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# PEIR CHAPTER 19

## Water Resources and Flood Risk

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# 19 WATER RESOURCES AND FLOOD RISK

## 19.1 SCOPE OF THE ASSESSMENT

### 19.1.1 INTRODUCTION

19.1.1.1 This chapter provides the preliminary information regarding water resources and flood risk and how they will be taken into account in the context of the Proposed Development. The Proposed Development is described in Chapter 3 - Description of the Proposed Development.

19.1.1.2 This chapter:

- Identifies onshore sensitive environmental and user receptors associated with the water resources environment, including flood risk arising from the Proposed Development;
- Presents the anticipated potential effects arising from the Proposed Development, based on the information gathered to date;
- Highlights the anticipated environmental control measures and any mitigation measures which could prevent, reduce or offset the anticipated potential effects subject to further design development and environmental consideration during subsequent EIA stages; and
- Identifies assumptions and limitations encountered in compiling the environmental information.

19.1.1.3 The Water Resources and Flood Risk assessment will consider the potential impacts associated with the following activities:

- Impacts on the flood risk profile of the area and people potentially affected as a result of construction activities and as a result of the Proposed Development during operation;
- Impact on surface water and groundwater conveyance/levels and quality as a consequence of the construction activities and as a result of the Proposed Development during operation, especially at the Converter Station in connection to groundwater;
- Impact on surface water drainage patterns and quality as a consequence of the construction activities and as a result of the Proposed Development during operation; and
- Impacts during decommissioning and potential cable replacement/ maintenance activities during operation are considered to involve similar techniques to those during construction and therefore typical decommissioning activates and cable replacement works are assumed to be similar as construction and therefore not specifically considered further.

19.1.1.4 It should be noted that this chapter should be read in conjunction with the following PEIR chapters:

- Marine – in particular, impacts on sensitive and/or important marine physical processes, marine water and sediment quality, intertidal and benthic ecology (e.g. water resources and ecology including and below intertidal zone) (Chapters 6-14);
- Onshore Ecology - impacts on sensitive and/or important onshore aquatic species and habitats within the non-saline environment (e.g. above intertidal environment) (Chapter 16); and
- Ground Conditions - the release of contaminants contained in the ground (Chapter 18).

19.1.1.5 Gaps in information identified at this PEIR stage will be considered and addressed in the ES along with further detail of the Proposed Development design and specific mitigation measures.

19.1.1.6 The Proposed Development will require assessment under the Water Framework Directive ('WFD') to ensure that the activities do not lead to a deterioration in waterbody status. The onshore WFD assessment will consider:

- Surface water bodies; and
- Groundwater bodies.

19.1.1.7 The onshore WFD assessment will form part of the further works supporting the ES; however, reference is made to WFD surface and groundwater bodies within the water quality sub-section of the baseline to inform this chapter.

## 19.1.2 STUDY AREA

19.1.2.1 The study area for water resources and flood risk assessment takes account of all current options within the Site Boundary and an additional buffer as summarised hereafter.

19.1.2.2 The study area will encompass direct surface water features up to approximately 0.5 km from the Proposed Development (i.e. associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems, and watercourses). The study area will also encompass indirect surface water features typically up to 1 km, or further where appropriate, from the Proposed Development area. These features will be considered based on professional judgement of the assessor and current knowledge of the surface water features in the area that are in hydraulic connectivity (i.e. including surface water abstractions and downstream watercourses).

19.1.2.3 The study area will encompass groundwater features within approximately 0.5 km of the Proposed Development and groundwater abstractions where subsurface catchment areas are located within 1 km of the Proposed Development. This distance is considered appropriate for the assessment of surface-borne pollutants migrating to groundwater features.

## 19.2 LEGISLATION, POLICY AND GUIDANCE

19.2.1.1 This assessment has taken into account the current legislation, policy and guidance relevant to water resources and flood risk. These are listed below.

### 19.2.2 LEGISLATION

- The Environmental Protection Act 1990 ('EPA') defines the structure and authority for waste management and the control of emissions to the environment. Part 1 sets out the regulations whereby the Secretary of State for Food and Rural Affairs can set limits on emissions into the environment. Part 2 deals with regulations surrounding the controlled disposal of waste. It also addresses the regulations surrounding transportation, treatment and storing of waste.
  - The legislation endorses the principle of a 'suitable for use' approach to contaminated land, where remedial action is only required if there are significant risks to human health or controlled waters.
- The WFD is an over-arching framework which is designed to:
    - Enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, which depend on the aquatic ecosystems;
    - Promote the sustainable use of water;
    - Reduce pollution of water, especially the 'priority' and 'priority hazardous' substances; and
    - Ensure progressive reduction of groundwater pollution.
  - The WFD is a EU Directive which commits EU member states to achieving good qualitative and quantitative status of all water bodies (including coastal waters up to one nautical mile from shore, inland surface water, transitional waters, and groundwater) at six-year intervals. The next objective is to achieve a "good" status by 2021.
  - The WFD is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
  - These regulations provide technical advice to the UK Administrators, co-ordinate the UK Agencies' input to the development of the European Guidance, and develop guidance and methods to support the consistent implementation of the Directive by the UK Agencies.

- The WFD and the Groundwater Daughter Directive ('GDD') (2006/118/EC), which were enacted in 2000 and 2006 respectively, replace the original Groundwater Directive (80/68/EEC) which was repealed in 2013. The GDD introduced procedures for assessing the 'Chemical Status' of groundwater as per the WFD, and protects groundwater by preventing direct discharge of 'hazardous pollutants' and limiting the direct discharge of non-hazardous pollutants.
- The EU Nitrates Directive (1991) aims to protect water quality by preventing nitrates from agricultural sources polluting groundwater and surface water and, by promoting the use of good farming practices. The Nitrates Directive has close links to the WFD (2000) and Groundwater Directives (2006). The Groundwater Directive (2006) confirms that nitrate concentrations must not exceed the trigger value of 50mg/L in order to reach 'Good' status under the WFD.
- The Drinking Water Directives (98/83/EC) concerns the quality of water intended for human consumption. Its objective is to protect human health from adverse effects of any contamination of water intended for human consumption.
- The Flood Risk Regulations 2009 transpose the EU Floods Directive (2007/60/EC) into law in England and Wales. The EU Floods Directive aims to provide a consistent approach to flood risk management across all of Europe. Under the Flood Risk Regulations 2009, the EA and Lead Local Flood Authorities ('LLFAs') had to prepare Preliminary Flood Risk Assessments ('PFRAs') by December 2011. A second cycle was completed by LLFAs in December 2017.
    - There is a duty on LLFAs within an agreed Flood Risk Area to publish flood hazard and flood risk maps for all sources of flooding by December 2013 and flood risk management plans have been published in December 2015 to manage flood risk for the next 6 years to the year 2021. These flood risk management plans should set objectives for flood risk management and outline measures for achieving these objectives.
- The Water Resources Act 1991 (as amended in 2009) regulates water resources, pollution, water quality and flood defence. The Act aims to prevent and minimise pollution of water. Currently, the EA is responsible for the policing of this Act.
- Under the Act, it is an offence to cause or knowingly permit any poisonous, noxious or polluting material, or any solid waste to enter any controlled water.
- The Anti-Pollution Works Regulations 1999 allows the EA (EA) to serve notice under Section 161A of the Water Resources Act to a business or person that has caused pollution or has a risk of causing pollution to any watercourse. The notice requires the recipient to conduct preventative works and operations in order to minimise the risk and future risk. Failing to abide by the notice may lead to prosecution.
- The Land Drainage Act 1991 and 1994 requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. If a

