the works location either by vessel (mooring area included in Corridor) or by designated walking route.
- the operational phase;
  - cooling water would be abstracted from and discharged into the River Dee, in line with current practice for the Connah's Quay Power Station which is covered by an existing permit (NRW, 2020).
  - the intake and outfall infrastructure would be kept clear through the use of a compressed air blasting system which is consistent with existing practice. If required, a jet washing system would be incorporated into the design. The air blast and jet washing activities would only take place on a falling tide to return the silt removed to the estuary sediment budget. Should these options not be sufficient to maintain clean flow through the screen, screens would be removed and replaced by spare screens for mechanical cleaning on land may be required. Where it is required that screens be removed, these would be undertaken in accordance with the methodology for replacement of the existing eel screens as detailed in **Chapter 5: Construction Management and Programme** (**EN010166/APP/6.2.5**).
- the decommissioning phase;
  - at the end of its operational life, decommissioning activities are assumed to be limited to filling of the pipework, with the cooling water infrastructure remaining in-situ. There is therefore no pathway for any impact on the marine environment during this phase.

16.3 Assessment Methodology

Impact Assessment Methodology

16.3.1 **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**), sets out the overarching approach which has been used in developing the ES. This section describes the technical methods used to determine the baseline conditions, sensitivity of the receptors and magnitude of effects and sets out the significance criteria that have been used.

Sensitivity

16.3.2 When defining sensitivity, the criteria levels set out in **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**) have been considered. To determine sensitivity of the receptor, the vulnerability of the receptor to the impact and its ability to recover and adapt are assessed. The criteria for assessing the sensitivity of the receptors are defined in **Table 16-6**.

Table 16-6: Sensitivity / Value Criteria for Physical Processes

Sensitivity / Value	Criteria
High	Receptor has little or no ability to absorb change without fundamentally altering its character. For example: • the receptor has low / no capacity to return to baseline conditions within project life (10 + years), e.g., low tolerance to change and low recoverability; or • the receptor is a designated feature or a protected site, is rare or unique; or economically and or environmentally valuable.
Medium	Receptor has moderate capacity to absorb change without significantly altering its character. For example: • the receptor has a medium capacity to return to baseline condition, i.e. return to baseline between 5 and 10 years; or • the receptor is valued but not protected.
Low	The receptor is tolerant to change without significant detriment to its character. For example: • disturbance to unconsolidated seabed sediments or sandwaves; • the receptor has a high capacity to return to baseline conditions, e.g., within 1 year, or up to 5 years; or • the receptor is common and / or widespread.
Very Low / Negligible	The receptor's character, survival or viability has a high tolerance to change.

Magnitude of Impact

16.3.3 The magnitude of impact has been considered in terms of the spatial extent, duration, and timing of the impact in question. A summary of the impact magnitude criteria is detailed in **Table 16-7.**

Table 16-7: Magnitude of Impact Criteria for Physical Processes

Magnitude of Impact	Criteria
High	Adverse: Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements.

Magnitude of Impact	Criteria
	Beneficial: Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Medium	Adverse: Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements. Beneficial: benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse: Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Beneficial: Minor benefit to, or in addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute, or a reduced risk of negative impact occurring.
Very Low / Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements. Beneficial: Very minor benefit to, or positive addition of one or more characteristics, features or elements.

Significance of effects

16.3.4 As set out in **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**), the classification of an effect is based on the magnitude of the impact and sensitivity or value of the receptor, using the matrix shown in **Table 16-8.**

Table 16-8: Classification of Effects

Magnitude of Impact	Sensitivity / Value			
	High	Medium	Low	Very Low / Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low / Negligible	Minor	Negligible	Negligible	Negligible

Rochdale Envelope

16.3.5 The setting of design parameters using the Rochdale Envelope approach is described in **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**). The maximum parameters for the principal components of the Proposed Development are set out in the **Design Principles Document** (**EN010166/APP/7.8**) and are illustrated on the **Works Plans** (**EN010166/APP/2.4**) and the **Parameter Plans** (**EN010166/APP/2.5**). These parameters, together with assumptions regarding the future plans for the existing Connah's Quay Power Station set out in **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**) have been used to inform the representative worst-case scenario that has been assessed in this chapter, in order to provide a robust assessment of the impacts and likely significance of environmental effects of the Proposed Development at its current stage of design.

16.3.6 In particular, focused use of the Rochdale Envelope has been adopted for the following aspect:

- cooling water for the Proposed Development would be abstracted from and discharged to the River Dee, in-line with the current process for the existing Connah's Quay Power Station CCGT. The existing permit requires that abstraction is limited to the period from one hour before high tide to two hours after with discharge permitted over the period from one to four hours after the predicted high tide. Cooling water would be abstracted at a rate of up to 3.04 cubic metres per second (m^3/s) and up to 33 megalitres (ML) per high tide. This assumption is regulated through the permit and licensing process.

Assessment Assumptions and Limitations

16.3.7 The assessment of Physical Processes is limited to areas situated below the local MHWS level.

16.3.8 Capital or maintenance dredging would not be required during the operational phase of the Proposed Development, which is consistent with the current situation. Dredging would also not be required during the construction and decommissioning phases.

16.3.9 For the purposes of the assessment, the construction phase includes enabling and demolition works required to facilitate the Proposed Development outlined in **Chapter 4: The Proposed Development** (**EN010166/APP/6.2.4**).

16.3.10 It is assumed that during construction, the contractor would adhere to best practice measures and existing permit, consent and licensing requirements to minimise the risk of impacts on the physical environment and physical processes. Further details are provided in Section 16.5.

16.3.11 During the decommissioning phase infrastructure within the water connection corridor (i.e. pipelines and intake structures) would be left in-situ and the pipes filled to prevent inflow and outflow.

16.4 Baseline Conditions and Study Area

16.4.1 This section describes the baseline environmental characteristics for the Construction and Operation Area and surrounding areas with specific reference to physical processes.

Data Sources

16.4.2 The following data sources have been used in support of this assessment.

- BGS Geology Viewer (Ref 16-24);
- Suspended Sediment Climatologies around the UK. (Ref 16-25);
- Admiralty Tide Tables (Ref 16-26);
- Renewables Atlas (Ref 16-27);
- SEASTATES (Ref 16-28);
- Awel y Môr Offshore Wind Farm Category 6: Environmental Statement (Ref 16-29);
- Foundation geology of the River Dee estuary cable-stayed bridge, Flintshire, North Wales (Ref 16-30);
- Morphological evolution of the Dee Estuary, Eastern Irish Sea, UK: A tidal asymmetry approach (Ref 16-31);
- North West Estuaries Processes Report, Dee Estuary (Ref 16-32);
- North West England and North Wales Shoreline Management Plan SMP2 and supporting studies (Ref 16-14, Ref 16-33);
- Measuring suspended sediment and its wave and turbulence forcing in the Dee Estuary (Ref 16-34); and
- UK Climate Projections User Interface (Ref 16-36).

Study Area

16.4.3 The study area has been defined to include physical processes features likely to be at risk from possible direct and indirect impacts arising from the Proposed Development, as determined by the maximum extent of the ZoI for all receptors. The seaward limit of the ZoI can be estimated using the tidal excursion distance from the Proposed Development for the highest astronomical tide (HAT), equivalent to the longitudinal axis of the maximum spring tidal ellipse. The maximum tidal ellipse dimension can be expected to increase from 6.2 km for a mean tide (Ref 16-28) to approximately 10 km for the largest tide in a year. However, the ZoI for the water column has been increased by a further 50% to allow for natural dispersion processes giving a seaward limit that is 15 km to the north-west of Water Connection Corridor (**Figure 16-2** (**EN010166/APP/6.3**)).

16.4.4 The upstream limit of the ZoI is based on the normal tidal limit within the river with a 1 km buffer zone (identified by the pink dashed line in **Figure 16-2** (**EN010166/APP/6.3**)) added to allow for the additional influence of storm surge propagation. To provide an initial estimate of the seaward limit of the ZoI, the length of the longitudinal axis of the mean tidal ellipse has been

scaled-up to represent a maximum spring tide (**Figure 16-2** (**EN010166/APP/6.3**)).

