



**AQUIND Limited**

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## **PEIR CHAPTER 7**

Marine Water and Sediment Quality



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## 7 MARINE WATER AND SEDIMENT QUALITY

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### 7.1 SCOPE OF THE ASSESSMENT

#### 7.1.1 INTRODUCTION

7.1.1.1 This chapter provides the preliminary information regarding the environmental impacts on marine water and sediment quality as a result of the Proposed Development.

7.1.1.2 This chapter outlines information regarding the potential impacts associated with the construction, operation (including repair and maintenance) and decommissioning of the Proposed Development as known at the time of publication. The potential effects of decommissioning are considered, in the worst case, to be equivalent to the effects associated with construction and are assessed on this basis. They may potentially be less than those associated with construction depending on the decommissioning activities undertaken, for instance where the marine cable is left in situ.

7.1.1.3 This chapter should be read in conjunction with other parts of the PEIR including Chapter 6 Physical Processes, Chapter 8 Intertidal and Benthic Ecology, Appendix 7.1 Marine WFD Assessment, Appendix 7.2 CEA Matrix and Appendix 7.3 Contaminated Sediment Survey Report.

#### 7.1.2 STUDY AREA

7.1.2.1 The Entire Marine Cable Corridor extends from the Landfall at Eastney, near Portsmouth to Pourville in Normandy, France.

7.1.2.2 For the purposes of assessment, this chapter focuses on the Landfall and Marine Cable Corridor within the UK marine area (as this comprises the Proposed Development). Where impacts arise as a result of the combination of the impacts of the Proposed Development and the impacts of projects in the UK marine area and/or other EEA states, these will also be identified and assessed.

##### **Marine Cable Corridor and Landfall**

7.1.2.3 The Marine Cable Corridor encompasses the location of the Landfall and extends from Eastney, from MHWS, out to the UK/France EEZ boundary line (see Figure 3.1. of Chapter 3 Description of the Proposed Development).

7.1.2.4 The marine cables will make Landfall through the use of HDD methods which will travel underneath the intertidal areas at Eastney from an exit/entry point in the marine environment approximately 1 km seaward from the transition joint bays located in the car park behind Fraser Range (Figure 3.3 in Chapter 3 Description of the Proposed Development).

- 7.1.2.5 HDD is now also proposed to be undertaken at Langstone Harbour to enable the cables to cross underneath Langstone Harbour from Portsea Island to the mainland (see Figure 3.9 of Chapter 3 Description of the Proposed Development). It is anticipated that no HDD works will occur within the marine environment of Langstone Harbour as the drilling will be underneath seabed of the harbour area. The entry/exit points of the drill will be located above the MHWS mark. Chapter 3 Description of the Proposed Development provides further information on the HDD methodology at Langstone Harbour.
- 7.1.2.6 Within 1 nmi (i.e. within the jurisdiction of the WFD), the study area for the water quality assessment (shown in Figure 7.1) is the coastal and transitional water bodies in the vicinity of the Marine Cable Corridor and the associated Landfall at Eastney; namely Solent, Isle of Wight East, Langstone Harbour and Chichester Harbour.
- 7.1.2.7 The study area beyond 1 nmi, extends seaward, 20 km either side of the Marine Cable Corridor out to the UK/France EEZ boundary line.
- 7.1.2.1 Based upon experience of similar projects, the study area (both within and beyond 1 nmi) are considered to encompass the likely Zol of the Proposed Development, including any resultant sediment plume. The study area will be kept under review and revised based upon the latest available information.

## 7.2 LEGISLATION, POLICY AND GUIDANCE

- 7.2.1.1 This assessment has taken into account the current legislation, policy and guidance relevant to marine water and sediment quality. These are listed below.

### 7.2.2 LEGISLATION

#### International Legislation

- 7.2.2.1 A number of European Directives are transposed into UK law as described below:
- EC Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy - transposed into UK law under the WFD;
  - EC Directive 76/464/EC Water pollution by discharges of certain dangerous substances (Dangerous Substances Directive) and Priority Substances Directive (2008/105/EC) - transposed into UK law under the Priority/Dangerous Substances Directive;
  - EC Directive 91/271/EC concerning urban waste water treatment - transposed into UK law under the Urban Waste Water Directive;
  - EC Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy - transposed into UK law under the MSFD; and
  - The International Convention for the Prevention of Marine Pollution by Ships (MARPOL Convention) 73/78.

### National Legislation

- MCAA (2009);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242) for England and Wales. Transposition of Directive 2000/60/EC (which repeals EC Directive 2006/7/EC, known as the Bathing Water Directive and EC Directive 2006/113/EC, known as the Shellfish Waters Directive);
- Nitrate Vulnerable Zones (England and Wales) Regulations 1998 (S.I. 1998/1202); and
- Marine Strategy Regulations 2010.

## 7.2.3

### PLANNING POLICY

#### National Policy

- Para. 5.3.3 of EN-1 Overarching NPS for Energy (2011) states: *'Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project.'*
- The UK MPS (2011) is the framework for preparing Marine Plans and taking decisions affecting the marine environment. This policy aims to contribute to the achievement of sustainable development and ensure that development aims to avoid harm to marine ecology and biodiversity through consideration of issues such as impacts of noise, ecological resources and water quality.

#### Regional Policy

- South Inshore and South Offshore Marine Plan (2018) objectives include:
  - Objective 11: S-WQ-1 requires that proposals that may have significant adverse impacts upon water environment, including upon habitats and species that can be of benefit to water quality must demonstrate that they will, in order of preference: a) avoid, b) minimise, and c) mitigate significant adverse impacts.
  - Objective 12: S-BIO-3 requires that proposals that enhance coastal habitats where important in their own right and/or for ecosystem functioning and provision of goods and services will be supported. Proposals must take account of the space required for coastal habitats where important in their own right and/or for ecosystem functioning and provision of goods and

services and demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate for net loss of coastal habitat.

#### 7.2.4 GUIDANCE

- Clearing the waters for all (as updated) (Environment Agency, 2017);
- Advice Note 18: Water Framework Directive (PINS), 2017); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018).

### 7.3 SCOPING OPINION AND CONSULTATION

#### 7.3.1 SCOPING OPINION

7.3.1.1 As detailed within Chapter 1 Introduction, a Scoping Opinion was received by the Applicant from PINS on 7 December 2018. The Scoping Opinion comments relating to marine water and sediment quality and how they have been addressed in this chapter of the PEIR are set out below in Table 7.1.

**Table 7.1 – Scoping opinion responses**

<b>Consultee</b>	<b>Scoping Opinion ID</b>	<b>Comment Received</b>	<b>How this has been addressed by the Applicant</b>
<b>PINS</b>	4.2.1	<p>The Inspectorate notes paragraph 2.1.56 which states that routine maintenance will not be required, but that some unplanned repair operations may take place. Paragraph 7.3.3 acknowledges that some operation and maintenance activities (e.g. repair and reburial) may lead to similar impacts as construction, but that these are likely to be much smaller in scale than the construction works. The Inspectorate considers that the justification provided in the Scoping Report does not demonstrate the information necessary to support the decision to scope this out.</p> <p>The ES should include an assessment of operational and maintenance activities on marine water and sediment quality, where significant effects are likely to occur. The Inspectorate recognises the potential similarity between potential effects that could arise from repair and reburial works to those during construction, and therefore the Applicant should consider whether it would be appropriate to apply the same/similar mitigation measures.</p>	An assessment of the potential impact of the operation stage works (including repair and maintenance) has been included in Section 7.6.
<b>PINS</b>	4.2.2	A study area of 2 km has been chosen to establish the marine water and sediment baseline for the ES; however, no justification for this distance has been provided. The ES must clearly identify and justify the extent of the study area.	A study area of 2 km was assigned at the scoping stage in order to align with WFD guidance (Environment Agency, 2017) on scoping for WFD protected areas. This study area was used to inform the baseline which