riparian owner fails to carry out his responsibilities under the Land Drainage Act, or if anyone else causes a watercourse to become blocked or obstructed, the County and District Councils have powers of enforcement by serving a notice under the Act. The Land Drainage Act 1994 amends the 1991 Act in relation to the functions of internal drainage boards and local authorities.

- The Flood and Water Management Act 2010 is the government's newest legislation to help improve flood risk management and ensure the security of water supplies in England and Wales. The Act updates legislation to ensure better protection from flooding and coastal erosion, manage water more sustainably, improve public services and secure water resources during periods of drought. The aims of the Flood and Water Management Act are to:
  - Clarify who is responsible for managing all sources of flood risk;
  - Encourage more sustainable forms of drainage in new developments;
  - Make it easier to resolve misconnections to sewers;
  - Make a national strategy for floods; and
  - Establish regional flood and coastal committees
- The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 provides guidance for imminent threats of 'environmental damage' or actual 'environmental damage', related to surface water and groundwater. Guidance is provided to ensure appropriate mitigation measures such as easements when working near waters. In addition, it recommends remediation measures should there be significant effects to cause a change in surface water and groundwater. This act only applies to England up to one nautical mile seaward in England.
- The Environmental Permitting (England and Wales) Regulations 2016, which replaced Environmental Permitting (England and Wales) 2007 (and amendments) as well as the Environmental Permitting (England and Wales) Regulations 2010. The Regulations set out the control requirements for the discharge of water to surface water and groundwater. The Regulations provide details on the permits required for a water discharge to surface waters and groundwater. Water discharge activities as well as groundwater activities are detailed to classify what is acceptable.
  - The Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016 came into effect on the 6th of April 2016. The intended effects are to make the approach risk based so that the regulators are able to concentrate on high risk applications, and to make applications for flood consents easier and quicker for businesses whilst ensuring that neither flood risk management nor environmental protection is compromised. It amends the Environmental Permitting (England and Wales) Regulations 2010 to

provide for the regulation of "flood risk activities" within the Environmental Permitting framework, replacing the current "flood defence consent scheme".

## 19.2.3 PLANNING POLICY

### National Policy

#### National Policy Statement

- Overarching National Policy Statement for Energy (NPS EN-1) (Department of Energy and Climate Change, 2011) sets out the Government's policy for delivery of major energy infrastructure.
- Parts 4 and 5 of EN-1 detail the general principles that will be used in the assessment of applications and sets out how generic physical impacts (i.e. those impacts most likely to arise from the development of any type of energy infrastructure) and means of mitigation will be considered. The physical impacts detailed that are most relevant to this chapter include Parts 5.7 (Flood Risk) and 5.15 (Water Quality and Resources).

#### National Planning Policy Framework

- The NPPF was published in July 2018 with the aim of protecting the environment and to promote sustainable growth. There is an overarching presumption in favour of sustainable development that should be the basis of every plan and every decision.
- The following paragraphs/policies within the NPPF are considered relevant to this assessment:
  - Paragraph 155: Requires that "*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere*";
  - Paragraph 158: Explains that "*the aim of the Sequential Test is to steer development to areas with the lowest probability of flooding*";
  - Paragraph 163: Explains that "*When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere […]*"; and
  - Paragraph 165: Recommends that "*major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

    *a) take account of advice from the lead local flood authority;*
    *b) have appropriate proposed minimum operational standards;*
    *c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
    d) *where possible, provide multifunctional benefits*".

## Local Planning Policy

### Portsmouth City Council

19.2.3.1 The relevant development plan documents for PCC include the following:

- Portsmouth Plan (Portsmouth Core Strategy) adopted January 2012 (Portsmouth City Council, 2012)
  - PCS12 Flood Risk – outlines the measures that will be taken to reduce flood risk when considering planning applications. Details requirement for sequential and exception tests and the requirement for site-specific flood risk assessment.

### Havant Borough Council

19.2.3.2 The relevant Development Plan documents for HBC include the following:

- Local Plan (Core Strategy) adopted March 2011 (Havant Borough Council, 2011)
  - CS15 Flood and erosion risk - details requirement for sequential and exception tests and requirement for site-specific flood risk assessment. Incorporation of flood protection, resilience and resistance and flood warning measures. Outlines requirements for Sustainable Drainage Systems ('SuDS'). Development that does cause unacceptable deterioration to water quality or have an unacceptable impact on water quantity will not be supported.
  - DM10 Pollution – outlines the criteria that polluting development is required to meet in order to be considered acceptable.

### Winchester City Council

19.2.3.3 The relevant Development Plan documents for WCC include the following:

- The Local Plan Part 1: WCC and SDNPA Joint Core Strategy adopted March 2013 (Winchester City Council and South Downs National Park Authority, 2013);
  - CP17 Flooding, flood risk and the water environment – details requirement for sequential and exception tests. Safeguards land, structures and features required for flood management. Outlines requirements for SuDS. Development that does not cause unacceptable deterioration to water quality or have an unacceptable impact on water quantity will be supported.
- Local Plan Part 2: Development Management and Allocations adopted April 2017 (Winchester City Council, 2017);
  - DM19 Development and pollution – states that development which generates pollution (or is sensitive to it) will only be permitted where it

achieves and acceptable standard of environmental quality. Outlines when detailed assessments and mitigation measures will be required.