Existing Baseline

16.4.5 **Table 16-9** lists the key receptors considered in this assessment. It includes the designations associated with the Dee Estuary, however a specific impact assessment is not carried out for each designation, instead key aspects of the physical environment within the Dee Estuary are assessed.

16.4.6 In many cases, there is no defined receptor for the physical environment but instead the physical processes act as a pathway which has the potential to impact other receptors (i.e. increased deposition resulting from the disturbance of seabed material could have an adverse impact on benthic habitats). One exception to this is the estuary / river morphology which has been considered as a receptor in its own right.

Table 16-9: Key Receptors within the Existing Baseline

Sensitive Receptor	Location
Dee Estuary / Aber Afon Dyfrdwy SSSI (Site of Special Scientific Interest)	Dee Estuary
The Dee Estuary (Wales) SPA (Special Protection Area)	Dee Estuary
Dee Estuary / Aber Dyfrdwy (Wales) SAC (Special Area of Conservation)	Dee Estuary
The Dee Estuary – Ramsar site	Dee Estuary
The River Dee (Afon Dyfrdwy) – SSSI (Site of Special Scientific Interest)	England/Wales
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC (Special Area of Conservation)	England/Wales
Estuary / river bed morphology	River Dee / Dee Estuary
Water column	River Dee / Dee Estuary
Estuary / river hydrodynamics	River Dee / Dee Estuary

Environmental Overview

16.4.7 The Construction and Operational Area is situated on the southern bank of the upper Dee Estuary close to Connah's Quay. The shape of the estuary is broad and funnel-shaped with a mouth approximately 5.7 km wide spanning between the Point of Ayr Spit and Hilbre Point (Ref 16-14). The length of the estuary is 30 km. The inner estuary environment is characterised by several channels, well developed mud and sand flats and extensive saltmarshes (Ref 16-17). The Dee Estuary is designated as a SSSI, SAC, Ramsar site and Special SPA, and contains several nature reserves within these

particular designated areas (**Figure 16-1** (**EN010166/APP/6.3**)). The River Dee which flows into the Dee Estuary is also designated as an SSSI and SAC.

16.4.8 The Water Connection Corridor is at the point where the River Dee channel begins to widen into the estuary, from approximately 150 m upstream of the Flintshire Bridge to approximately 350 m (entire channel width).

Geology

16.4.9 The Dee Estuary was formed as an iceway during the last ice age as icesheets moved south-eastwards from the Irish Sea towards the Cheshire Plain (Ref 16-38). The bedrock geology surrounding and underpinning the estuary includes Triassic Sandstone and the Carboniferous bedrock band of Pennine Lower Coal Measures Formation, formed around 318 million years ago. This hard geology acts as a structural control on the estuary morphology (Ref 16-30).

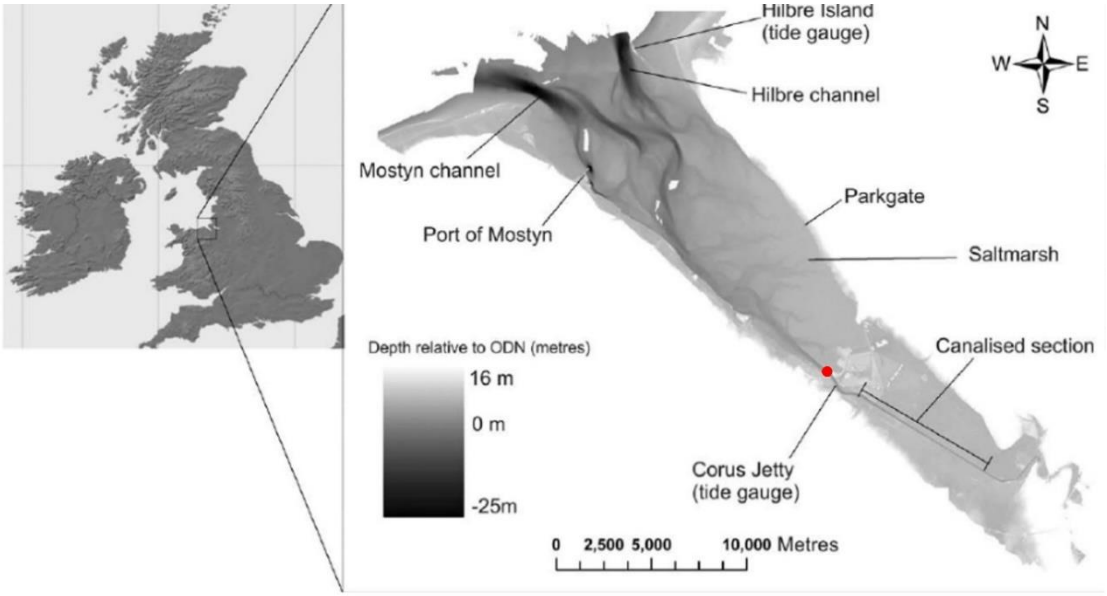
16.4.10 The bedrock geology is overlain by surficial Quaternary formations, including clayey tills laid down during the last glaciation of the Pleistocene. This is followed by tidal flat deposits and alluvial sands, silts and clays deposited by the River Dee (Ref 16-24; Ref 16-30).

Bathymetry

16.4.11 The overall bathymetry of the Dee Estuary is shown in **Plate 16-1**. The plate depicts the location of the Water Connection Corridor (red dot) where the river channel is below Chart Datum (CD) with depths within the wider estuary ranging from 17 m below CD to 8 m above. Much of the estuary consists of intertidal sand banks with a narrow navigation channel. The canalised section upstream of Connah's Quay is believed to have caused heavy siltation and accretion, allowing the formation of a saltmarsh environment within the wider estuary (Ref 16-31).

16.4.12 A section of training wall adjacent to the existing outfall acts as a guide to currents at this location which was constructed as an aid to navigation.

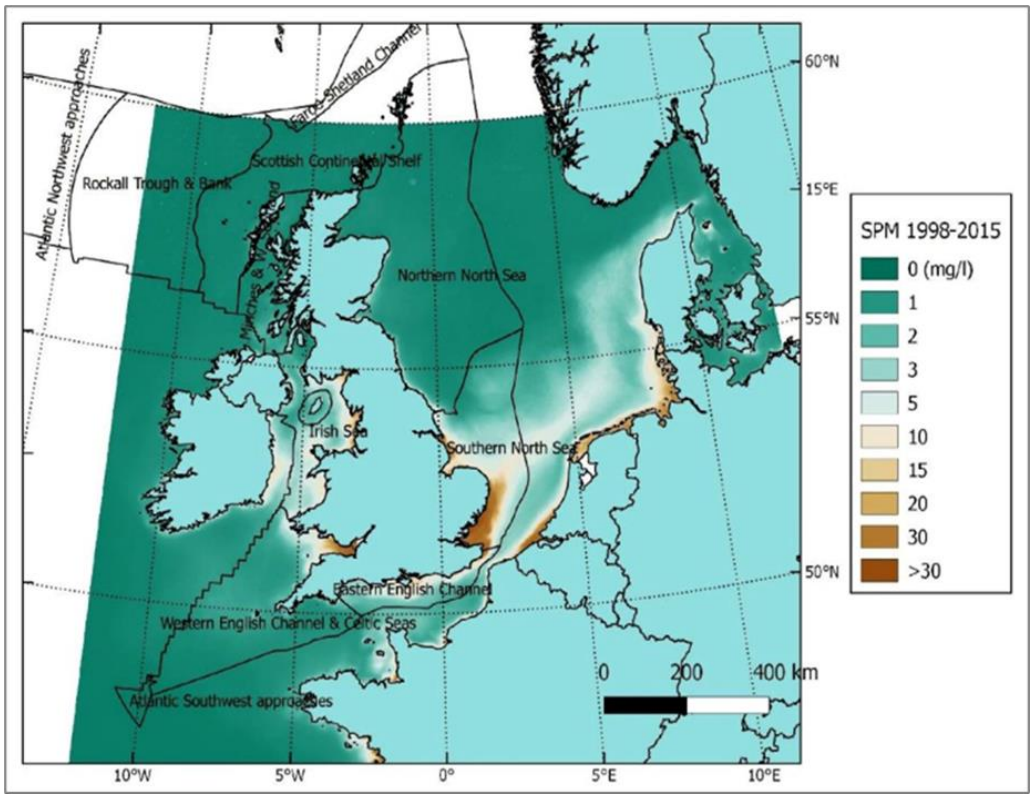
Plate 16-1: Bathymetry of the Water Connection Corridor and wider Dee Estuary (Ref 16-31)