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
			<p>reports on protected areas within and beyond 2 km.</p> <p>The study area for this chapter currently under consideration is defined in Section 7.1.2.</p> <p>The study area will be revisited upon receipt of physical processes modelling outputs, prior to submission of the ES.</p>
<b>PINS</b>	4.2.3	<p>The Inspectorate notes that contaminated sediment sampling has been completed along the inshore Marine Cable Corridor as part of the benthic sampling campaign and this is to be analysed. The Inspectorate recommends the Applicant makes effort to agree the sampling and analysis with relevant consultation bodies and present any agreements within the ES.</p> <p>It is noted that details of quality standards to be applied have not been provided at this stage. It should be noted that methods of chemical analysis should be compatible with the benchmarks they are compared against (for example the metal extraction method). The Inspectorate considers that the chemical analysis used to inform the assessment of likely significant effects is sufficiently robust and where necessary for this purpose conforms to Marine Management Organisation (MMO) dredge disposal laboratory guidelines.</p>	<p>Contaminated sediment sampling analysis and reporting has now been completed (Appendix 7.3).</p> <p>It is noted that the Inspectorate considers the chemical analysis used to inform the assessment is sufficiently robust and where necessary for this purpose, conforms to MMO laboratory guidance.</p> <p>The quality standards which were applied are set out within Appendix 7.3 of the PEIR, which details 'Site specific contaminated sediment sample collection and analysis'. Details of sample analysis, and classification of samples, and their suitability for disposal is also provided within Appendix 7.3.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
PINS	4.2.4	<p>The Applicant should seek to agree the scope of the proposed WFD assessments with relevant consultation bodies, including the Marine Management Organisation and Environment Agency. It is recommended that transitional waters and coastal waters be addressed together in a ‘marine’ WFD assessment. The Applicant should also be aware that the Bathing Water Directive, as referred to in Appendix B to the Scoping Report, has been subsumed into the WFD Directive.</p>	<p>Transitional and coastal waters are addressed together in the Marine WFD Assessment (Appendix 7.1).</p> <p>The scope of the WFD Assessment – Marine has been defined within Appendix 7.1 based on currently available information, and has been presented for agreement with consultation bodies within this PEIR submission.</p> <p>Should any amendments to the scope of the assessment be required subsequent to the PEIR submission, this will be agreed with the appropriate consultation bodies prior to submission of the ES.</p> <p>Bathing waters are considered in the WFD Assessment in Appendix 7.1.</p>
PINS	4.2.5	<p>This chapter of the Scoping Report makes no reference to the potential impacts from changes to water and sediment quality on designated sites. It is acknowledged that ecological designations are proposed to be assessed in relevant other aspect chapters of the ES. However, the Inspectorate considers that these assessments should be informed by the</p>	<p>Designated sites will be assessed under the WFD Assessment – Marine which will be reported within the ES, alongside the HRA Report, with appropriate cross-referencing throughout.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		marine water and sediment quality assessment, and appropriate cross-references should be made in the ES.	
MMO	Page: 212	Section 7 of the Scoping Report states that sediment samples from the inshore UK section of the cable route were collected as part of the benthic sampling campaign, and these samples will be analysed for particle size distribution and contaminant levels (metals, organotins, PAHs, THC's, and PCBs). The MMO considers this is sufficient to characterise the sediment to be dredged, and therefore no additional sampling is required.	Noted.
MMO	Page: 212	No topics relating to dredge and disposal activities have been scoped out of subsequent assessment. No mitigation or monitoring measures are suggested in relation to dredge and disposal activities at this stage, which is to be expected.	Noted.
MMO	Page: 212	In Sections 7 and 8 of the Scoping Report, water quality and intertidal and benthic habitats organisms have been appropriately identified as receptors to the potential impacts associated with dredge and disposal activities, such as temporary increased suspended sediments, the resuspension of contaminated sediments, smothering and disturbance of seabed.	Noted.
MMO	Page: 212	Details of quality standards have not been provided at this stage. It is noted that the Scoping Report makes reference to Cefas Action Levels for determining the suitability of sediment	Contaminated sediment sampling analysis and reporting has now been completed (Appendix 7.3).