### East Hampshire District Council

19.2.3.4 The relevant Development Plan documents for EHDC include the following:

- The Local Plan Part 1: EHDC and SDNPA Joint Core Strategy adopted June 2014 (East Hampshire District Council and the South Downs National Park Authority, 2014).
  - CP25 Flood risk – sets out the requirement for sequential and exception tests, and site-specific flood risk assessments for development in areas at risk of flooding. CP25 requires all new development to ensure there is no net increase in surface water runoff. It also sets out requirement for SuDS.
  - CP26 Water resources/water quality – requires new development to protect the quality and quantity of water and make efficient use of water.
  - CP27 Pollution – states that development must not result in pollution that prejudices the health and safety of communities and their environment.

### Hampshire County Council

19.2.3.5 The Groundwater Management Plan ('GWMP') for Hampshire 2013 essentially combines elements of the strategic (i.e. equivalent to the overarching Surface Water Management Plan ('SWMP')), intermediate level, and detailed SWMPs. It has been broadly set out in accordance with the technical guidance provided by Defra (Department for Environment, Food and Rural Affairs) in 2010 (Ref 4) although this is also set in the context of the SWMPs already produced or planned by HCC. The "overarching" document (Ref 3) provides a single, concise and consolidated reference on matters relating to surface water flooding and flood risk across Hampshire. It identifies and sets out the responsibilities of the various different organisations with a role in the management of flood risk and the provision and maintenance of flood water infrastructure.

## 19.2.4 GUIDANCE

19.2.4.1 Design Manual for Roads and Bridges ('DMRB') Volume 11, Section 3, Part 10 (HD 45/09) (2009) provides guidance on the assessment and management of the impacts that road projects may have on the water environment. These include possible impacts on the quality of water bodies and on the existing hydrology of the catchments through which roads pass.

19.2.4.2 Transport Analysis Guidance ('TAG') Unit A3 Environmental Impact Appraisal – Impacts on the Water Environment (2013) provides guidance for appropriately qualified environmental practitioners/topic specialists on appraising the impact of transport proposals on the built and natural environment, and on people. When using the guidance in this TAG unit, environmental practitioners/topic specialists should refer to current European and UK legislation, regulations and policy and best practice.

19.2.4.3 A number of Construction Industry Research and Information Association ('CIRIA') guidance documents provide guidance on the control of water pollution, these guidance documents are noted below:

- CIRIA Report C532, Control of water pollution from construction sites: Guidance for consultants and contractors;
- CIRIA Report C648, Control of water pollution from linear construction projects: Technical guidance;
- CIRIA Report C649, Control of water pollution from linear construction sites: Site guide; and
- CIRIA Report C753, The SuDS Manual.

19.2.4.4 The following Scottish Environment Protection Agency ('SEPA') Pollution Prevention Guidelines ('PPGs')/ Guidance for Pollution Prevention ('GPPs') (developed jointly with the EA and the Northern Ireland EA) have also been considered, despite having been withdrawn, as they provide some appropriate guidance to the management of pollution prevention in lieu of any replacement guidance on good practice being available:

- PPG1 Understanding your environmental responsibilities – good environmental practices (July 2013);
- GPP2 Above ground oil storage tanks (January 2018);
- PPG3 Use and design of oil separators in surface water drainage systems (April 2006);
- The EA's approach to groundwater protection
- GPP4 Treatment and disposal of wastewater where there is no connection to the public foul sewer (November 2017);
- GPP5 Works and maintenance in or near water (January 2017);
- PPG6 Working at construction and demolition sites (2012);
- PPG7 Safe storage – the safe operation of refuelling facilities (July 2011);
- GPP8 Safe storage and disposal of used oils (July 2017);
- GPP13 Vehicle washing and cleaning (April 2017);
- PPG18 Managing fire water and major spillages (June 2000);
- GPP21 Pollution incident response planning (July 2017);
- PPG22 Incident response - dealing with spills; (April 2011); and
- PPG26 Safe storage – drums and intermediate bulk containers (March 2011).

## 19.3 SCOPING OPINION AND CONSULTATION

### 19.3.1 SCOPING OPINION

19.3.1.1 As detailed within Chapter 1 - Introduction, a Scoping Opinion was received by the Applicant from PINS (on behalf of the SoS) on 07 December 2018, including formal responses from statutory consultees and the MMO. The responses from PINS in relation to Water Resources and Flood Risk, and how those requirements should be addressed by the Applicant, are set out below in Table 19.1.

19.3.1.2 Appendix 5.3 provides a complete set of responses in the PEIR to the contents of the Scoping Opinion.

**Table 19.1 – PINS Scoping Opinion Responses 07 December 2018**

| Scoping Opinion Ref | Summary of Comment Received | How this has been addressed by the Applicant |
|---|---|---|
| **4.17.2** | The Scoping Report identifies that surface water features up to a minimum of 0.5 km from the Proposed Development and features of hydraulic connectivity within 1km of the Proposed Development will be considered. The impact assessment should consider all sensitive receptors within the ZoI for the Proposed Development, particularly where hydrological links occur. | Walkover surveys will be undertaken to establish potential hydraulic connectivity at surface between the development and groundwater receptors at greater distance. The assessment will rely on published information on subsurface linkages, e.g. between karst features and public water supply sources. |
| **4.17.3** | The Inspectorate notes that this paragraph defers the assessment of groundwater quantity, groundwater flows and release of contaminants to the Groundwater Chapter of the ES. As noted in Table 4.16 of the Opinion, there is no reference to the assessment of groundwater quality. This must be included in the ES. Where the Water Resources and Flood Risk aspect chapter informs the groundwater aspect chapter (and vice | Consultation with Portsmouth Water to provide any groundwater water quality data where development area falls within Source Protection Zone ('SPZ')[1] will be required. No no site-specific groundwater water quality data has been collected.<br><br>A qualitative assessment will be provided on the impact to groundwater quality, groundwater flow and contamination. |

| Scoping Opinion Ref | Summary of Comment Received | How this has been addressed by the Applicant |
|---|---|---|
| | versa), appropriate cross-references should be included. | |
| **4.17.4** | This paragraph appears to be the first mention of 'impact to flood defences, most likely from within the tidal area (landfall)'. The baseline does not contain any information with regards to flood defences present that could be affected by the Proposed Development. The ES should clearly include in the baseline, a description of existing (and where relevant, proposed) flood defences that could be impacted by the Proposed Development. | On-going consultation has been undertaken with East Solent Coastal Partnership ('ESCP') and the EA to identify where flood defences are present within the Proposed Development and the baseline is going to consider existing flood defences and the impact by the Proposed Development. An assessment of impacts on flood defences will be included in the ES, if required. |
| **4.17.5** | As set out in the NPS EN-1 (Paragraph 4.8.6), the Applicant should take into account the potential impacts of climate change using the latest UK Climate Projections (UKCP). The UKCP18 projections have recently been published. Effort should be made to agree the climate change model and future flood risk allowance baseline with relevant consultation bodies. | Climate change allowances considered and latest UKCP18 allowances (which were released November 2018) will need to be further discussed with EA to understand how they should be implemented going forward and how they should be taken into consideration at ES stage as part of Flood Risk Assessment ('FRA'). |
| **4.17.6** | The Scoping Report does not clarify the locations where the cable may cross below or run in close proximity to a main river. This should be detailed in the ES. Site-specific assessments for each location should also be undertaken to inform the cable crossing | Watercourses crossed identified within PEIR (includes main river based on EA data and ordinary watercourses based on OS mapping only), confirmation of locations where trenchless techniques will be utilized still being developed by engineering |