Suspended sediment

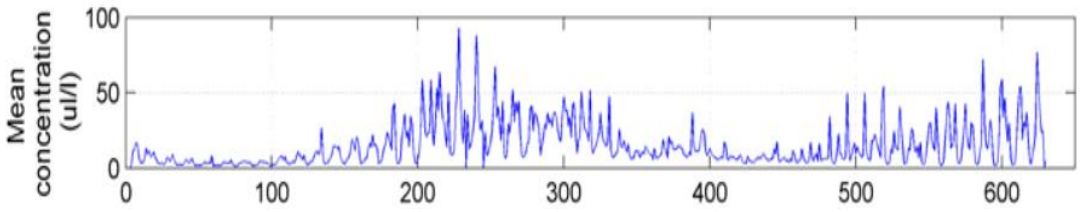
16.4.13 The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) between 1998 and 2005 for the majority of the UK continental shelf (**Plate 16-2**). The largest plume concentrations are associated with the major estuaries and waterbodies, such as Liverpool Bay off the North Wales Coast, where the mean values of SPM are above 30 mg/l (Ref 16-34).

Plate 16-2: Average Suspended Sediment Around the UK (Ref 16-25)



16.4.14 SPM values for the Dee Estuary are expected to be higher than in Liverpool Bay, which is confirmed by CEFAS in-situ measurements with values near the mouth frequently reaching 60 mg/l or higher, as shown in **Plate 16-3**. The highest concentrations were found to be relatively close to the bed (i.e. bottom 1 m) with peak values occurring in response to the flood and ebb tides as well as well as storm wave conditions (Ref 16-25). The mobile sediment was found to have a mean particle size of 70 µm, representative of silt and fine sand fractions which is consistent with material found within the estuary (Ref 16-27).

Plate 16-3: Measured suspended sediment concentrations (mg/l) plotted against time (hours) from initial deployment in the Hilbre Channel (Ref 16-34)



16.4.15 Although no measured data has been identified for SSC in the upper reaches of the Dee Estuary at the Water Connection Corridor, it is likely that SSC levels will be elevated further at this location due to additional sediment supply from the river.

Tidal Water levels

16.4.16 **Table 16-10** presents tidal levels from the UK Hydrographic Office (UKHO) Admiralty Tide Tables for the Connah's Quay (0463) Secondary Non-Harmonic Port (Ref 16-26). The Dee Estuary is classified as being a semi-diurnal, macro-tidal environment with a mean spring tidal range at Mostyn Docks in the outer estuary of 7.8 m. The tidal range reduces from west to east as the tidal wave is attenuated due to the influence of bed friction in the shallow water depths.

Table 16-10: Tidal planes for Connah's Quay and Mostyn Docks (Ref 16-26)

	Connah's Quay		Mostyn Docks	
Description	Height (m CD[1])	Level (m ODN[2,3])	Height (m CD)	Level (m ODN[4])
HAT (Highest astronomical tide)	5.50	+4.75	9.80	+5.30
MHWS (Mean high water springs)	4.70	+3.95	8.90	+4.40

	Connah's Quay		Mostyn Docks	
MHWN (Mean high water neaps)	3.00	+2.25	7.00	+2.50
MSL (Mean sea level)	-	-	4.90	+0.40
MLWN (Mean low water neaps)	-	-	2.90	-1.60
MLWS (Mean low water springs)	-	-	1.10	-3.40
LAT (Lowest astronomical tide)	-	-	0.20	-4.30

Notes

1. CD = Chart Datum
2. ODN = Ordnance Datum Newlyn
3. ODN is 0.75 m above CD at Connah's Quay
4. ODN is 4.50 m above CD at Mostyn Docks

16.4.17 A hydrodynamic model (Ref 16-35) including Liverpool Bay and the Dee Estuary configured using the MIKE21 modelling software was calibrated and validated using available water level and tidal current data (Ref 16-26). Model output data covers the one-month period of June 2001. The location of the model output point relative to Connah's Quay is shown in **Plate 16-4** which is approximately 2 km downstream of the proposed development and can therefore be used to provide a reasonable estimate of low water levels at Connah's Quay. Modelled variations in local water levels are also shown in **Plate 16-5** based on results from the 2D depth-averaged model which confirm that although there is a reduction in tidal range from Mostyn Docks to Connah's Quay, conditions are still macro-tidal.

16.4.18 Within the Dee Estuary, the tides exhibit greater asymmetry particularly around Connah's Quay, where ebb and flood tides have unequal durations.

Plate 16-4: Location of model output point in the Dee Estuary

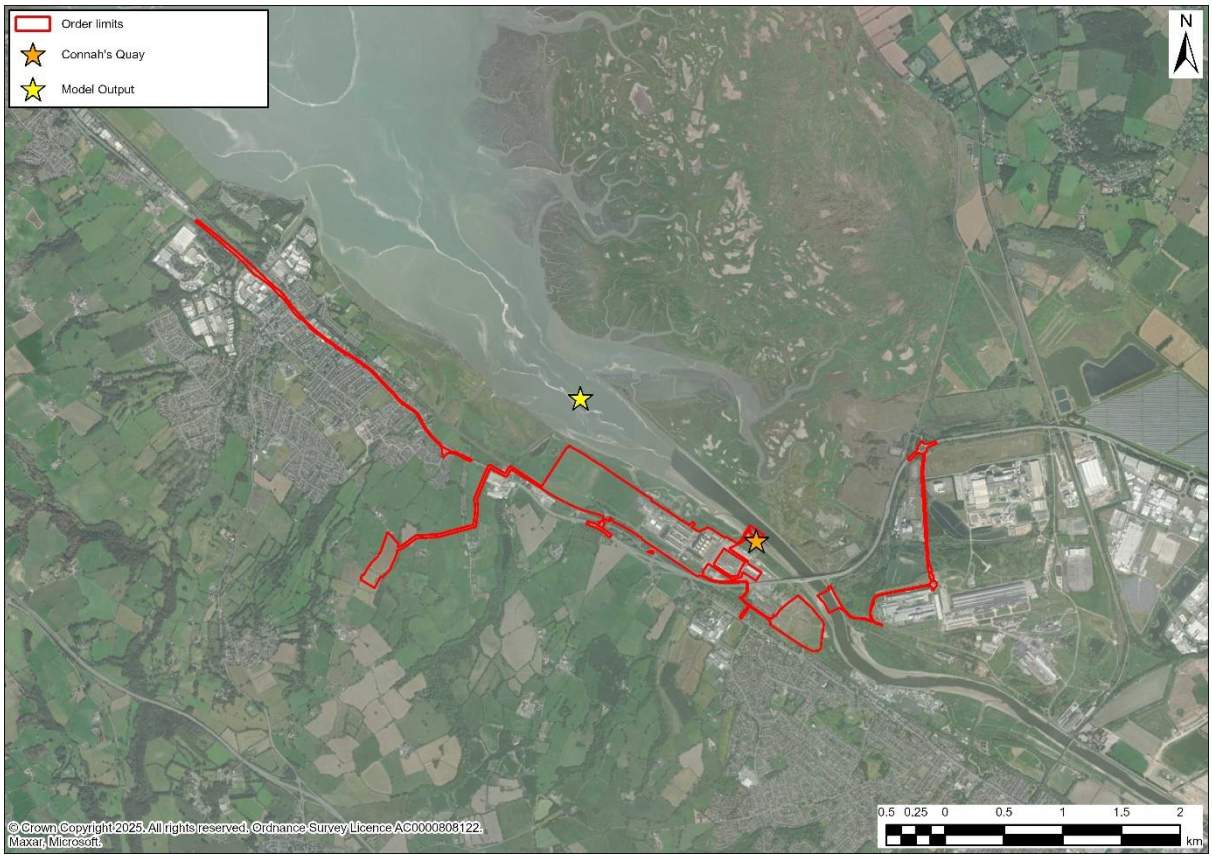
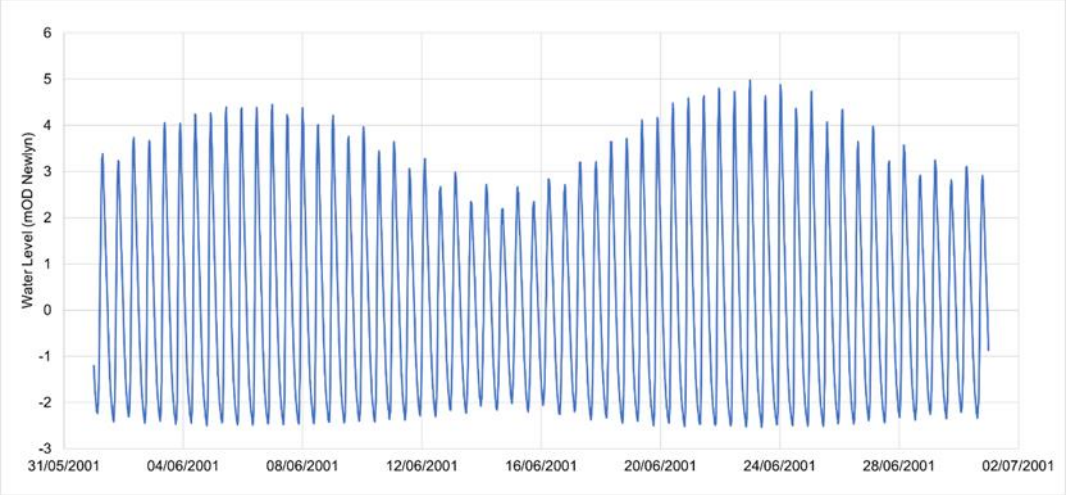