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>for disposal at sea, which is appreciated. It should be noted that methods of chemical analysis should be compatible with the benchmarks they are compared against (for example the metal extraction method). The MMO recommends that the chemical analysis conforms to the MMO dredge disposal laboratory guidelines (<a href="https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans">https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans</a>)</p>	<p>It is acknowledged that the MMO dredge disposal laboratory guidelines referred to in the scoping opinion includes a specific reporting template. The reporting template was not used in this instance as it is designed for sample analysis undertaken during dredging and dredge disposal activities where additional information (e.g. volumes of sediment to be deposited) is known. The reporting template was therefore not considered suitable for the current purpose. Details of contaminated sediment analysis are provided in Appendix 7.3.</p> <p>Furthermore, it is noted that the Inspectorate considers the chemical analysis used to inform the assessment is sufficiently robust and where necessary for this purpose conforms to MMO laboratory guidance (ref. PINS ID 4.2.3).</p>
<b>Environment Agency</b>	Page: 108	<p>Water Framework Directive (WFD)</p> <p>We are pleased to see that the WFD has been scoped into the ES, and in particular impacts on marine water quality. We agree that the impacts on water quality from any temporary increases in suspended sediment concentrations will need to be</p>	<p>An assessment of the potential impact of the operations and maintenance stage works has been included in Section 7.6 and included in Appendix 7.1.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>considered, in particular those related to re-suspension of contaminated sediments.</p> <p>The developer proposes to only assess potential effects during construction and decommission, and to scope out any works required for maintenance. However, it is our opinion that maintenance works should be included in the ES as they still bear the same risks as any other construction work if carried out in proximity to sensitive areas such as Shellfish Waters and Bathing Waters.</p>	
<b>Environment Agency</b>	Page: 108	<p>With regard to the WFD assessment, we suggest that transitional waters and coastal waters should be addressed together in a 'marine' WFD assessment.</p> <p>We would also like to point out that the Bathing Water Directive, which is referred to Appendix B (page 22-23 of the appendices), has been subsumed into WFD, and is now considered a protected area therein. The same applies to the Shellfish Waters Directive.</p>	<p>Transitional and coastal waters are addressed together in a specific marine WFD assessment - Appendix 7.1.</p> <p>It is acknowledged that Bathing Waters are considered a protected area under the WFD, and have been assessed as such in the WFD Assessment - Marine Appendix 7.1.</p>
<b>Environment Agency</b>	Page: 108	<p>Lastly, we would like to reiterate our advice on the scope and structure of the WFD Assessment, which is the same as given previously:</p> <p>A WFD assessment will be required for all elements of the works that fall within, or have the potential to affect, a WFD water body and any of the protected areas therein (including</p>	<p>The scope of the WFD Assessment – Marine defined within Appendix 7.1 is based on current guidance and currently available information, and has been presented for agreement with consultation bodies within this PEIR submission.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>Bathing Waters and Shellfish Waters). An assessment of water quality impacts should also be included.</p> <p>There are Bathing Waters and Shellfish Waters around the area of landfall. Any sediment disturbances that lead to increases in suspended solids in the water column could potentially affect compliance with the WFD. Suitable evidence of no likely impact will be required for any marine works. Hence, marine water quality and a WFD assessment should be included in the ES.</p> <p>The WFD assessment should follow the ‘Clearing the Waters for All’ guidance, which has been published on the gov.uk website: <a href="https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters">https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters</a>.</p> <p>A WFD Assessment should comprise either:</p> <ul style="list-style-type: none"> <li>an explanation of why the activity has been screened out; or</li> <li>an explanation of why all elements have been scoped out, ideally using the scoping template; or</li> <li>an impact assessment.</li> </ul> <p>The size and scale of the WFD Assessment should be proportional to the risk posed by the potential works, but the applicant must demonstrate that they have assessed the risks and provided mitigation where necessary.</p>	<p>Inclusion of water bodies and protected areas therein (including Bathing Waters and Shellfish Waters) is based on currently available information and, if necessary, will be revised prior to submission of the ES, based upon latest Physical Processes modelling outputs.</p> <p>Water quality and a WFD Assessment – marine will be included in the ES, and impacts which have the potential to affect compliance with WFD addressed.</p> <p>In line with the ‘Clearing the Waters for All’ guidance, all marine activities are screened, in accordance with Environment Agency recommendations, some of which have been taken forward to scoping and assessment where appropriate.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
<b>Environment Agency</b>	Page: 110	<p>Summary Table</p> <p>Maintenance works should be included in the ES as they still bear the same risks as any other construction work if carried out in proximity to sensitive areas such as Shellfish Waters and Bathing Waters.</p> <p>Transitional waters and coastal waters should be addressed together in a 'marine' WFD assessment, and this should be reference in the ES.</p> <p>The Bathing Water Directive and Shellfish Waters Directive has been subsumed into WFD. This should be reflected in the ES.</p> <p>A WFD assessment will be required for all elements of the works that fall within, or have the potential to affect, a WFD water body and any of the protected areas therein (including Bathing Waters and Shellfish Waters). An assessment of water quality impacts should also be included. This should be reflected in the ES.</p> <p>Any sediment disturbances that lead to increases in suspended solids in the water column could potentially affect compliance with the WFD. Suitable evidence of no likely impact will be required for any marine works. Marine water quality and a WFD assessment should be included in the ES.</p>	<p>Operational stage works have been assessed within the PEIR.</p> <p>Transitional waters and coastal waters have been addressed together in the WFD Assessment - Marine, Appendix 7.1.</p> <p>Bathing Waters and Shellfish Waters have been assessed in the WFD Assessment - Marine, Appendix 7.1. This assessment considers all elements of the works which fall within or have the potential to affect a WFD water body and protected areas therein, based on currently available information. This will be revisited and updated prior to submission of the ES.</p> <p>Disturbance of sediments are considered in the WFD assessment, in line with the Environment Agency's recommendations and guidance.</p>
<b>Natural England</b>	Page: 225	<p>We have assessed the scoping report under the knowledge that the proposed cable route is currently indicative and will be</p>	<p>It is noted that Natural England support the consideration of impacts provided in</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>refined in the later stages of the application. Natural England has commented in respect to designated sites and species out to 12 nmi under our remit. The Joint Nature Conservation Committee (JNCC) is the statutory adviser for sites beyond 12nm.</p> <p>This is a complex proposal which will result in a number of different impacts. Natural England supports the consideration of the following impacts which have been scoped in for further assessment (as summarised in Appendix C - Table C1 of the scoping report):</p> <ul style="list-style-type: none"> <li>• Marine Water and Sediment Quality:</li> <li>• Impacts on water quality</li> <li>• Temporary increase in suspended sediment concentrations during construction (and decommissioning)</li> <li>• Impacts from the resuspension of contaminated sediment during construction (and decommissioning)</li> <li>• Natural England has noted that the following impacts have been scoped out of further assessment:</li> <li>• Marine Water and Sediment Quality:</li> <li>• Temporary increase in suspended sediment concentrations and impacts associated with</li> </ul>	<p>Appendix C - Table C1 of the scoping report. This table included an error. In line with page 98 of the EIA Scoping Report (PINS Ref: EN020022) ‘temporary increase in suspended sediment concentrations’ and ‘impacts from the resuspension of contaminated sediment’, are considered to sufficiently assess impacts on marine water &amp; sediment quality.</p> <p>An assessment of the potential impact of the operational stage works is included in Section 7.6.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		resuspension of contaminated sediment during operation and maintenance.	
<b>Public Health England</b>	Page: 238	<p>Receptors</p> <p>The ES should clearly identify the development’s location and the location and distance from the development of off-site human receptors that may be affected by emissions from, or activities at, the development. Off-site human receptors may include people living in residential premises; people working in commercial, and industrial premises and people using transport infrastructure (such as roads and railways), recreational areas, and publicly-accessible land. Consideration should also be given to environmental receptors such as the surrounding land, watercourses, surface and groundwater, and drinking water supplies such as wells, boreholes and water abstraction points.</p>	<p>It is acknowledged that impacts to water and sediment quality could have impacts on public health if there is a reduction in the quality of recreational areas such as Bathing Waters. The WFD Assessment - Marine (Appendix 7.1) addresses potential for effects on designated bathing waters which may result from the marine works, findings of which have informed this PEIR chapter. This assessment will be updated based upon available information prior to submission of the ES.</p>
<b>Public Health England</b>	Page: 239	<p>Emissions to air and water:</p> <p>When considering a baseline (of existing environmental quality) and in the assessment and future monitoring of impacts these:</p> <ul style="list-style-type: none"> <li>• Should include appropriate screening assessments and detailed dispersion modelling where this is screened as necessary.</li> <li>• Should encompass all pollutants which may be emitted by the installation in combination with all pollutants arising from associated development and transport,</li> </ul>	<p>The WFD Assessment - Marine (Appendix 7.1) considers the potential for effects on designated bathing waters which may result from the marine works, findings of which have informed this PEIR chapter.</p> <p>This assessment will be updated based upon available information (e.g. physical processes modelling) prior to submission of the ES.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>ideally these should be considered in a single holistic assessment should consider the construction, operational, and decommissioning phases.</p> <ul style="list-style-type: none"> <li>• Should consider the typical operational emissions and emissions from start-up, shut-down, abnormal operation and accidents when assessing potential impacts and include an assessment of worst-case impacts.</li> <li>• Should fully account for fugitive emissions.</li> <li>• Should include appropriate estimates of background levels.</li> <li>• Should identify cumulative and incremental impacts (i.e. assess cumulative impacts from multiple sources), including those arising from associated development, other existing and proposed development in the local area, and new vehicle movements associated with the proposed development; associated transport emissions should include consideration of non-road impacts (i.e. rail, sea, and air).</li> <li>• Should include consideration of local authority, Environment Agency, Defra national network, and any other local site-specific sources of monitoring data.</li> <li>• Should compare predicted environmental concentrations to the applicable standard or guideline value for the</li> </ul>	<p>Potential impacts of pollutant release have been addressed both in relation to potential release of contaminants in sediment disturbed during the works (Section 7.6) and through pollution events (Sections 7.6. and 7.7).</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>affected medium (such as UK Air Quality Standards and Objectives and Environmental Assessment Levels) – If no standard or guideline value exists, the predicted exposure to humans.</p> <ul style="list-style-type: none"> <li>• Should be estimated and compared to an appropriate health-based value (a Tolerable Daily Intake or equivalent). Further guidance is provided in Annex 1. This should consider all applicable routes of exposure e.g. include consideration of aspects such as the deposition of chemicals emitted to air and their uptake via ingestion.</li> <li>• Should identify and consider impacts on residential areas and sensitive receptors (such as schools, nursing homes and healthcare facilities) in the area(s) which may be affected by emissions, this should include consideration of any new receptors arising from future development</li> </ul>	
<b>Public Health England</b>	Page: 239	<p>Emissions to air and water:</p> <p>Significant impacts are unlikely to arise from installations which employ Best Available Techniques (BAT) and which meet regulatory requirements concerning emission limits and design parameters. However, PHE has a number of comments regarding emissions in order that the EIA provides a comprehensive assessment of potential impacts.</p>	<p>A human health assessment is presented in Chapter 25 of the PEIR. Furthermore, the WFD Assessment – Marine (Appendix 7.1) assesses potential impacts on recreational areas such as bathing waters.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>When considering a baseline (of existing water quality) and in the assessment and future monitoring of impacts these:</p> <ul style="list-style-type: none"> <li>• Should include assessment of potential impacts on human health and not focus solely on ecological impact.</li> <li>• Should identify and consider all routes by which emissions may lead to population exposure (e.g. surface watercourses; recreational waters; sewers; geological routes etc.).</li> <li>• Should assess the potential off-site effects of emissions to groundwater (e.g. on aquifers used for drinking water) and surface water (used for drinking water abstraction) in terms of the potential for population exposure.</li> <li>• Should include consideration of potential impacts on recreational users (e.g. from fishing, canoeing etc.) alongside assessment of potential exposure via drinking water</li> </ul>	
<b>Public Health England</b>	Page: 241	<p>Other aspects:</p> <p>Within the EIA PHE would expect to see information about how the promoter would respond to accidents with potential off-site emissions e.g. flooding or fires, spills, leaks or releases off-site. Assessment of accidents should: identify all potential hazards in relation to construction, operation and decommissioning; include</p>	<p>Pollution prevention and response procedures will be followed throughout all stages of the Proposed Development.</p> <p>Specifically, in relation to marine waters, marine pollution contingency methods will be developed by considering all appropriate</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>an assessment of the risks posed; and identify risk management measures and contingency actions that will be employed in the event of an accident in order to mitigate off-site effects.</p> <p>The EIA should include consideration of the COMAH Regulations (Control of Major Accident Hazards) and the Major Accident Off-Site Emergency Plan (Management of Waste from Extractive Industries) (England and Wales) Regulations 2009: both in terms of their applicability to the installation itself, and the installation's potential to impact on, or be impacted by, any nearby installations themselves subject to the these Regulations.</p>	<p>regulations and agreed with the PINS and appropriate advisors including the MMO.</p>
<p><b>Public Health England</b></p>	<p>Page: 246</p>	<p>Human health risk assessment (chemical pollutants):</p> <p>The points below are cross-cutting and should be considered when undertaking a human health risk assessment:</p> <ul style="list-style-type: none"> <li>• The promoter should consider including Chemical Abstract Service (CAS) numbers alongside chemical names, where referenced in the ES.</li> <li>• Where available, the most recent United Kingdom standards for the appropriate media (e.g. air, water, and/or soil) and health-based guideline values should be used when quantifying the risk to human health from chemical pollutants. Where UK standards or guideline values are not available, those recommended by the</li> </ul>	<p>Pollution prevention and response procedures will be followed throughout all stages of the Proposed Development.</p> <p>Specifically, in relation to marine waters, marine pollution contingency methods will be developed by considering all appropriate guidelines and regulations, and will be agreed with the PINS and appropriate advisors, including the MMO, prior to commencement.</p>