| Scoping Opinion Ref | Summary of Comment Received | How this has been addressed by the Applicant |
|---|---|---|
| | techniques at each main river and where significant effects may occur.<br>Any mitigation and/or design measures relied upon for the purposes of the assessment e.g. either trenchless or open cut methods should be explained in the ES and appropriately secured. Effort should be sought to agree proposed mitigation and reinstatement measures with the relevant consultation bodies e.g. EA. | team. Further information will be presented in the ES.<br>PEIR outlines key principles for the assessment, which will be built upon at ES stage alongside consultation with EA and LLFA. |
| **4.17.7** | The ES and FRA should assess likely significant impacts associated with temporary works, such as dewatering and working compounds in the flood plain. | Methodologies to be confirmed with engineering team and will be developed at ES stage through FRA to cover construction and operation. |
| **4.17.8** | The Scoping Report does not include figures to show the location of potential receptors or the flood maps for the area. The ES must include clear and appropriate figures to support the impact assessment, including those in support of any FRA and WFD Assessment. | Appropriate flood maps produced as part of PIER. WFD assessment to be undertaken at ES stage. |
| **4.17.9** | The Scoping Report refers to outdated legislation: the Environment Permitting (England and Wales) Regulations 2010 which has been superseded by the Environmental Permitting (England and Wales) Regulations 2016, which should be used when | PEIR now refers to the Environmental Permitting (England and Wales) Regulations 2016. |

| Scoping Opinion Ref | Summary of Comment Received | How this has been addressed by the Applicant |
|---|---|---|
| | interpreting the Environmental Permitting requirements for the Proposed Development in the ES. | |

### 19.3.2 CONSULTATION

19.3.2.1 Consultation is a key part of the DCO application process. Further consultation will continue to be undertaken once the PEIR has been made available. A summary of the consultation undertaken for the Water Resources and Flood Risk assessment to date is detailed in Table 19.2 below.

**Table 19.2 – Consultation Responses**

| Consultee | Date (Method of Consultation) | Discussion | Summary of Outcome of Discussions |
|---|---|---|---|
| **EA** | Email consultation from 25 May 2018 | Initial request sent for flood risk profile information and feedback on policy/assessment requirements.<br>EA responded 12 July 2018 with responses to the request including JFLOW levels, flood defence maps, sea level data for Ordnance Datum Newlyn ('ODN') and Flood Risk Assessment ('FRA') advisory text.<br>A further request was sent 8 November due to Site Boundary changes as well as further information on water takes being requested.<br>EA initially responded resending information from July. We are now | WSP are still awaiting a response to the most recent information request.<br>Planning advice was also provided by the EA which gave advice to reduce flood risk during construction, advice on Environmental Permits for Flood Risk Activities and advice on details to be incorporated in a FRA. This advice will be incorporated where applicable i.e. in a CEMP and FRA. |

| Consultee | Date (Method of Consultation) | Discussion | Summary of Outcome of Discussions |
|---|---|---|---|
| | | waiting on a further response with updated information. | |
| **East Solent Coastal Partnership ('ESCP')** | Email consultation from 25 May 2018 | Initial request sent for flood risk issues in area of Site Boundary, details of flood defence schemes in the area and request for additional issues or comments.<br>On-going discussion was had with ESCP regarding details of flood defences, including ownership and maintenance that could be relevant to the Proposed Development. | ESCP responded to queries with information on existing flood defences they maintain, plans for future work as well as information on other defences in the area i.e. a revetment maintained by Highways England.<br>ESCP also provided GIS files of recent inspection programme and condition ratings of defences.<br>This information is incorporated into baseline text where applicable. |
| **Hampshire County Council ('HCC')** | Email consultation from 25 May 2018 | Initial request sent for flood risk profile information, feedback on policy/assessment requirements and information requested on FRA and outline drainage strategy.<br>HCC responded 26 July 2018 with responses to the request and attached GIS files to address flood risk queries.<br>A further request was sent 31 October 2018 | HCC provided GIS files and responses on Policy, Guidance and Documents and on the Proposed FRA and Outline Drainage Strategy.<br>Information received has been incorporated in PEIR where applicable. Additional information will be incorporated in FRA and CEMP at the EIA stage. |

| Consultee | Date (Method of Consultation) | Discussion | Summary of Outcome of Discussions |
|---|---|---|---|
| | | due to Site Boundary changes.<br>Following further discussion, HCC responded on 13 November 2018 with updated GIS information. | |
| **Portsmouth City Council ('PCC')** | Email consultation from 25 May 2018 | Request sent for flood risk profile information, feedback on policy/assessment requirements and information requested on FRA and outline drainage strategy.<br>Response received 30 May 2018 responding to queries we raised specifically around policies and guidance, FRA and drainage strategy. | Initial response from PCC commented on points relating to policy and guidance documents, proposed FRA, an outline drainage strategy and provided a SuDS planning document.<br>Particular note was given to need to assess PCS12 in PCC Local Plan.<br>Points will be incorporated into the ES, where applicable. |
| **East Hampshire District Council ('EHDC')** | Email consultation from 25 May 2018 | Initial request sent for flood risk profile information, feedback on policy/assessment requirements and information requested on FRA and outline drainage strategy. | EHDC response discussed flood risk, (historic and potential), the Converter Station being within SPZ1 and the need for further discussion with Portsmouth Water, susceptibility to high groundwater levels during prolonged wet periods, the need for run-off to be attenuated and not increase flood risk as well as the need to |

| Consultee | Date (Method of Consultation) | Discussion | Summary of Outcome of Discussions |
|---|---|---|---|
| | | | factor in climate change.<br>EHDC also noted that the majority of the Onshore Cable Corridor is outside the EHDC boundary. |
| **Havant Borough Council ('HBC')** | Email consultation from 25 May 2018 | Initial request sent for flood risk profile information, feedback on policy/assessment requirements and information requested on FRA and outline drainage strategy. | HBC response focused mainly on recommending policies to review relating to their Adopted Core Strategy and Draft Local Plan.<br>HBC recommended directing the flood risk portion of our enquiry to HCC as LLFA. |
| **Winchester City Council ('WCC')** | Email consultation sent 25 May 2018. | Initial request sent for flood risk profile information, feedback on policy/assessment requirements and information requested on FRA and outline drainage strategy. | No response was received from WCC. Further consultation will be undertaken to obtain requested information. |