Plate 16-5: Water levels (m ODN) at model output point in the upper Dee Estuary



16.4.19 The nearshore tidal ellipse at the entrance to the Dee Estuary is orientated north north-west to south south-east. The major axis of this tidal ellipse is approximately 6.2 km in length (based on a mean tide) with a similar excursion distance likely to be found within the estuary. Further offshore within the Irish Sea the ellipses are orientated west to east and are approximately 10 to 12 km long (based on a mean tide) (Ref 16-27).

Waves and wind

16.4.20 The SEASTATES data explorer (Ref 16-28) was used to provide an indication of the wind and wave conditions for the region.

16.4.21 The closest available data point is at the entrance of Dee Estuary and has therefore been used to provide indicative local wind and wave conditions.

16.4.22 **Plate 16-6** provides a wave rose for significant wave height which shows that the dominant direction of waves reaching the estuary mouth is from the north-west. Similarly, **Plate 16-7** provides a summary of wind conditions with the dominant direction from west to south-west (Ref 16-28).

Plate 16-6: Significant wave height at the entrance to the Dee Estuary (Ref 16-28)

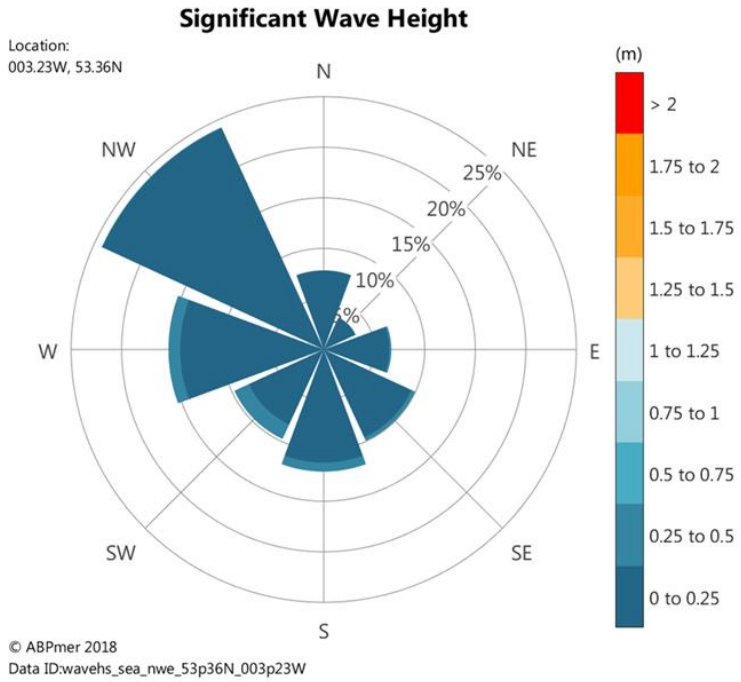
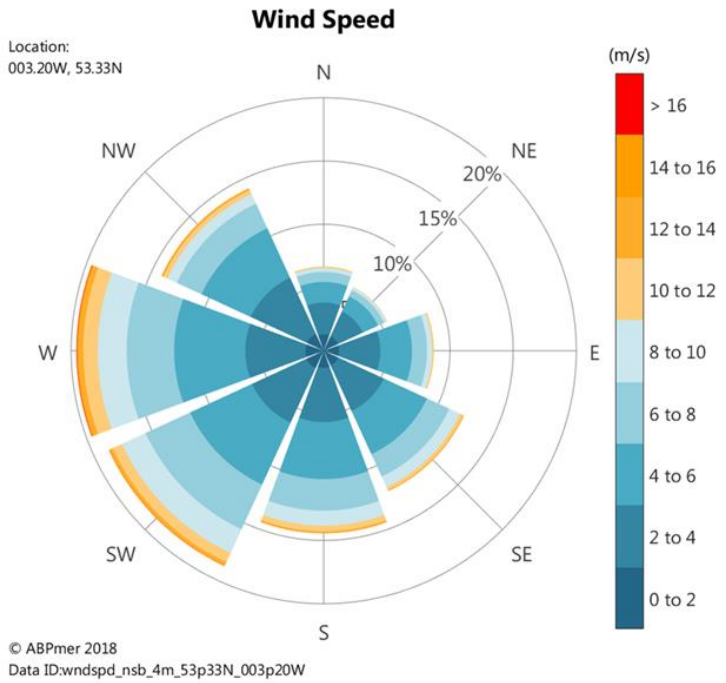


Plate 16-7: Wind speed at the entrance to the Dee Estuary (Ref 16-28)

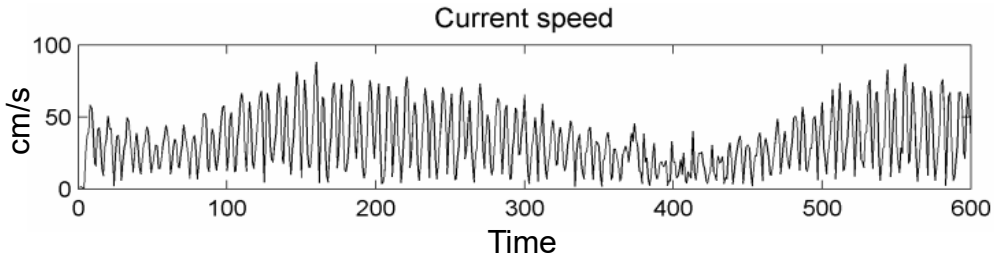


Tidal Currents

16.4.23 Tidal currents are an important component of the physical environment, influencing aspects such as sediment transport and dispersion of suspended sediment.

16.4.24 **Plate 16-8** shows the variation in measured tidal currents in the Hilbre Channel off the Wirral coast near the mouth of the estuary where peak currents over a spring-neap cycle are shown to be approximately 0.8 m/s (or 80 cm/s) (Ref 16-26).