Consultee	Scoping Opinion ID	Comment Received	How this has been addressed by the Applicant
		<p>European Union or World Health Organisation can be used.</p> <ul style="list-style-type: none"> <li>• When assessing the human health risk of a chemical emitted from a facility or operation, the background exposure to the chemical from other sources should be taken into account.</li> <li>• When quantitatively assessing the health risk of genotoxic and carcinogenic chemical pollutants PHE does not favour the use of mathematical models to extrapolate from high dose levels used in animal carcinogenicity studies to well below the observed region of a dose-response relationship. When only animal data are available, we recommend that the 'Margin of Exposure' (MOE) approach<sup>10</sup> is used</li> </ul>	

## 7.3.2 CONSULTATION

7.3.2.1 Consultation is a key part of the DCO application process. Further consultation will be undertaken after views have been sought on the PEIR, including as part as further pre-application engagement and following submission of the DCO application.

7.3.2.2 Details of project consultation undertaken to date and planned future consultation for all disciplines is presented within Chapter 5 Consultation.

## 7.4 METHODS OF ASSESSMENT

7.4.1.1 The assessment methodology used in this PEIR chapter is based on that outlined by the CIEEM for projects in marine and coastal environments (CIEEM, 2018). Where potential impacts are within the WFD transitional and coastal water bodies, the assessment has drawn from the findings of the WFD assessment (Appendix 7.1).

### 7.4.2 SIGNIFICANCE CRITERIA

7.4.2.1 With regards to the transitional and coastal water bodies assessed within the WFD assessment (see Appendix 7.1); a significant effect in the EIA is considered to be one that results in a deterioration of a water body's status, or prevention of a water body reaching 'good' status as a result of the Proposed Development.

7.4.2.2 Beyond the jurisdiction of the WFD (i.e. >1 nmi from land), significant effects have been defined as those which are great enough that they need to be taken into account during the consenting process i.e. those where the effect of an activity is negative, the extent and magnitude of the effect are likely to be large, duration is likely to be long, and/or the effect is likely to be irreversible.

### 7.4.3 LIMITATIONS

7.4.3.1 The information presented within Chapter 3 Description of the Proposed Development presents the most recent emerging information on the most likely construction methods for the Proposed Development. As the design and construction methods for the Proposed Development are still evolving at the time of writing of this chapter, not all of the proposed construction methods have been assessed. Accordingly, assessments within this chapter do not give consideration to the following methods described in Chapter 3 Description of the Proposed Development;

- Use of flotation pits to enable installation vessels to approach closer to shore;
- Grounding of installation vessels on the seabed at low tide; and
- Use of a TSHD vessel to create the trench for pre-lay installation.

- 7.4.3.2 The approach to modelling of sediment deposit (resulting from seabed preparation, HDD exit/entry pit, and omega joint excavation) is described in Chapter 6 Physical Processes. Plume dispersion modelling is being undertaken for the Proposed Development; however the results of this are not available to inform the PEIR. This assessment is based upon available data sources and will be validated, and updated where required, once the modelled data is available. The outputs from the modelling will be used to refine the Zol and update and finalise conclusions as part of the final ES.
- 7.4.3.3 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the Proposed Development on identified sensitive receptors will be undertaken as part of the continuing EIA process and the results included in the final ES. Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments and will be presented in the ES.
- 7.4.3.4 Specifically, the scope of the Marine WFD Assessment (Appendix 7.1) has been defined; however, the impact assessment has not yet been completed. The WFD assessment will be completed prior to the ES submission based on the most up to date information, and conclusions made will further inform this chapter.
- 7.4.3.5 Furthermore, the HRA Report will be completed and submitted as part of the DCO application. The findings of the HRA Report will be used to inform both the WFD Assessment and this chapter, where effects on marine water and sediment quality and WFD receptors have connectivity with Natura 2000 designated sites.

## 7.5 BASELINE ENVIRONMENT

### 7.5.1 DATA SOURCES

- 7.5.1.1 The baseline environment has been described using information from the literature (Table 7.2), and site-specific surveys for contaminated sediments (Appendix 7.3). This information is considered to be sufficient to characterise the baseline within the study area and conduct a proportionate assessment given the nature of the Proposed Development.

**Table 7.2 – Data Sources**

Organisation	Data type	Details
Natural Power Consultants Ltd	Benthic and intertidal survey (Appendix 8.1)	Site specific benthic and intertidal surveys.

Organisation	Data type	Details
<b>Natural Power Consultants Ltd</b>	Contaminated sediment survey results (Appendix 7.3)	Site specific contaminated sediment sample collection and analysis.
<b>Partrac Ltd</b>	Coastal Processes Modelling (Chapter 6 Physical Processes)	Detail of baseline environment and outline of approach to assessment including brief narrative of sediment plume modelling.
<b>National Grid</b>	IFA2 ES (RSK Environmental Ltd ('RSK') 2016)	Coastal Processes chapter including water quality of the ES for IFA2, a nearby interconnector project.
<b>Rampion Offshore Wind Farm ('OWF')</b>	Rampion ES Section 11 – Marine Ornithology (RSK, 2012).	Coastal Processes chapter including water quality of the ES for Rampion OWF; an OWF located 13 km off the coast of Sussex, to the east of the Marine Cable Corridor.
<b>Gouillou <i>et al.</i> (2017)</b>	Modelling Near-surface Suspended Sediment Concentration ('SSC') in the Channel	Published literature comparing measured and modelled near surface SSC in the Channel.
<b>Defra</b>	Magic Map Application	Online mapping resource providing layers of habitat types and features within the study area.
<b>Environment Agency</b>	Environment Agency Data Catchment Explorer	Information relating to Water Bodies monitored under the remit of the WFD.
<b>OSPAR</b>	OSPAR Intermediate Report (OSPAR, 2017a)	Multinational assessment and monitoring effort in the OSPAR Maritime Area. The Channel lies in the Greater North Sea OSPAR Geographic Region (Region II).

## 7.5.2 MARINE WATER QUALITY

### 7.5.2.1

The waters of the Channel are characterised as shallow and well mixed with a seasonal thermocline as a result of seasonal changes in temperature and salinity (Gentilhomme and Lizon, 1998; Halsband-Lenk and Antajan, 2010; Masquelier *et al.*, 2011; Tappin and Millward, 2015). As a result of its confined geography and prevailing south westerly winds, it is susceptible to swells and coastal flooding (Tappin and Millward, 2015).

- 7.5.2.2 There has been significant improvement in water quality within the Channel since 1990 regarding the input of nutrients; however, eutrophication is still considered to be a problem (OSPAR, 2017a). Water quality in UK waters has improved in recent years particularly due to the reduction of discharged effluent due to implementation of the Urban Waste Water Directive. Similarly, tighter controls on nutrient inputs, as directed by the Nitrates Directive, have contributed to an improvement in water quality. Despite improvements however, the terrestrial area directly surrounding the Landfall and Solent is still designated as a nutrient (nitrate) sensitive area ('NSA') under the Nitrates Directive.
- 7.5.2.3 In a recent study of the current health status of the North-East Atlantic by OSPAR, the main source of nutrients in coastal areas was found to be from rivers, particularly related to estuaries and areas affected by river plumes, with several spikes in nutrient input levels coincided with large flooding events (OSPAR, 2017a). High levels of nitrogen and phosphorus were being produced from the Portsmouth area, with Chichester Harbour classified as a 'problem area' for eutrophication and Langstone Harbour was classified as a 'potential problem area' (OSPAR, 2017b). The remainder of the Channel out to the 12 nmi limit was classified as a 'non-problem area' (OSPAR, 2017b).
- 7.5.2.4 The study area is supplied with oxygen-rich water originating from the Atlantic. Studies on oxygen demand in the Solent-Southampton Estuary system recorded that despite oxygen demand, dissolved oxygen levels never dropped below 80% (Shi, 2000).
- 7.5.2.5 The Marine Cable Corridor passes through South East Transitional and Coastal (TraC) Management Catchment, part of the broader South East River Basin District. The smaller operational catchments (Solent and Isle of Wight TraC) are subdivided into water bodies, of which the Marine Cable Corridor passes through Isle of Wight East and the Solent. Water bodies are defined as part of the South East District RBMP, which includes transitional waters and coastal waters up to 1 nmi from the shore (Environment Agency, 2015).
- 7.5.2.6 The Landfall is situated close (<1 km) to the entrance to the Langstone Harbour water body (Figure 7.1) and >5 km from the entrance to Chichester Harbour water body. Details of water bodies' biological and chemical statuses for Cycles 1 and 2 of the WFD are provided online in the Environment Agency's Catchment Data Explorer (Environment Agency, 2018). Full details of the status of the water bodies are provided in Appendix 7.1 Marine Water Framework Directive Assessment and summarised below.