19.3.2.2 Full details of project consultation for all disciplines are presented within Chapter 5 Consultation.

19.3.2.3 Consultation is ongoing and continued consultation specific to this chapter and the ES will be undertaken, as appropriate, with the following consultees:

- EA;
- Portsmouth Water;
- Local/ Regional Partnerships (ESCP, Partnership of Urban South Hampshire);
- Lead Local Flood Authorities;
- Local Authorities Flood Risk and Drainage Teams (including SDNPA); and
- Southern Water.

## 19.4 METHODS OF ASSESSMENT

### 19.4.1 METHOD OF ASSESSMENT OVERVIEW

19.4.1.1 The methodology in this Chapter includes:

- Establish baseline conditions within the study area through review of desk based sources of information, literature review, site walkovers and consultation with relevant authorities;
- Determine the anticipated receptors and their sensitivity;
- Assessment of predicted impact prior to mitigation and residual effects as a consequence of the expected mitigation to be taken forward within the ES;
- Identify opportunities for enhancements within the water resources and flood risk environment; and
- Impacts during decommissioning and potential cable replacement/ maintenance activities during operation are considered to involve similar techniques to those during construction and therefore typical decommissioning activates and cable replacement works are assumed to be similar as construction and therefore not specifically considered further.

19.4.1.2 In order to assess the significance of impacts on the water environment it is important to define credible and consistent criteria to assess the magnitude of effects and sensitivity of the receptors. No standard methodology exists for this as evaluation methods can be of various types; the assessment methodology used in this chapter of the PEIR builds on and adapts the classification contained in the DMRB Volume 11, Section 3, Part 10 (HD 45/09) and the TAG Unit A3 Environmental Impact Appraisal – Impacts on the Water Environment.

19.4.1.3 The above guidance, although developed for assessing impacts that road projects may have on the water environment, provide a suitable framework to develop a consistent classification of both magnitude of effects and sensitivity of potential water receptors.

19.4.1.4 The assessment of the effects of the Proposed Development on water resources and flood risk will involve consideration of the following receptors.

**Construction**

- Effects of flooding on human receptors:
  - Construction Workers; and
  - Residents and occupants of the surrounding areas (public).
- Effects on water quality:
  - Groundwater waterbody receptors (e.g. aquifers);
  - Surface water receptors (e.g. main rivers and ordinary watercourses) – primarily considered in flood risk; and

- Public sewers.

- Effects on water quantity:
  - Groundwater waterbody receptors (e.g. aquifers);
  - Surface water receptors (e.g. main rivers and ordinary watercourses) – primarily considered in flood risk;
  - Public sewer network; and
  - Public potable water network.

**Operation**

- Effects of flooding on human receptors:
  - Staff (e.g. site users); and
  - Residents and occupants of the surrounding area (public).

- Effects on water quality:
  - Groundwater waterbody receptors (e.g. aquifers);
  - Surface water receptors (e.g. main rivers and ordinary watercourses); and
  - Public sewers;

- Effects on water quantity:
  - Groundwater waterbody receptors (e.g. aquifers);
  - Surface water receptors (e.g. main rivers and ordinary watercourses) – primarily considered in flood risk;
  - Public sewer network; and
  - Public potable water network.

### 19.4.2 METHOD OF BASELINE DATA COLLECTION

19.4.2.1 Baseline conditions considered within this chapter include:

- water quantity of surface water/ groundwater features, public sewer networks and public potable water supply network;
- the quality of water flowing in surface water and groundwater features and the quality of water discharged to public surface water sewer networks; and
- flood risk within the study area and throughout all route options.

19.4.2.2 Information to inform the baseline conditions has been obtained through:

- A review of publicly available information, including:
  - OS mapping;
  - Defra.gov.uk online MAGiC Map database;
  - Gov.uk/EA's online flood map for planning,
  - Gov.uk/EA's online 'learn more about this areas flood risk' database;
  - EA data sets, including, Catchment Data Explorer (WFD data);
  - British Geological Survey ('BGS') online geological mapping;

- AQUIND Interconnector EIA Scoping Report 2018;
- Terradat Geophysical Survey Report 'Geophysical survey to map possible solution features Lovedean, East Hampshire' 2018;
- Geotechnics UK-France HVDC Interconnector Package 1 Factual Report (Draft) 2018;
- Geotechnics UK-France HVDC Interconnector Package 1A Factual Report (Draft) 2018;
- EA's flood map for planning, surface water, groundwater and water abstractions;
- Local Planning Authority and Lead Local Flood Authority Mapping; and
- The GWMP for Hampshire (dated October 2003).

- A review of datasets obtained through consultation as summarised in Table 19.1 and 19.2 with third parties:
  - EA datasets;
  - East Solent Costal Partnership datasets;
  - Southern Water datasets; and
  - Portsmouth Water datasets.
- In addition to the desk top study a number of site visits have been undertaken as summarised below:
  - High level site wide drive through; and
  - Converter Station walk over survey.

### 19.4.3 SIGNIFICANCE CRITERIA

19.4.3.1 The assessment of potential effects, as a result of the Proposed Development, has taken into account both the construction and operational stages.

19.4.3.2 Impacts during decommissioning and potential cable replacement/ maintenance activities during operation are considered to involve similar techniques to those during construction and therefore typical decommissioning activities and cable replacement works are assumed to be similar as construction and therefore are not considered separately.

19.4.3.3 The significance level attributed to each effect has been assessed based on the magnitude of change/effect due to the Proposed Development and the sensitivity of the affected receptors.

19.4.3.4 The magnitude of impacts and sensitivity of the affected receptors have been assessed based on adapting the relevant tables within the following documents:

- TAG Unit A3 Environmental Impact Appraisal – Impacts on the Water Environment Chapter; and

- DMRB HD 45/09: Road Drainage and the Water Environment; the DMRB provides guidance for appraising significance of likely effects that road projects may have on the water environment.