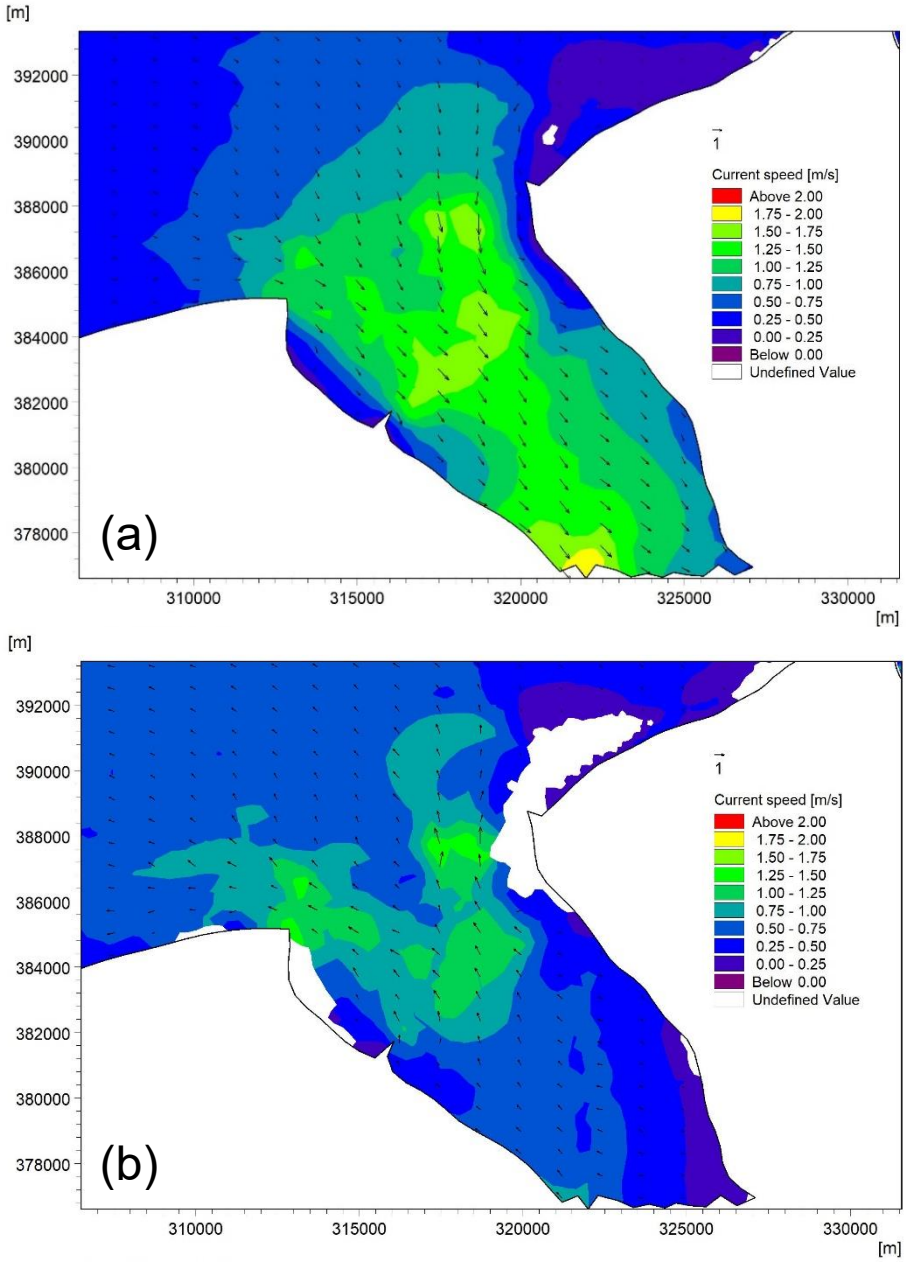
Plate 16-8: Measured current speed (cm/s) plotted against time (h) from initial deployment (Ref 16-26).



16.4.25 Tidal current vectors from the 2D hydrodynamic model are presented in **Plate 16-9** (Ref 16-26) for a spring tide showing peak flow conditions during flood and ebb phases with similar current patterns found for a neap tide, but with a lower magnitude. The model results show how the magnitude of the flood currents is increased within the estuary due to the funneling effect. The main low water channel is not well resolved thus the existing model does not accurately predict currents at the location of the Water Connection Corridor.

A peak current speed in excess of 1.75 m/s is shown along the southern shoreline with peak tidal currents reducing in magnitude further upstream. This suggests that the upper reaches could be a more depositional environment although river flow conditions are likely to become more influential with distance upstream (Ref 16-26). The ebb tidal currents are shown to be much weaker than the flood indicating flood dominance, likely to provide a depositional environment for sediment transported from Liverpool Bay (Ref 16-26).

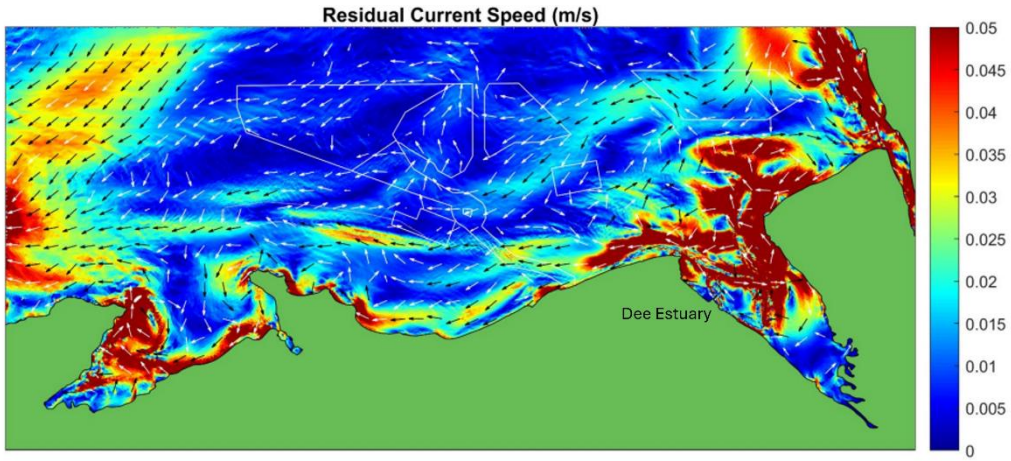
Plate 16-9: Modelled Spring tide current vectors in the Dee Estuary for (a) Flood and (b) Ebb tide (Ref 16-26)



16.4.26 **Plate 16-10** shows modelled residual tidal currents prepared for a study of a proposed windfarm development (Awel Y Mor) and shows the variation of these residuals within the Dee Estuary, as derived over a spring-neap tidal cycle (Ref 16-29). Tidal residuals represent the net movement of water particles averaged over a period of time and can be used to infer potential sediment transport pathways and, in this case, suggest that tidal-induced

sediment transport is significant in the coastal region and extending into the Dee Estuary, but is less influential in the upper reaches, including the study area. This suggests that river flow conditions have an important influence on physical processes at this location.

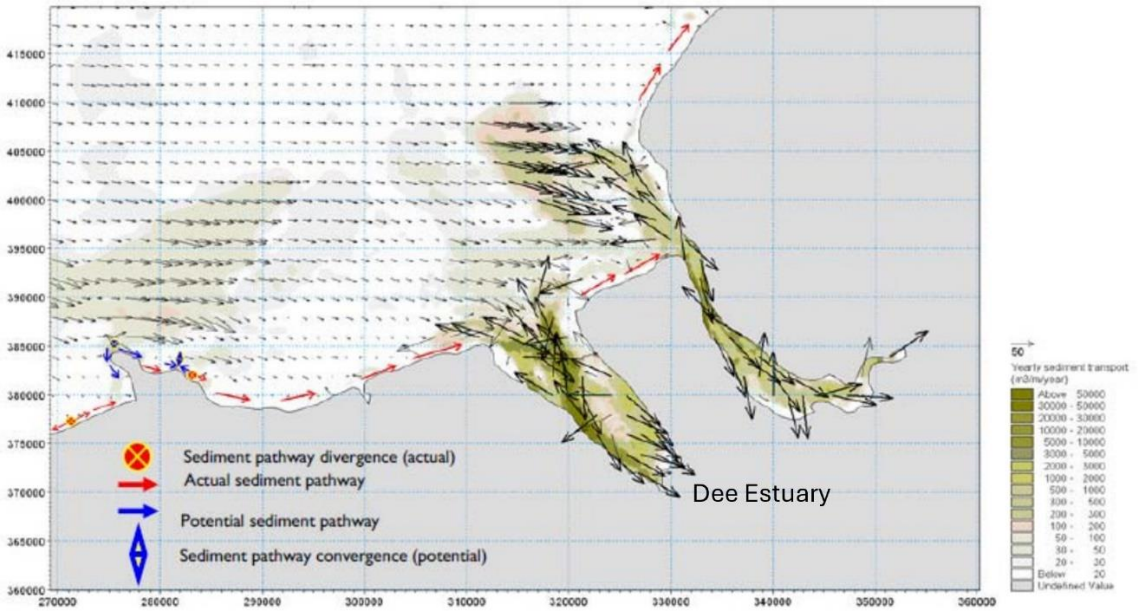
Plate 16-10: Residual current vectors for a spring-neap tidal cycle (Ref 16-29)



Sediment Transport Processes

16.4.27 The Dee Estuary is flood dominant with stronger currents during the flood phase of the tide resulting in the net movement of sediment into the estuary (**Plate 16-11**) (Ref 16-33). The primary sediment source results from the inshore movement of material from the Irish Sea. The black vector arrows show yearly estimated subtidal sand transport under representative tide and wave forcing and the red arrows indicate actual littoral transport pathways with the blue arrows indicating potential littoral transport pathways where sediment is present (Ref 16-33).