### **Isle of Wight East Water Body**

- 7.5.2.7 The Isle of Wight East water body is described as ‘heavily modified’ due to extensive flood protection and coastal erosion protection. The water body’s overall classification has remained consistently ‘good’, with both the ecological and chemical elements being awarded ‘good’ status. The waterbody met its 2015 objectives. There are no shellfish waters within the water body, however there are a number of bathing waters, and overlapping Natura 2000 sites.

### **Solent Water Body**

- 7.5.2.8 The Solent coastal water body is ‘heavily modified’ due to extensive coastal erosion and flooding protection, and use for navigation, ports & harbours. Its overall classification has remained ‘moderate’ from 2013 to 2016. This was determined based on its ecological status, which fell short on supporting elements (surface water), angiosperms (seagrass and saltmarshes), and dissolved inorganic nitrogen which were all classed as ‘moderate’. Its chemical status improved to ‘good’ in 2016.
- 7.5.2.9 Reasons for not achieving ‘good’ status for the overall water body in 2015 are listed as unfavourable balance of costs and benefits, disproportionate burdens, and there being no known technical solutions available. Furthermore, action to get biological element to good would have significant adverse impact on use. The target of reaching ‘good’ status has been delayed until 2027.
- 7.5.2.10 There are a number of shellfish waters, bathing waters, and overlapping Natura 2000 sites within the Solent.

### **Langstone Harbour Water Body**

- 7.5.2.11 Langstone Harbour is a transitional water body. As with the Solent and Isle of Wight East water bodies, its hydromorphological designation is ‘heavily modified’ due to extensive flood protection and coastal erosion protection.
- 7.5.2.12 Langstone Harbour’s overall status classification has remained ‘moderate’ from 2013 to 2016, with its ecological status also reported as ‘moderate’ due to mitigation measures for supporting elements (surface water) recorded as ‘moderate or less’. The water body failed in its chemical objectives in 2013 and 2014 (due to presence of priority hazardous substance mercury and its compounds) but improved to ‘good’ in 2015 and 2016. Disproportionate burdens are cited as the reason to delay the target of reaching ‘good’ status until 2027. There are no bathing waters within the water body, however there are a number of shellfish waters and overlapping Natura 2000 sites.

### **Chichester Harbour Water Body**

- 7.5.2.13 Chichester Harbour is a transitional water body. As with the other water bodies in the vicinity, its hydromorphological designation is ‘heavily modified’ due to extensive flood protection and coastal erosion protection.

7.5.2.14 Chichester Harbour’s overall status classification has remained ‘moderate’ from 2013 to 2016, with its ecological status also reported as ‘moderate’ due to as mitigation measures for supporting elements (surface water) recorded as ‘moderate or less’, as well as high levels of dissolved inorganic nitrogen, ‘moderate’ invertebrate infaunal quality index (‘IQI’) and excessive algal growth (macroalgae). Input of dissolved inorganic nitrogen comes from land run off and sewage discharge, as well as background coastal sources. The water body has received a consistently ‘good’ chemical status from 2013 to 2016, with no chemical pollutants in sufficient concentration to cause concern.

7.5.2.15 Chichester Harbour was not assessed prior to 2013, and therefore the original deadline of 2015 does not apply. The deadline for improvement of quality status to ‘good’ has been set at 2027 due to disproportionate burdens, unfavourable balance of cost and benefits in relation to hydrology, and time required for ecological recovery. As per Langstone Harbour, there are no bathing waters within the water body, however there are a number of shellfish waters and overlapping Natura 2000 sites.

### 7.5.3 MARINE SEDIMENTS

7.5.3.1 Seabed sediments were characterised using a combination of publicly available sources and a site-specific survey undertaken in the benthic survey area, defined as 500 m either side of the Marine Cable Corridor. A full description of marine sediments has been provided in Chapter 8 Intertidal and Benthic Ecology and Appendix 8.1 Benthic Ecology Survey Report and is summarised here.

#### Habitat classifications

7.5.3.2 Within 1 nmi of the shore, detailed survey analysis undertaken during benthic baseline surveys showed the majority of habitat classifications within the benthic survey area was composed of A5.43 (Circalittoral mixed sediments) with A5.23 (Infralittoral fine sand) found close to the shore. EMODnet (2016) predictions of EUNIS habitat classifications in the vicinity of the benthic survey area (also shown in Figure 7.1) indicated a high incidence of A5.14 (Circalittoral coarse sediment) and A5.23 (Infralittoral fine sand).

7.5.3.3 Survey results in the Channel (outwith 1 nmi) shown in Appendix 8.1 reveal a progression from A5.43 (Circalittoral mixed sediments) to A5.14 (Circalittoral coarse sediment), to A5.15 (Offshore circalittoral coarse sediment).

7.5.3.4 In the area surrounding the benthic survey area, EMODnet predictions of EUNIS habitat classifications also indicated a high incidence of A5.23 or A5.24 (Infralittoral sand or muddy sand) and A5.14 (Circalittoral coarse sediment), A5.25 or A5.26 (Circalittoral fine sand or muddy sand) and A5.33 or A5.35 (Infralittoral or Circalittoral sandy mud) (EMODnet, 2016).

### **Sediment composition**

- 7.5.3.5 Composition of sediments across the benthic survey area in English waters ranged from predominantly sandy gravel and muddy sandy gravel to finer muds and sands. In general, sampling stations further offshore were dominated by coarser sediments. Inshore grounds typically comprised mixed sediments with the exception of sampling station 2 near to Eastney, which was characterised by finer sands. One grab sample (station 3) comprised 60.4% mud; however, the mud fraction did not exceed 18% at any other station, and only exceeded 10% at three sampling stations. Total Organic Carbon ('TOC') values for all sampling stations in UK waters fell between 0.2% (station 2) and 2.9% (station 3), with the majority of samples greater than 0.5%. Full detail of Particle Size Analysis ('PSA') and TOC analysis is presented in Appendix 8.1 Benthic Ecology Survey Report.

### **Suspended sediments**

- 7.5.3.6 Literature indicates that background levels of SSC within the Solent are naturally higher than that of the Channel, resulting in a spatial zonation between highly turbid coastal waters with mean near surface SSC of 10-25 mg<sup>l</sup><sup>-1</sup> and waters further offshore with low concentrations of 2 to 3 mg<sup>l</sup><sup>-1</sup> (Guillou, *et al.*, 2017). Storm events can reportedly raise SSC in nearshore naturally turbid environments by a factor of 10-20, with SSC reported up to 95 mg<sup>l</sup><sup>-1</sup> in coastal locations in the Channel (Guillou *et al.*, 2017; RSK Environmental Ltd, 2012). Further offshore, storm events can cause SSC levels to reach c. 20 mg<sup>l</sup><sup>-1</sup> (Guillou *et al.*, 2017).
- 7.5.3.7 Further details of baseline SSC in the Channel is provided in Chapter 6 Physical Processes.

### **Contaminated Sediment Analysis**

- 7.5.3.8 A total of ten sampling stations were used for the contaminated sediment survey, as part of the benthic survey (see Appendix 8.1 and Appendix 7.3 Contaminated Sediment Survey Report for further details). These were spaced along the benthic survey area, which is defined as 500 m either side of the Marine Cable Corridor. It should be noted that sample collection was undertaken during earlier design iterations of the Proposed Development and at the time, the Marine Cable Corridor followed a slightly different route, and an East Wittering landfall option was being considered. Stations 5 – 7 were selected in order to sample this Landfall option, which has since been removed from the Proposed Development.