## Determining Sensitivity of Receptors

19.4.3.5 DMRB Volume 11, Section 3, Part 10 (HD 45/09) and the TAG Unit A3 Environmental Impact Appraisal – Impacts on the Water Environment refer to the importance/value of an environmental attribute/feature. Sensitivity and importance/value are strictly linked and for the purposes of this chapter of the PEIR, sensitivity has been used to reflect the rarity, vulnerability and importance/quality of the potential receptor.

19.4.3.6 Sensitivity of the affected receptor is assessed on a scale of high, medium, low. For the purpose of this assessment, receptors assessed with a 'negligible' sensitivity will not be assessed as the effects on them are insignificant.

19.4.3.7 Table 19.3 below shows the general criteria used in assessing the sensitivity of water receptors as part of this assessment.

**Table 19.3 – Sensitivity of Receptor Criteria**

| Sensitivity | Description | Example Receptors |
|---|---|---|
| **High** | Receptor with High quality and rarity, regional or national scale and limited potential for substitution. | Principal aquifer providing a regional important resource or supporting a site protected under EC and UK habitat legislation;<br>Located within Source Protection Zone ('SPZ') Inner Zone (Zone 1) and SPZ Outer Protection Zone (Zone 2);<br>Waterbody with 'High' or 'Good' Water Framework Directive ('WFD') overall status and/or water quality status for surface water or groundwater waterbody;<br>Designated site protected under EU or UK habitat legislation, such as SSSI, SAC, and SPA, for the disciplines assessed in this chapter;<br>Waterbody with a range of hydromorphological features with very little modification;<br>Major river providing a potable water resource to a large population;<br>Residents;<br>Public sewer with available capacity only subject to major improvement works. |

| Sensitivity | Description | Example Receptors |
|---|---|---|
| **Medium** | Receptor with Medium quality and rarity, regional or national scale and limited potential for substitution. | Aquifer providing abstraction water for a small number of domestic private water supplies, agricultural or industrial use;<br>Waterbody with 'Moderate' WFD overall status and/or water quality status for surface water or groundwater waterbody;<br>Located within SPZ Total Catchment Zone 3;<br>Surface water or groundwater waterbodies considered to be directly supporting or maintaining water conditions in non-designated wetland or peatland sites with hydrological linkage to Proposed Development;<br>Surface water abstraction requirements for private water supply providing a water resource to a small population or industry;<br>Minor river providing a water resource to a small population or industry;<br>Watercourse or floodplain, with a possibility of direct flood risk to high value agricultural areas, which are moderately sensitive to increased flood risk by the possible increase in water levels;<br>Commercial users/ construction workers;<br>Public sewer with available capacity subject to upgrade works. |
| **Low** | A receptor with Low quality and rarity, regional or national scale and limited potential for substitution. | Waterbody with 'Poor' or 'Bad' WFD overall status and/or water quality status for surface water or groundwater waterbody;<br>Minor river or drain of low quality;<br>Surface water or groundwater waterbodies are not considered to contribute or maintain water conditions in any wetland or peatland sites;<br>Waterbody containing no hydromorphological diversity and/or identified as 'heavily modified waterbodies' or 'artificial waterbodies';<br>Non-aquifer;<br>Public sewer with available capacity. |

19.4.3.8 The TAG Unit A3 and DMRB guidance includes a 'very high' classification for the value/importance of receptors. For the purposes of this assessment, receptors assessed with 'very high' value/importance in accordance with TAG Unit A3 and DMRB guidance will be assessed as having a 'high' sensitivity.

19.4.3.9 Sensitivity of people to flooding has been assessed taking into account their intrinsic vulnerability based on several factors such as awareness, in-place practices, operation times, age, etc. For example, residents are generally considered more vulnerable than commercial users, as the former sleep within their premises, although in some cases their vulnerability might be reduced by specific factors (e.g. people sleeping at the first floor and above are less vulnerable to flooding). Construction workers normally have a lower vulnerability than residents due to their increased awareness of Health and Safety and training.

19.4.3.10 Receptors with negligible sensitivity have not been considered in this table.

### Magnitude of Change/Effect

19.4.3.11 Magnitude of change/effect is assessed on a scale of major, moderate, minor and negligible which can be positive or negative, where applicable. Table 19.4 indicates the general criteria used to determine the magnitude of change as part of this assessment.

19.4.3.12 The TAG Unit A3 guidance provides classifications of magnitude of impact in' Large', 'Moderate', and 'Slight' quantities and the DMRB guidance provides classification of magnitude of impact in 'Major', 'Moderate', 'Minor' and 'Negligible'. For the purposes of this assessment, the magnitude of change/effect will be considered as 'Major', 'Moderate', 'Minor' and 'Negligible'.

**Table 19.4 – Magnitude of Change/Effect Criteria**

| Magnitude | Descriptor | Examples |
|---|---|---|
| **Major** | Results in a major loss or gain of feature | Significant fluvial flooding affecting offsite receptors caused by the scheme is statistically possible or even likely (e.g. exceeding 1% annual probability) with potential high depth/velocity of water and risk to life and/or major financial effect;<br>Significant flooding which could potentially cause major effect at the Site (e.g. loss of life) is possible or even likely; (magnitude of effect)<br>Pollution of potable source of abstraction. Increase of a significant amount of flow entering controlled systems (Sufficient enough to cause a change in WFD classification or loss or gain of important fishery); |

| Magnitude | Descriptor | Examples |
|---|---|---|
| | | Major reduction in flooding extension/likelihood;<br>Removal of major existing pollutant;<br>High risk of pollution during construction, significant or long-term change in water quality, resulting in a permanent change in WFD status or permanent loss of water supply (groundwater and surface water);<br>Major loss of an aquifer in terms of water level or yield, with total loss of or major changes to dependent habitats/abstractions; or<br>Major groundwater flow changes with significant consequences on nearby groundwater dependent habitats/abstractions. |
| **Moderate** | Results in a medium impact of integrity (beneficial or adverse) of feature or loss or gain of part of a feature. | Flooding of the Site which could cause financial impact and disruption (but no loss of life) is statistically possible or even likely;<br>A significant increase in the likelihood of flooding offsite is possible as a consequence of the development with potential financial effect but no loss of life;<br>Contribution of significant effluent towards receiving river, but insufficient to change WFD classification;<br>Increase of amount of flow entering controlled systems (sufficient enough to cause an increase in flooding);<br>Moderate risk of pollution during construction, moderate temporary change in water quality, resulting in a temporary change of WFD status or preventing attainment of overall status of 'Good', or temporary loss of water supply (groundwater and surface water);<br>Moderate groundwater flow changes with minor consequences on nearby groundwater dependent habitats/abstractions; or<br>Partial change or loss of a Groundwater Dependent Terrestrial Ecosystem ('GWDTE') where the value of the site would be affected. |
| **Minor** | Results in a low impact | Small increase/decrease in the likelihood of flooding; |