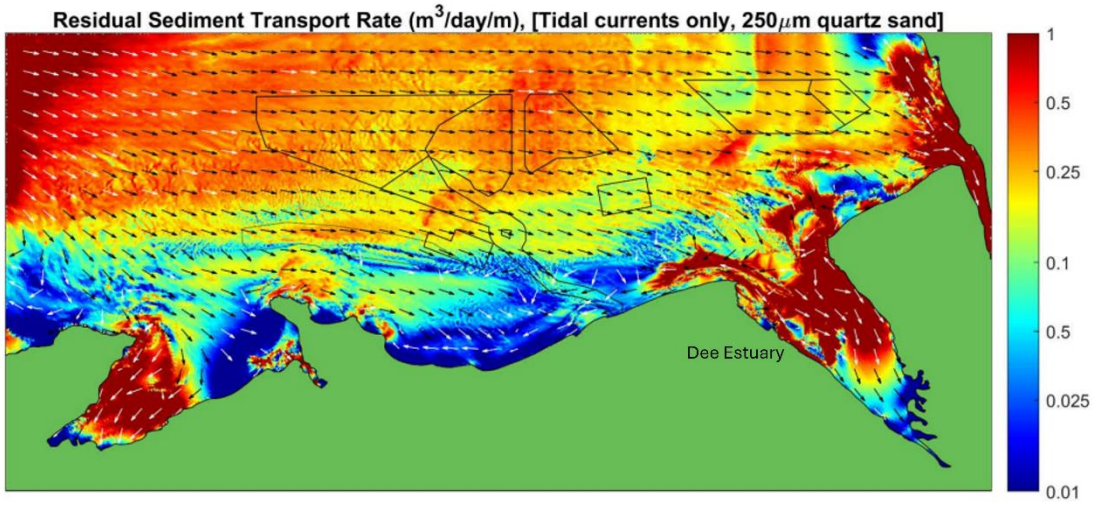
Plate 16-11: Estimated annual average littoral and subtidal sediment transport vectors (Ref 16-33)



16.4.28 The estuary is a major sink for fine sands which are stored within the sandbanks at the mouth of the estuary, such as the East Hoyle Bank.

16.4.29 Modelling results for the proposed Awel Y Mor offshore wind farm study provide indicative residual sediment transport rates under tidal currents for sand (**Plate 16-12**). These results are particularly relevant given that the wind farm is approximately 20 km from the mouth of the Dee Estuary which is included in the model extending upstream to the tidal limit. Similar to the pattern of residual currents, the potential for high sediment transport is shown within the outer estuary whereas in the inner estuary transport rates are significantly reduced (Ref 16-37).

Plate 16-12: Modelled residual sediment transport rate within the Dee Estuary (Ref 16-26)



Water Quality

16.4.30 Detailed information on water quality is provided in **Chapter 13: Water Environment and Flood Risk** (**EN010166/APP/6.2.13**).

Marine Sediment Quality

16.4.31 The non-technical summary for the Awel Y Mor offshore wind farm (situated approximately 40 km offshore and north-west from the Main Development Area (Ref 16-37), provides offshore marine sediment quality data. However, it is expected that within the Dee Estuary and nearer to the Water Connection Corridor, sediment quality is likely to be different due to the limited exposure to waves and the influence of flows from the River Dee.

16.4.32 The contaminant analysis of offshore sediment samples identified that metal concentrations were below the marine sediment quality guidelines (**Table 16-11**) within the windfarm area, apart from arsenic, where concentration levels were slightly elevated as a result of geological inputs from the North Wales coastal region.

Summary of Sensitive Receptors

Table 16-11: Tidal planes for Connah's Quay and Mostyn Docks

Sensitive Receptor	Stage of Development	Closest location to the Proposed Development
Water column	Construction and Operation	The River Dee and Dee Estuary

Sensitive Receptor	Stage of Development	Closest location to the Proposed Development
River / estuary bed morphology	Operation	Dee Estuary – within the Water Connection Corridor

Future Baseline

16.4.33 The future baseline scenario, as defined in **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**), is set out below for this chapter.

16.4.34 For the assessment of changes to physical processes under a different future climate change scenario, the UK guidance and projection of sea level rise and increased storminess are applied to the baseline (present day) conditions.

16.4.35 Changes in future wind and wave conditions are provided by the Environment Agency's 'Flood Risk Assessments: Climate Change Allowances (Ref 16-15), and Welsh Government guidance (Ref 16-19) (**Table 16-1**). The guidance states that wind speeds and wave height should be increased by 5% between 1990 and 2055 and by 10% for 2056 to 2115.

16.4.36 The latest UK Climate Projections are available from the UKCP18 website (Ref 16-36) which provides the most up-to-date assessment of how the climate may change up to 2100 and post-2100. Sea level rise data for locations around the UK coast are available for the relevant grid square. According to this data, by 2050, sea levels may rise by 0.22 m above 2023 levels in the Dee Estuary. This is estimated for a high emissions Representative Concentration Pathway 8.5 (RCP 8.5) for the 95th percentile value.

16.5 Development Design and Embedded Mitigation

16.5.1 The Proposed Development has been designed, as far as possible, to avoid or minimise impacts and effects on Physical Processes through the process of design development, and by embedding measures into the design of the Proposed Development.

16.5.2 The following embedded mitigation measures are proposed:

- a compressed air blast / jet washing system would be used to clear any build-up of silt on the intake screens, thus avoiding any requirement for maintenance dredging. This would be a requirement of the **Appendix 4-A: Operational and Maintenance Mitigation Register** (**EN010166/APP/6.4**); and
- replacement of the existing intake screens rather than complete refurbishment of the related infrastructure (as confirmed through the works description in Schedule 1 of the **Draft DCO** (**EN010166/APP/3.1**)). The requirement for a cofferdam and other potential disturbances to the riverbed during the construction phase is therefore avoided.

16.5.3 In addition to the embedded mitigation measures, the following standard construction practices are also relevant to this assessment:

- construction phase impacts would be mitigated through the implementation of standard construction techniques and mitigation measures which are detailed in the **Framework Construction Environmental Management Plan** (**EN010166/APP/6.5**);
- a list of additional consents, licences, and permits that the Applicant may need to obtain to enable the construction, operation, maintenance, and decommissioning of the Proposed Development is provided in the **Consents Agreements Position Statement** (**EN010166/APP/3.3**);
- approaches to mitigating potential significant effects during construction, operational phases have been described with reference to good practice guidance and design. This is not relevant to the decommissioning stage due to the absence of any interaction with the marine environment based on the proposed approach, as described in Section 16.2; and
- a Decommissioning Environmental Management Plan (DEMP) would be produced at the time of decommissioning, pursuant to a Requirement of the **Draft DCO** (**EN010166/APP/3.1**). The DEMP would include an outline programme of works, would consider all potential environmental risks and contain guidance on how risks can be removed, mitigated or managed, accounting for potential future changes to baseline conditions.

16.6 Assessment of Likely Impacts and Effects

16.6.1 Taking into account the embedded mitigation measures as detailed in Section 16.5 above, the potential impacts and effects of the Proposed Development have been assessed using the methodology as detailed in Section 16.3 of this chapter and **Chapter 2: Assessment Methodology** (**EN010166/APP/6.2.2**).