- 7.5.3.9 Analysis of ten samples collected within UK waters for contaminants indicated that for a single metal (arsenic) two stations (5 and 26) exceeded Cefas Action Level ('AL') 1 and one station (5) exceeded OSPAR Background Assessment Concentrations ('BAC's) (MMO, 2015). While these stations were within the original benthic survey area which was based on earlier design iterations, neither of these stations are within the current Marine Cable Corridor (see Figure 2 in Appendix 7.3). Arsenic levels at five other stations were above OSPAR Effects Range Low ('ERL'), but below AL 1. The levels for all remaining metals were generally low, with no other metals exceeding AL 1 in any sample.
- 7.5.3.10 The majority of the Poly-Chlorinated Biphenyls ('PCB') were below the limit of detection and none of the stations exceeded Cefas AL 1 for total PCBs. Organotin compounds, dibutyl tin ('DBT') and tributyl tin ('TBT'), were below the limits of detection <1 µgkg<sup>-1</sup>, therefore did not exceed Cefas AL 1 or OSPAR levels. Full analysis of contaminated sediment samples is presented in Appendix 7.3 Contaminated Sediment Survey Results (UK).
- 7.5.3.11 Due to the proximity of the Marine Cable Corridor to industrial and recreational ports along the south coast (Southampton, Portsmouth, Langstone Harbour) the slightly elevated levels in the fine muds was expected and similar results had been found in both IFA2 (RSK, 2016) and Rampion EIA surveys (RSK, 2012).

#### 7.5.4 DESIGNATED SITES

- 7.5.4.1 A number of WFD Protected Areas within the study area were scoped in to the Marine WFD Assessment (Appendix 7.1) and are presented in Table 7.3.
- 7.5.4.2 While Natura 2000 sites (SAC and SPA) were scoped in to the assessment, potential effects will be assessed within the HRA, findings of which will be used to update the WFD assessment prior to submission of the DCO application.

Table 7.3 – Designated sites scoped in for assessment

Name	Criteria	Current Status	Approx. closest distance to the Proposed Development* (km)
Natura 2000			
<b>Solent Maritime SAC</b>	Qualifying features: estuaries; spartina swards ( <i>Spartinion maritimae</i> ); Atlantic salt meadows ( <i>Glaucopuccinellietalia maritimae</i> ); sandbanks which are slightly covered by sea water all the time; mudflats and sandflats not covered by seawater at low tide; coastal lagoons; annual vegetation of drift lines; perennial vegetation of stony banks; salicornia and other annuals colonizing mud and sand; shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes").	Designated	0
<b>South Wight Maritime SAC</b>	Qualifying features: reefs; vegetated sea cliffs of the Atlantic and Baltic Coasts; submerged or partially submerged sea caves	Designated	3.30
<b>Chichester and Langstone Harbours SPA</b>	Qualifying features**: Little tern ( <i>Sterna albifrons</i> ) Common tern ( <i>Sterna hirundo</i> ) Sandwich tern ( <i>Sterna sandvicensis</i> ) Red-breasted merganser ( <i>Mergus serrator</i> )	Designated	0.04

Name	Criteria	Current Status	Approx. closest distance to the Proposed Development* (km)
<b>Solent and Southampton Water SPA</b>	Qualifying features**: Little tern ( <i>Sterna albifrons</i> ) Sandwich tern ( <i>Sterna sandvicensis</i> ) Common tern ( <i>Sterna hirundo</i> ) Roseate tern ( <i>Sterna dougalli</i> ) Mediterranean gull ( <i>Larus melanocephalus</i> )	Designated	6.69
<b>Solent and Dorset pSPA</b>	Qualifying features**: Sandwich tern ( <i>Sterna sandvicensis</i> ) Common tern ( <i>Sterna hirundo</i> ) Little tern ( <i>Sterna albifrons</i> )	Proposed	0
<b>Bathing Waters</b>			
<b>Eastney</b>	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	0.43
<b>Beachlands West</b>	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	2.12

Name	Criteria	Current Status	Approx. closest distance to the Proposed Development* (km)
Southsea East	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	2.51
Beachlands Central	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	3.96
Eastoke	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	4.28
West Wittering	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	6.01
Bracklesham Bay	Monitored for the presence of faecal indicator organisms by the Environment Agency.	Excellent quality	6.92
<b>Shellfish Waters</b>			
Langstone Harbour (UKSW33)	Monitored for faecal indicator organisms by Cefas.	Class B (effective from 3 September 2018)	0.01
Solent water body Spithead and Stokes Bay (UKSW48) Ryde (UKSW487)	Monitored for faecal indicator organisms by Cefas.	Class B – LT (effective from 3 September 2018)	Spithead and Stokes Bay: 2.70 Ryde: 2.97

Name	Criteria	Current Status	Approx. closest distance to the Proposed Development* (km)
<b>Chichester Harbour</b> <b>Emsworth Channel (UKSW30)</b> <b>Thornham Channel (UKSW31)</b>	Monitored for faecal indicator organisms by Cefas.	Emsworth Channel: Class B (effective from 3 September 2018).  Data not available for Thornham Channel.	Emsworth: 4.55 Thornham: 6.46

\*Distance calculated based on closest point between the edge of the Proposed Development and the edge of the protected site. '0' indicates overlap with the Proposed Development.

\*\*Only those qualifying features with potential connectivity to the Proposed Development are shown. Connectivity was established using maximum foraging range values from Thaxter *et al.*, (2012).

## 7.5.5 IDENTIFICATION OF RECEPTORS

7.5.5.1 The receptors to be assessed within this chapter are:

- WFD Water Bodies: Solent, Isle of Wight East, Langstone Harbour and Chichester Harbour; and
- Marine waters and sediment of the Channel (beyond 1 nmi and therefore outwith the scope of the WFD assessment).

## 7.5.6 FUTURE BASELINE

7.5.6.1 The baseline environment present in the vicinity of the Proposed Development is currently undergoing significant change through the implementation of legislation aimed at protecting and improving the water environment. In the absence of the Proposed Development, the water quality status is considered to continue to improve as a result of current management regimes and increased coordination of marine activities under the WFD and national planning policy, subject to the influence of large-scale climactic factors that may occur in such a time period.

## 7.6 IMPACT ASSESSMENT

7.6.1.1 The following potential impacts on marine water and sediment quality were identified during scoping:

- Construction (and decommissioning):
  - Temporary increase in SSC; and
  - Impacts from the resuspension of contaminated sediment.

7.6.1.2 Whilst some operation and maintenance activities (e.g. repair and reburial of sections of cable) may lead to similar impacts as those above, these are considered likely to be much smaller in scale than construction works.

7.6.1.3 For the purposes of the PEIR assessment, no consideration of the potential activities of construction of the flotation pits, grounding of vessels at low tide or the use of TSHD for cable trenching is included in the below assessment. If these methods remain part of the final Project design, impacts associated with these activities will be assessed for the ES.

7.6.1.4 HDD activities to the north-west of Langstone Harbour (A2030 Bridge), will not directly impact receptors as TJBs will be located above MHWS, and ducts will be installed under the intertidal zone and marine environment. Marine pollution contingency plans will be adhered to throughout works. As a result, under standard operations there will be no impact to water quality as a result of the HDD works in this location.

7.6.1.5 Similarly, the onshore HDD works in the car park at Eastney i.e. TJBs, and the drilling under the intertidal area at Eastney will not result in any potential effects to water quality. However, the excavation works at the marine entry/exit point off the coast at Eastney required prior to HDD works is considered within this assessment as part of the broader route preparation works.