| Magnitude | Descriptor | Examples |
|---|---|---|
| | of integrity of feature or minor loss of part of a feature. | Increase of amount of flow entering controlled systems, but would not cause flooding;<br>Measurable changes in feature, but of limited size and/or proportion;<br>Minor risk of pollution during construction, minor temporary changes in water quality such that ecology is temporarily affected. Equivalent to a temporary minor, but measurable, change within WFD status class;<br>Minor groundwater flow changes with minimal impact on nearby groundwater dependent habitats/abstractions; or<br>Small changes to or loss of a GWDTE, where the value of the site would not be affected. |
| **Negligible** | Results in a change but insufficient to affect attribute. | The Proposed Development is unlikely to affect the integrity of the water environment and the impact on flooding is not relevant. For example, the quantity is immeasurable or insignificant, when compared to the baseline condition;<br>No increase of amount of flow entering controlled systems i.e. no effect when compared to baseline condition;<br>No significant effect on the economic value of the feature;<br>Negligible risk of pollution during construction, very slight temporary change in water quality with no discernible effect on watercourse ecology;<br>Negligible groundwater flow changes with no discernible impact on nearby groundwater dependent habitats/abstractions;<br>Minimal or no change to an aquifer in terms of water level or yield, with no discernible change to dependent habitats/abstractions; or<br>Minimal or no change to or loss of a GWDTE. |

## Significance of Effects

19.4.3.13 The overall significance will be assessed using the matrix shown in Table 19.5. This uses the sensitivity of the receptor and magnitude of change to determine the significance of effect.

**Table 19.5 – Significance of Effects Matrix**

| | | Value/Sensitivity | | | |
|---|---|---|---|---|---|
| | | High | Medium | Low | Negligible |
| Magnitude/of Change | Major | Major | Major to Moderate | Moderate | Negligible |
| | Moderate | Major to Moderate | Moderate | Minor to moderate | Negligible |
| | Minor | Moderate | Minor to Moderate | Minor | Negligible |
| | Negligible | Negligible | Negligible | Negligible | Negligible |

19.4.3.14 The following terms have been used to define the significance of the effects identified:

- **Major effect**: where the Proposed Development could be expected to have a considerable effect (either positive or negative) on flood risk, drainage water resources quality or water resources quantity in the area;
- **Moderate effect**: where the Proposed Development could be expected to have a noticeable effect (either positive or negative) on drainage and water resources quality or quantity in the area;
- **Minor effect**: where the Proposed Development could be expected to result in a small, barely noticeable effect (either positive or negative) on drainage and water resources quality or quantity in the area; or
- **Negligible**: where no discernible effect is expected as a result of the Proposed Development on drainage or water resources in the area. (i.e. the effect is insignificant).

## 19.4.4 ASSUMPTIONS AND LIMITATIONS

19.4.4.1 This chapter of the PEIR provides preliminary information as it relates to the Proposed Development to date and to data currently available and gathered at this point of the assessment process.

19.4.4.2 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, where appropriate, at subsequent stages to inform the ES.

19.4.4.3 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the ES.

19.4.4.4 It is assumed that all the principal existing land uses adjoining the Site will remain, other than those detailed within Chapter 28 Cumulative Effects.

19.4.4.5 Onshore water resources and flood risk are closely linked with a number of other environmental assessments being undertaken as part of this PEIR. It should be noted that potential impacts on these topic areas are not included within this Chapter and can be found in other chapters as summarised below:

- Marine – impacts on sensitive and/or important marine physical processes, marine water and sediment quality, intertidal and benthic ecology (e.g. water resources and ecology including and below intertidal zone) will be assessed in Chapters 6 to 14;
- Ecology - impacts on sensitive and/or important onshore aquatic species and habitats within the non-saline environment (e.g. above inter-tidal environment) will be assessed in the Chapter 16 Onshore Ecology which includes impacts on sensitive and/or important ecology associated to noise and vibration; and
- Ground Conditions - the release of contaminants contained in the ground will be assessed in the Chapter 18 Ground Conditions.

19.4.4.6 It is assumed that the preliminary recommendations for mitigation relating to the Construction Stage will be developed as part of a CEMP alongside the production of the ES.

## 19.5 BASELINE ENVIRONMENT

### 19.5.1 DESIGNATED SITES

19.5.1.1 Designated sites that have a hydrological linkage to the Proposed Development and which therefore have a High sensitivity are summarised in Appendix 19.1 Table 1.

### 19.5.2 SITE TOPOGRAPHY

19.5.2.1 A summary of the topography within each section of the study area is provided within Appendix 19.1 Table 2 which is based on OpenSource gov.uk LiDAR data, with a resolution of 2m, which has been reproduced on Figure 19.3 appended, this baseline data has also been used to help inform potential overland flow routes in the proceeding surface water flood risk section (report Section 19.5.11). Key terrain features discussed include:

- Hills: areas of high ground, from hilltop ground slopes down in all directions;
- Ridges: a line of high ground with height variations along its crest;
- Valleys: reasonably level ground bordered on the sides by higher ground (contours often U shaped);
- Draws: similar to a valley, except that it normally is a less developed (contours often V shaped); and
- Spurs: a usually short, continuously sloping line of higher ground, normally jutting out from the side of a ridge.

## 19.5.3 GEOLOGY

19.5.3.1 A detailed description of the geology of the study area is also available in Chapter 18 - Ground Conditions. The main characteristics in geology of the study area are described below under the subsequent headings with the main bedrock and superficial geology presented on Figure 19.1 and Figure 19.2 appended.

**Section 1 – Lovedean (Converter Station Area)**

19.5.3.2 Review of BGS mapping indicates a presence of superficial Head Deposits in the area of the Converter Station and Access Road comprising mostly clay, silt, sand and gravel.

19.5.3.3 The Converter Station and Access Road is underlain by the Tarrant Chalk Member comprising soft white chalk with relatively widely spaced but large flint seams.

**Section 2 to Section 9 – Onshore Cable Corridor**

19.5.3.4 Review of BGS mapping indicates that superficial deposits along the Onshore Cable Corridor Sections 2 to Section 9 comprise the following:

- Head Deposits composed mostly of clay, silt, sand and gravel;
- River Terrace Deposits (undifferentiated) consisting of sand, silt and clay; and
- Raised Marine Deposits comprising sand and gravel.