16.6.2 Many impacts and changes to the physical environment associated with the construction and operational phases are impact pathways that could give rise to likely significant effects to other receptors that are not related to physical processes. Where this is the case, the relevant chapter is referenced, and the impact is assessed further.

Construction phase

16.6.3 The Proposed Development would utilise the existing Connah's Quay Power Station cooling water abstraction and discharge infrastructure located within the River Dee. It has been established that this infrastructure is in a suitable condition for re-use with some refurbishment and additions within the overall footprint of the existing infrastructure. This would comprise installation of new 2 mm eel screens on the existing intakes, in line with applicable legislative controls.

16.6.4 The new eel screens would have similar dimensions to the existing and therefore any impacts associated with the change in flow conditions near the bed due to increased water column turbidity and increased levels of suspended sediment concentrations would be negligible. The resultant effect on the water column, of low sensitivity, would be **negligible** (**not significant**).

16.6.5 The related release of contaminants into the water column due to estuary bed disturbance would therefore also be negligible. The resultant effect on the water column, of low sensitivity, would be **negligible** (**not significant**).

16.6.6 In summary, there are no planned construction or refurbishment works that would cause any likely significant effects on Physical Processes within the Water Connection Corridor.

Operation phase

16.6.7 The earliest year of operation for the Proposed Development is anticipated to be 2030, under a phased construction approach beginning in 2026 for a period of five years. If construction was to be undertaken in a simultaneous phased approach, the earliest year of operation is anticipated to be 2035. If a single phased construction approach was undertaken at the latest possible time, five years after DCO Consent, operation would be anticipated to occur in late 2036.

16.6.8 Impacts on Physical Processes features during the operational phase of the Proposed Development are likely to include:

- changes to river/estuary bed morphology, due to:
- scour of the river / estuary bed and associated change in hydrological regimes as cooling water is extracted from the estuary and discharged from the outfall into the estuary;
- maintenance procedures involving use of an air blast, and/or jet washing system to remove accumulated sediment from the intake screens;
- increase suspended sediment concentration in the water column due to estuary bed scour (start of an impact pathway); and
- potential release of sediment-bound contaminants into the water column due to estuary bed disturbance (start of an impact pathway).

Changes to river / estuary bed morphology

Cooling water abstraction and discharge

16.6.9 Cooling water abstraction and discharge would be limited to periods around high water in line with the current abstraction permit. Cooling water would be abstracted at a rate of up to 3.04 cubic metres per second (m^3/s) and up to 33 mega litres (ML) per high tide.

16.6.10 A maximum rate of 2.50 m^3/s is permitted over a restricted three hour discharge period from one to four hours after the time of high water. The total volume of water discharged per tide is 27 ML which is less than the abstracted volume due to losses within the system.

16.6.11 As cooling water is discharged it may lead to local scour and erosion of the estuary bed caused by the increased velocity of the discharging / abstracting water.

16.6.12 The capacity of the outfall and intake structures, the rate of discharge into the estuary, would be the same design as the existing power station.

Therefore, there would be no change (associated with scour and erosion) to the riverbed as water is discharged into the estuary.

16.6.13 Further, the estuary is dynamic undergoing natural changes over varying timescales on a local and wider scale. The influence of intake and outfall discharges is outweighed by the larger-scale natural processes influencing the wider estuary geomorphology.

16.6.14 There would be **no effect** on estuary bed morphology as a result of cooling water and abstraction discharge.

Maintenance Procedures – use of air blast system

16.6.15 Current operational practice involves the regular use of an air blast system to clear sediment build-up around the intake screen. This process would be intermittent and short-duration and effectively returns sediment back into the estuary thereby minimising any changes to natural transport processes and the overall estuary sediment budget. The associated impact magnitude on bed morphology, which is of low sensitivity, has been assessed as negligible given the relatively small volumes of sediment involved and the large area over which this material is likely to settle. Changes in the bed morphology would therefore be at a millimetric or sub-millimetric scale. This impact would result in a **negligible** effect on bed morphology, which is **not significant**.

Increased suspended sediment concentration in the water column

16.6.16 As described above, as cooling water is discharged and abstracted into and from the estuary this may lead to local scour and erosion of the estuary bed caused by the increased velocity of the discharging/ abstracting water. Scour may also occur around the outfall and intake structures. The regular removal / scour of sediment from the bed can lead to increased amounts of suspended sediment and increased turbidity of the water column. Plumes of suspended sediment may then be transported about the estuary by currents.

16.6.17 While the water column may experience increased turbidity, there is no impact associated with the water column itself. Instead, increased water column turbidity can act as an impact pathway for other receptors, for example the impact of increased sediment suspension levels on sensitive habitats and species are assessed in **Chapter 12: Marine Ecology** (**EN010166/APP/6.2.12**). However, as outlined above, the capacity of the outfall and intake structures and the rate of discharge into the estuary, would be the same as for the existing power station. Therefore, there would be no change to the current baseline conditions, with no increase to the amount of potential sediment disturbed, and as such there would be **no effect.**

Release of contaminants in the water column

16.6.18 The suspension of sediment into the water column may also lead to the release of contaminants leading to water quality deterioration. The type of contaminants present within the Water Connection Corridor are currently unknown. In 2019 waterbodies within the Dee Estuary were found to have a failed chemical status for selected contaminants and any related effects are discussed in **Chapter 13: Water Environment and Flood Risk** (**EN010166/APP/6.2.13**). The release of contaminants would lead to deterioration in water quality which may act as an impact pathway for

sensitive habitats and species which are assessed in **Chapter 12: Marine Ecology** (**EN010166/APP/6.2.12**). However, if the process of contaminant release does occur, it would be no different from the present-day situation unless a new source of contamination is identified. In this event, the magnitude of any impact would be negligible. The resultant effect on the water column, of low sensitivity, would be **negligible** (**not significant**).

Decommissioning phase

16.6.19 Based on the proposed approach during decommissioning, the Proposed Development would not have any impact on the physical marine environment due to the absence of any pathway.

16.7 Additional Mitigation and Enhancement Measures

16.7.1 The assessment found that the construction, operation and decommissioning phases of the Proposed Development are likely to have no significant effects on physical processes. Therefore, additional mitigation measures and enhancements are not required.

16.8 Summary Residual Effects

16.8.1 **Table 16-12** and **Table 16-13** summarise the residual effects of the Proposed Development in relation to Physical Processes. In summary there are no likely significant residual effects on the Physical Processes receptors during the construction, operation (including maintenance) or decommissioning of the Proposed Development.

16.8.2 There is no summary table associated with the residual effects relating to the Decommissioning phase of the Proposed Development as no effect pathways have been identified.

16.8.3 An assessment of cumulative effects with other proposed developments that could interact with the effects of this Proposed Development is outlined in **Chapter 24: Cumulative and Combined Effects** (**EN010166/APP/6.2.24**). **Chapter 24** also assess the in-combination effects of multiple impacts occurring on one receptor.

16.8.4 No significant residual effects have been identified.

Table 16-12: Summary of Likely Significant Residual Effects (Construction)

Receptor	Sensitivity (value)	Description of Impact	Magnitude of Impact	Classification of Effect (prior to Additional Mitigation)	Additional Mitigation / Enhancement Measure	Magnitude of Impact after Additional Mitigation	Residual Effect after Additional Mitigation
Water column	Low	Increased water column turbidity and increased levels of SSC - negligible	Negligible	Negligible (not significant)	None	N/A	Negligible (not significant)
Water column	Low	Release of contaminants into the water column due to estuary bed disturbance - negligible	Negligible	Negligible (not significant)	None	N/A	Negligible (not significant)

Table 16-13: Summary of Significant Residual Effects (Operation)

Receptor	Sensitivity (value)	Description of Impact	Magnitude of Impact	Classification of Effect (prior to Additional Mitigation)	Additional Mitigation / Enhancement Measure	Magnitude of Impact after Additional Mitigation	Residual Effect after Additional Mitigation
Water column	Low	Increased water column turbidity / increased SSC due to estuary bed scour	No impact	No effect	None	N/A	No effect

Receptor	Sensitivity (value)	Description of Impact	Magnitude of Impact	Classification of Effect (prior to Additional Mitigation)	Additional Mitigation / Enhancement Measure	Magnitude of Impact after Additional Mitigation	Residual Effect after Additional Mitigation
River / estuary bed morphology	Low	Impacts on bed morphology associated with maintenance procedures (air blast system) – negligible	Negligible	Negligible (not significant)	None	N/A	Negligible (not significant)
River / estuary bed morphology	Low	Impacts on bed morphology associated with cooling water abstraction and discharge	No impact	No Effect	None	N/Ac	No Effect
Water column	Low	Potential release of sediment-bound contaminants into the water column due to estuary bed disturbance	Negligible	Negligible (not significant)	None	N/A	Negligible

References

Ref 16-1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/572). London: HMSO (Accessed 14/02/25).