## 7.6.2 WORST CASE DESIGN ENVELOPE

7.6.2.1 Table 7.4 presents the worst-case design parameters as they apply to marine water and sediment quality.

**Table 7.4 – Worse case design parameters**

Potential impact	Design envelope scenario assessed
<b>Construction (&amp; Decommissioning) stage</b>	
<b>Temporary increase in suspended sediment concentrations</b>	Deposit of 1,700,000 m <sup>3</sup> of sediment from route preparation works (including deposit of dredged material, HDD pit excavation and omega cable joints)
<b>Resuspension of contaminated sediment</b>	
<b>Operation (including maintenance and repair) stage</b>	
<b>Temporary increase in suspended sediment concentrations</b>	<p>The Proposed Development has been designed so that maintenance of the marine cables is not required during its operational lifetime.</p> <p>During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years.</p> <p>Should repair and maintenance works be required, it is anticipated that the works would be of shorter duration and smaller in extent than the installation works required during the construction stage.</p>
<b>Resuspension of contaminated sediment</b>	

### 7.6.3 CONSTRUCTION (AND DECOMMISSIONING)

#### Temporary Increase in SSC

7.6.3.1 Activities associated with the Proposed Development will cause a temporary increase in SSC which could negatively impact the identified receptors through increased turbidity and release of sediment bound nutrients thus making them biologically available to marine organisms. Additionally, increases in SSC could give rise to high oxygen demands, thus reducing the levels of dissolved oxygen within the water. It is anticipated that overall increases in SSC will occur within the study area following route preparation (including deposit of dredged material, HDD pit excavation and cable joint work).

#### WFD Water Bodies

7.6.3.2 The WFD assessment (Appendix 7.1) will be revisited prior to submission of the final ES and results will inform this assessment.

#### Marine Water and Sediment of the Channel (beyond 1 nmi)

7.6.3.3 Literature indicates that background levels of SSC within the Channel are naturally lower than that of the Solent, with mean near surface SSC of 10 to 35 mg $l^{-1}$  in coastal waters and 2 to 3 mg $l^{-1}$  (Guillou *et al.*, 2017) in waters further offshore. However, storm events increase SSC in open coastal environments to 100-180 mg $l^{-1}$  (Guillou *et al.*, 2017), and offshore, storm events can cause SSC levels to reach approximately 20 mg $l^{-1}$  (Guillou *et al.*, 2017).

7.6.3.4 It is predicted that increases in turbidity as a result of the Proposed Development may exceed levels observed during storm events although they are expected to reduce to background levels in a relatively short period of time (e.g. days). Furthermore, it is considered that the water quality within the Channel has the capacity to accommodate increases in turbidity as the water exchange would remain unrestricted throughout all stages of the Proposed Development, allowing rapid recovery to background levels.

7.6.3.5 While release of sediment bound nutrients would have the potential to increase algal growth under suitable conditions, the study area is supplied with oxygen-rich water originating from the Atlantic, and algal blooms are unlikely to occur where there is significant flushing of oxygen rich waters.

7.6.3.6 It is therefore considered that the marine water and sediments of the Channel (beyond 1 nmi) demonstrate high recoverability to the impact, and while the sediment plume may extend over a large area, its magnitude (in this instance considered to be the degree of change from baseline) is predicted to be low and the impact will be temporary. It is concluded therefore, that no significant effects will occur as a result of this impact.

### **Resuspension of Contaminated Sediment**

7.6.3.7 Activities associated with the Proposed Development will result in the resuspension of sediments, which may result in the release of toxic chemicals which are biologically available.

7.6.3.8 Out of 10 stations analysed for contaminated sediments, two identified arsenic concentrations in excess of Cefas AL 1. Both stations were situated outside of the Marine Cable Corridor and are therefore unlikely to be disturbed. None of the samples within the Marine Cable Corridor exceeded either Cefas AL 1 or OSPAC BACs. No contaminants were detected in concentrations greater than Cefas AL 2.

### **WFD Water Bodies**

7.6.3.9 The WFD assessment (Appendix 7.1) will be revisited prior to submission of the final ES and results will inform this assessment.

### **Marine Water and Sediment of the Channel (beyond 1nmi)**

7.6.3.10 Contaminated sediment sampling and analysis of stations in the Channel (>1 nmi) indicates that contamination is low and below detection levels of all contaminants analysed (Appendix 7.3). Furthermore, based on the results of surveys undertaken for IFA 2 and Rampion OWF, levels of contaminants in sediments in deeper water in the Channel are generally low or below detection levels. Deposit of dredged material originating beyond 1 nmi is therefore not considered to pose a risk to marine water and sediment quality.

7.6.3.11 Sediment disturbance and the subsequent release of contaminants, if present, is considered to be a higher potential risk in inshore waters (<1 nmi) due to the higher concentration of source activity (e.g. land runoff, shipping traffic, industry and spoil dumping). There is potential for sediments which originated within the 1 nmi limit to be deposited beyond the 1 nmi limit, or for the resultant plume to extend beyond 1 nmi.

7.6.3.12 Contaminated sediment sample analysis within 1 nmi of the shore identified two stations within the benthic survey area which contained levels of arsenic above Cefas AL 1, though neither of these were within the Marine Cable Corridor. No contaminants in any samples exceeded Cefas AL 2.

7.6.3.13 Levels of arsenic detected within the benthic survey area are generally consistent with levels detected within samples collected for nearby developments, namely IFA2 (RSK, 2016) and Rampion OWF (RSK, 2012).

7.6.3.14 While disturbance and release of sediments contaminated with low levels of arsenic will have negative effects on marine water and sediment quality, these will be temporary and low in magnitude (i.e. degree of change above baseline). Furthermore, dilution effects within the Channel, due to increased rates of flushing, will result in habitats receiving lower concentrations of contaminants. It is concluded therefore, that no significant effects will occur as a result of this impact.

## 7.6.4 OPERATION (INCLUDING REPAIR AND MAINTENANCE)

### Temporary Increase in SSC

7.6.4.1 Activities associated with marine cable repair(s) during the operational life of the Proposed Development will cause a temporary increase in SSC which could negatively impact the identified receptors through increased turbidity and release of sediment bound nutrients thus making them biologically available to marine organisms. Additionally, increases in SSC could give rise to high oxygen demands, thus reducing the levels of dissolved oxygen within the water. It is anticipated that temporary and localised increases in SSC will occur within the study area during cable repair.

### WFD Water Bodies

7.6.4.2 The WFD assessment (Appendix 7.1) will be revisited prior to submission of the final ES and results will inform this assessment.

### Marine Water and Sediment of the Channel (beyond 1 nmi)

7.6.4.3 Literature indicates that background levels of near surface SSC are 10 to 35 mg<sup>l</sup><sup>-1</sup> in coastal waters and 2 to 3 mg<sup>l</sup><sup>-1</sup> (Guillou *et al.*, 2017) in waters further offshore. Storm events increase SSC in open coastal environments to 100-180 mg<sup>l</sup><sup>-1</sup> (Guillou *et al.*, 2017), and offshore, storm events can cause SSC levels to reach approximately 20 mg<sup>l</sup><sup>-1</sup> (Guillou *et al.*, 2017).

7.6.4.4 It is predicted that increases in turbidity as a result of localised cable repairs will not exceed levels observed during storm events. Furthermore, it is considered that the water quality within the Channel has the capacity to accommodate temporary and localised increases in turbidity as the water exchange would remain unrestricted throughout all phases of the Proposed Development, allowing rapid recovery to background levels.

7.6.4.5 While release of sediment bound nutrients would have the potential to increase algal growth under suitable conditions, the study area is supplied with oxygen-rich water originating from the Atlantic, and algal blooms are unlikely to occur where there is significant flushing of oxygen rich waters.

7.6.4.6 It is therefore considered that the marine water and sediments of the Channel (beyond 1 nmi) demonstrate high recoverability to the impact; the impact will be temporary; and the magnitude of the impact (in this instance considered to be the degree of change from baseline) is predicted to be low. It is concluded therefore, that no significant effects will occur as a result of this impact.

#### **Resuspension of Contaminated Sediment**

7.6.4.7 Activities associated with cable repair(s) during the operational life of the Proposed Development will result in the resuspension of sediments, which may result in the release of toxic chemicals which are biologically available.

7.6.4.8 Out of 10 stations analysed for contaminated sediments, two identified arsenic concentrations in excess of Cefas AL 1. Both stations were situated outside of the Marine Cable Corridor and are therefore unlikely to be disturbed. None of the samples within the Marine Cable Corridor exceeded either Cefas AL 1 or OSPAC BACs. No contaminants were detected in concentrations greater than Cefas AL 2.

#### **WFD Water Bodies**

7.6.4.9 The WFD assessment (Appendix 7.1) will be revisited prior to submission of the final ES and results will inform this assessment.

#### **Marine Water and Sediment of the Channel (beyond 1 nmi)**

7.6.4.10 Contaminated sediment sampling and analysis of stations in the Channel (>1 nmi) indicates that contamination is low and below detection levels of all contaminants analysed (see Appendix 7.3). Furthermore, based on the results of surveys undertaken for IFA 2 and Rampion OWF, levels of contaminants in sediments in deeper water in the Channel are generally low or below detection levels. Localised disturbance and resuspension of sediment of is therefore not considered to pose a risk to marine water and sediment quality.

7.6.4.11 Sediment disturbance and the subsequent release of contaminants, if present, is considered to be a higher potential risk in inshore waters (<1 nmi) due to the higher concentration of source activity (e.g. land runoff, shipping traffic, industry and spoil dumping). Due to the more localised extent of repair work (in comparison to that required during construction stage) it is considered unlikely that sediment which originated within the 1 nmi limit will be deposited beyond the 1 nmi limit, or for the resultant plume to extend beyond 1 nmi, in volumes sufficient to cause an impact. Furthermore, dilution effects within the Channel, due to increased rates of flushing, will result in habitats receiving lower concentrations of contaminants. It is concluded therefore, that no significant effects will occur as a result of this impact.

## 7.6.5 CUMULATIVE EFFECTS ASSESSMENT

- 7.6.5.1 Cumulative effects on marine water and sediment quality may arise from the interaction of impacts from the Proposed Development during construction, operation (including repair and maintenance) or decommissioning and impacts from other planned or consented projects in the wider vicinity of the Proposed Development.
- 7.6.5.2 A list of projects that have the potential to give rise to a cumulative effect on marine water and sediment quality receptors has been considered (Appendix 7.2 CEA Matrix).
- 7.6.5.3 As detailed in Chapter 28 Cumulative Effects, the CEA is to be undertaken with regards to PINS Advice Note Seventeen – Cumulative Effects Assessment (PINS, 2015). The list of projects presented in Appendix 7.2 CEA Matrix has been refined for marine water and sediment quality as follows:
- First, a spatial assessment was conducted. Any project identified in the long list of projects falling within the study area for marine water and sediment quality (as defined in Section 7.1) was screened in for further consideration. The study area is considered to encompass the likely Zol;
  - A temporal, scale and nature-based assessment was conducted for those projects where a potential spatial overlap was identified; and
  - Taking the above into account, any projects considered likely to affect the marine water and sediment quality, and/or likely to result in significant effects due to their scale and nature, have been identified.
- 7.6.5.4 Of all impacts assessed, only increases in suspended sediment (during construction) have the potential to interact cumulatively with other projects. Those projects where a significant cumulative impact was considered a possibility are identified below:
- AQUIND Interconnector (France); and
  - IFA2.
- 7.6.5.5 The CEA for these projects is yet to be undertaken and will be detailed in the ES to be submitted in support of the application for development consent in due course.

## 7.6.6 TRANSBOUNDARY EFFECTS

- 7.6.6.1 No significant effects on marine water and sediment quality receptors within the UK marine are have been identified as a result of the Proposed Development. While there is potential for the sediment plume to extend into French waters, any transboundary impact is considered to be reduced in comparison to that within UK waters, as a result of flushing within the Channel. Therefore, no significant transboundary effects are currently expected to occur.

## **7.7 PROPOSED MITIGATION**

- 7.7.1.1 At this stage, the approach to assessment in this chapter assumes that mitigation measures embedded into the design (e.g. routing the cable to avoid constraints, use of appropriate construction techniques, marine pollution prevention measures) or which constitute industry standard environmental plans and best practice will be in place. As the final design evolves further detail on all embedded mitigation measures will be provided and assessments will reflect all the embedded and proposed mitigation measures within the ES.
- 7.7.1.2 Embedded mitigation has been included within the assessment, and no further mitigation requirements have been identified to date.

## **7.8 RESIDUAL EFFECTS**

- 7.8.1.1 Table 7.5 summarises the significance of effects of potential impacts assessed to date.

**Table 7.5 – Summary of effects**

<b>Project Stage</b>	<b>Potential Impact</b>	<b>Receptor</b>	<b>Significance</b>	<b>Mitigation</b>	<b>Significance of Residual Effect</b>
<b>Construction (and Decommissioning)</b>	Temporary increase in SSC	WFD Water Bodies	To be updated	To be updated	To be updated
		Marine water and sediment of the Channel (beyond 1 nmi)	Not significant	None	Not significant
	Resuspension of contaminated sediment	WFD Water Bodies	To be updated	To be updated	To be updated
		Marine water and sediment of the Channel (beyond 1 nmi)	Not significant	None	Not significant
<b>Operation (including repair and maintenance)</b>	Temporary increase in SSC	WFD Water Bodies	To be updated	To be updated	To be updated
		Marine water and sediment of the Channel (beyond 1 nmi)	Not significant	None	Not significant
	Resuspension of contaminated sediment	WFD Water Bodies	To be updated	To be updated	To be updated
		Marine water and sediment of the Channel (beyond 1 nmi)	Not significant	None	Not significant

## 7.9 SUMMARY AND CONCLUSIONS

### BASELINE

- 7.9.1.1 There has been significant improvement in water quality within UK waters over the last couple of decades, due to the implementation of European Directives, such as the Urban Waste Water Directive and the Nitrates Directive. Waterbodies within the study area are achieving good or moderate status against the WFD parameters, despite their heavily modified status. Beyond 1 nmi, the Channel is supplied with oxygen-rich water originating from the Atlantic, and the waters are characterised as shallow and well mixed with a seasonal thermocline as a result of seasonal changes in temperature and salinity.
- 7.9.1.2 With regards to sediment quality, while elevated levels of arsenic were detected at a couple of stations within the study area, due to the proximity of the Marine Cable Corridor to industrial and recreational ports along the south coast (Southampton, Portsmouth, Langstone Harbour), the slightly elevated levels in the fine muds was expected and similar results had been found in both IFA2 (RSK, 2016) and Rampion EIA surveys (RSK, 2012).

### ASSESSMENT

The following impacts were assessed on relevant receptors:

- Construction (and decommissioning)
  - Temporary increase in suspended sediment concentrations; and
  - Resuspension of contaminated sediment.
- Operation (including repair and maintenance)
  - Temporary increase in suspended sediment concentrations; and
  - Resuspension of contaminated sediment.

- 7.9.1.3 The assessment of potential impacts within 1 nmi will be completed and included within the ES based upon the outputs of the physical processes modelling.
- 7.9.1.4 Beyond the 1 nmi limit, there is potential for short term negative impacts to water quality as result of increased SSC, however, effects are not significant due to the high resilience and recoverability of the receptor, and the low magnitude of the effect. There is potential for the transport of low levels of contaminants, however due to the high rate of flushing in the Channel any low levels of contaminants will be readily diluted.
- 7.9.1.5 A cumulative screening exercise was also undertaken which identified the following projects as having the potential to lead to significant cumulative effects:
- AQUIND Interconnector (France); and
  - IFA2.

7.9.1.6 The potential for cumulative effects with these projects will be assessed in the ES to be submitted in support of the application for development consent.

7.9.1.7 While there is potential for any sediment plume arising to extend into French waters, transboundary impacts are not currently considered to have the potential to be significant. This will be further assessed in detail within the final ES

### MITIGATION

7.9.1.8 At this stage, the approach to assessment in this chapter assumes that mitigation measures embedded into the design (e.g. routing the cable to avoid constraints, use of appropriate construction techniques, marine pollution prevention measures) or which constitute industry standard environmental plans and best practice will be in place. No further mitigation has been proposed to date.

### RESIDUAL EFFECTS

7.9.1.9 No potentially significant effects are predicted to arise on marine water and sediment quality beyond 1 nmi as a result of construction, decommissioning and operation (including repair and maintenance) of the Proposed Development. Further information is required to make conclusions on effects within 1 nmi and this assessment will be provided within the ES.

### CONCLUSION

7.9.1.10 Based on the information to date, Table 7.5 identifies that potential effects of the Proposed Development (as described in Chapter 3 Description of the Proposed Development and accounting for activities excluded from assessment in Section 7.4.3) on marine water and sediments beyond 1 nmi are not anticipated to be significant.

## 7.10 ASSESSMENTS STILL TO BE UNDERTAKEN

7.10.1.1 Detailed outputs of the sediment disposal modelling i.e. for SSC plumes and sediment deposition depth and locations, were not available at the time of writing this chapter. When detailed modelling is available these will help inform and update the assessment undertaken and will be presented in the final ES.

7.10.1.2 Effects on marine water and sediment within the jurisdiction of the WFD (<1 nmi) and WFD Protected Areas will be assessed and presented in the ES. This will be based on the conclusions of the WFD Assessment (Appendix 7.1) which will also be completed as part of the DCO application.

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