Ref 16-2 Marine and Coastal Access Act, 2009 [online]. Available at: https://www.legislation.gov.uk/ukpga/2009/23/contents (Accessed 28/07/25).

Ref 16-3 The Marine Strategy Regulations, 2010 [online]. Available at: The Marine Strategy Regulations 2010 (legislation.gov.uk) (Accessed 28/07/25).

Ref 16-4 The Water Environment (Water Framework Directive) (England and Wales) Regulations, 2017 [online]. Available at: https://www.legislation.gov.uk/uksi/2017/407/contents/made (Accessed 28/07/25).

Ref 16-5 DESNZ, 2023; Overarching National Policy Statement for Energy (EN-1) [online]. Available at: https://assets.publishing.service.gov.uk/media/65a7864e96a5ec0013731a93/overarching-nps-for-energy-en1.pdf (Accessed 28/07/25).

Ref 16-6 DESNZ, 2023; National Policy Statement for Natural Gas Electricity Generating Infrastructure (EN-2) [online]. Available at: https://assets.publishing.service.gov.uk/media/655dc15a544aea000dfb3239/nps-natural-gas-electricitygenerating-infrastructure-en2.pdf (Accessed 28/07/25).

Ref 16-7 DESNZ, 2023; National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) [online]. Available at: https://assets.publishing.service.gov.uk/media/655dc2d4046ed4000d8b9dd9/nps-natural-gas-supply-infrastructurepipelines-en4.pdf (Accessed 28/07/25).

Ref 16-8 DESNZ, 2023; National Policy Statement for Electricity Networks Infrastructure (EN-5) [online]. Available at: https://assets.publishing.service.gov.uk/media/655dc25e046ed400148b9dca/nps-electricity-networks-infrastructure-en5.pdf (Accessed 28/07/25).

Ref 16-9 Welsh Government, 2021; Planning Policy Wales: Edition 11 [online]. Available at: https://www.gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf (Accessed 28/07/25).

Ref 16-10 HM Government, 2011; Marine Policy Statement. [online]. Available at: https://assets.publishing.service.gov.uk/media/5a795700ed915d042206795b/pb3654-marine-policy-statement-110316.pdf (Accessed 28/07/25).

Ref 16-11 Welsh Government (2019). Welsh National Marine Plan. [online]. Available at: Welsh National Marine Plan | GOV.WALES (Accessed 28/07/25).

Ref 16-12 Welsh Government (2021). Future Wales: The National Plan 2040 https://www.gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf (Accessed 28/07/25).

Ref 16-13 FCC, 2023; Flintshire Local Development Plan 2015 – 2030. Adopted Plan 24th January 2023. [Online] Available at: https://flintshire.gov.uk/en/PDFFiles/Planning/Examination-Library-Documents/FINAL-LDP-Written-Statement-English.pdf (Accessed 28/07/25).

Ref 16-14 Halcrow Group Limited, 2010; North West & North Wales Coastal Group North West England and North Wales Shoreline Management Plan SMP2. Great Ormes Head to Scotland SMP22 [online]. Available at: Great Ormes Head to Scotland SMP22 | Shoreline Management Plans (data.gov.uk) (Accessed 28/07/25).

Ref 16-15 Environment Agency, 2016. Flood risk assessments: climate change allowances, Guidance [online]. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (Accessed 28/07/25).

Ref 16-16 Natural Resources Wales (NRW), 2020; Permit number EPR/NP3037AF.

Ref 16-17 Natural Resources Wales (NRW), 2021; Marine Physical Processes Guidance to inform Environmental Impact Assessment (EIA), Guidance Note.

Ref 16-18 Brooks, AJ., Whitehead, PA., Lambkin, DO. 2018. Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects. NRW Report No: 243, 119 pp, Natural Resources Wales, Cardiff.

Ref 16-19 Welsh Government, 2021. Climate change allowances and flood consequence assessments [online]. Available at: https://www.gov.wales/climate-change-allowances-and-flood-consequence-assessments (Accessed 28/07/25).

Ref 16-20 Welsh Government (2024). Flood and Coastal Erosion Risk Management Programme 2024 to 2025. How we are investing to reduce the risk of flooding and coastal erosion to communities.

Ref 16-21 Marine Management Organisation (2015). CEFAS, High Level Review of Current UK Action Level Guidance. MMO Project No: 1053.

Ref 16-22 National Resource Wales (2018). Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to Inform EIA of Major Development Projects.

Ref 16-23 HM Government (2009). The Eels (England and Wales) Regulations 2009 [online]. Available at: https://www.legislation.gov.uk/uksi/2009/3344/made (Accessed 28/07/25).

Ref 16-24 BGS Geology Viewer (2025). BGS Geology Map Viewer.

Ref 16-25 CEFAS (2016). Suspended Sediment Climatologies around the UK. Report for the UK Department for Business, Energy & Industrial Strategy offshore energy Strategic Environmental Assessment programme. [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf (Accessed 28/07/25).

Ref 16-26 UK Hydrographic Office, 2016. Admiralty Tide Tables, NP201, Volume 1 [online].

Ref 16-27 ABPmer, 2017. Renewables Atlas [online]. Available at: https://www.renewables-atlas.info/explore-the-atlas/

Ref 16-28 ABPmer, 2018. Data Explorer (SEASTATES).

Ref 16-29 GoBe Consultants, 2022. Awel y Môr Offshore Wind Farm Category 6: Environmental Statement, Volume 4, Annex 2.3: Physical Processes Modelling Results [online]. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010112/EN010112-000217-6.4.2.3_AyM_ES_Volume4_Annex2.3_PhysProResults_vFinal.pdf (Accessed 28/07/25).

Ref 16-30 Nicol and Wilson, 2002. Foundation geology of the River Dee estuary cable-stayed bridge, Flintshire, North Wales. Engineering Geology. 63, 131-139.

Ref 16-31 Moore, Wolf, Souza, and Flint, 2009. Morphological evolution of the Dee Estuary, Eastern Irish Sea, UK: A tidal asymmetry approach. Geomorphology, 103, 4, pp.588-596.

Ref 16-32 Halcrow Group Limited, 2013. North West Estuaries Processes Report, Dee Estuary. Prepared for Sefton Council.

Ref 16-33 Halcrow, 2010. North West England and North Wales Shoreline Management Plan SMP2. Supporting Studies. Cell Eleven Tide and Sediment Transport Study (CETaSS) Phase 2 (ii). Main Report – Summary of Findings. Report prepared by Halcrow Group Ltd for the North West and North Wales Coastal Group, 152pp.

Ref 16-34 Bolanos, Moate, and Souza, 2009. Measuring suspended sediment and its wave and turbulence forcing in the Dee Estuary. Proceedings of Coastal Dynamics, World Scientific.

Ref 16-35 AECOM (2020). TN-0002: Hydrodynamic Model Calibration. Report No. MTPP-499573-TN-0002, Rev. 2.0. Report prepared for LCRCA.

Ref 16-36 UKCP, 2023. UK Climate Projections User Interface [online]. Available at: Welcome to UKCP (metoffice.gov.uk).

Ref 16-37 GoBe Consultants, 2022. Awel y Môr Offshore Wind Farm Category 6: Environmental Statement, Non-technical summary. [online]. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010112/EN010112-000294-

6.7.1_AyM_Non-technical_Summary_English_vFinal.pdf (Accessed 28/07/25).

Ref 16-38 Gresswell, R.K., 1964. The origin of the Mersey and Dee Estuaries. Geological Journal 4, 77 – 86.