19.5.3.5 Bedrock geology includes the following:

- Tarrant Chalk Member which is composed of soft white chalk with relatively widely spaced but large flint seams (Section 2);
- Lambeth Group comprising clay, silt and sand (Section 3);
- London Clay and Wittering Formations both comprising clay, silt and sand (Section 4);
- Portsdown Chalk Formation and Whitecliff Sand Member comprising white chalk with marl seams and flint bands (Section 4);
- Spetisbury Chalk Member which is composed of firm white chalk with regular large flint seams (Section 4 and Section 5);
- Tarrant Chalk Member (Section 4 and Section 5);
- Newhaven Chalk Formation comprising soft to medium hard chalk with marl and flint bands (Section 5);
- White Chalk Subgroup comprising chalk with flints (Section 5 to Section 7);
- Lambeth Group, London Clay Formation and Bognor Sand Member, the latter is composed of partially cemented fine to medium grained sands (Section 8); and
- London Clay Formation (Portsmouth Sand Member) and Wittering Formation (Section 9).

19.5.3.6 The White Chalk Subgroup is composed of the following units:

- Portsdown Chalk Member;

- Spetisbury Chalk Member;
- Tarrant Chalk Member;
- Newhaven Chalk Formation;
- Seaford Chalk Formation; and
- Lewes Nodular Chalk Formation.

19.5.3.7 The above units, where applicable, will be referenced individually in this chapter if there are implications of the Proposed Development that will adversely or beneficially affect groundwater receptors along the Onshore Cable Corridor (Section 2 to Section 9).

19.5.3.8 In the Proposed Development area, the rocks have been folded into a large east-west trending synclinal (trough) structure known as the Chichester Syncline. The White Chalk Subgroup of the South Downs dips southwards, disappearing beneath the overlying superficial deposits (see Appendix 19.1 Table 4), which are at the surface in the core of the syncline, before rising-up to the surface along the Portsdown anticline. The Bedhampton and Havant springs are found at the boundary between the Chalk and overlying Lambeth Group.

**Section 10 – Eastney (Landfall)**

19.5.3.9 Review of BGS mapping indicates that superficial deposits are composed of the following:

- River Terrace Deposits and Tidal Flat Deposits comprising clay, silt, sand and gravel; and
- Storm Beach Deposits comprising gravel and rarely sand.

19.5.3.10 The Wittering Formation is composed of clay, silt and sand and underlies the superficial deposits in Section 10 – Eastney (Landfall).

### 19.5.4 LOCAL CHALK KARST SYSTEMS

19.5.4.1 The Chalk of the South Downs contains features indicative of a karst landscape, which are formed through the dissolution of soluble rocks. Karst landscapes developed in the Chalk are often associated with springs that can provide large supplies of water. The Bedhampton and Havant spring complex in Hampshire, where the scheme is located, is one of the best examples of Chalk karst springs in the UK.

19.5.4.2 The Bedhampton and Havant spring complex is divided into three (3 no.) karst zones defined on the basis of the geology (see Figure 19.1 appended), the density and type of surface karst features present.

19.5.4.3 Karst Zone 1 is characterised by frequent stream sinks and dolines associated with the geological boundary between Tertiary (sand and clay) and Cretaceous (chalk) deposits. Stream sinks and dolines are defined as holes in the ground caused by a collapse of a surface layer i.e. chemical dissolution of carbonate rocks has occurred.

19.5.4.4 Karst Zone 2 is an intermediate area where the clay with flints superficial deposits are present. In this zone, dolines and solution pipes are likely to occur but few hydrologically active stream sinks are present i.e. no flow of water through the system. Karst Zone 3 is the area further from the geological boundary in Karst Zone 1, where stream sinks are absent and dolines are rare. No part of the Proposed Development falls within Karst Zone 3.

19.5.4.5 Groundwater contours suggest that the general flow direction within the catchment of the springs is from north to south, with focused concentrations of flow down valley features. Dry valleys may develop on permeable rocks such as chalk and, do not hold surface water because it infiltrates into the underlying permeable rocks.

19.5.4.6 Tracer tests are used to determine connections between stream sinks and springs to demonstrate how fast the water moves through the subsurface. Tracer tests have been carried out at five (5 no.) stream sinks located on the White Chalk Subgroup and superficial deposits boundary (Atkinson and Smith, 1974) within Route Section 2 of the Proposed Development. Tracer from four (4 no.) of these stream sinks were detected at both the Bedhampton and Havant Springs, demonstrating rapid groundwater flow of several kilometres per day which are defined in Appendix 19.1 Table 3.

19.5.4.7 These velocities (km/day) are extremely high for groundwater and suggest flow through a well-connected system of karstic conduits and fissures extending over distances of many kilometres. The highest velocities were recorded in a test from Rowlands Castle #39 NGR SU 73317 10662 (10.5 km/day and 12.3 km/day).

19.5.4.8 The tracer tests (Appendix 16.1 Table 3) demonstrate the presence of karstic groundwater flow linking the stream sinks along the geological boundary between the Tertiary (sand and clay) and Cretaceous (White Chalk Subgroup) deposits to the Bedhampton and Havant Springs in Section 4 and Section 5.

**Section 1 – Lovedean (Converter Station Area)**

19.5.4.9 Superficial deposits comprising Head Deposits in the area of Section 1 are classified by the EA as Secondary (undifferentiated) aquifers. The undifferentiated designation indicates that the Head Deposit aquifer properties vary due to the heterogenous and irregular composition of the rock type.

19.5.4.10 The Tarrant Chalk Member (White Chalk Subgroup) is classified a Principal aquifer by the EA. Principal Aquifers are defined as having high intergranular and/or fracture permeability and having a high level of water storage, capable of supporting water supplies and/or river base-flow at a regional or strategic scale and therefore have a High sensitivity.

19.5.4.11 The area is located within SPZ Zone 1 relating to abstractions from the Lovedean Pumping Station. An SPZ Zone 1 is defined as the 50-day travel time from any point below the water table to the source. An SPZ highlights the risk of contamination from any activities that might cause pollution in the area and are typically used to protect abstractions for public water supply.

**Groundwater Flow and Levels**

19.5.4.12 The BGS hydrogeological map provides a cross-section "Section 2", located to the west of the indicative Converter Station location and Access Road, but considered representative of the site and the main hydrogeological characteristics of the Chalk aquifer (being the White Chalk Subgroup). The cross-section "Section 2" identifies that the Chalk aquifer is considered a saturated unconfined aquifer, which is exposed at surface.

19.5.4.13 Groundwater contours within the Chalk, as provided on the BGS hydrogeological map, indicate that the elevation and gradient of the water table fluctuates seasonally in response to recharge. The general flow direction within the catchment is from north to south, with flow locally towards and along valley features.

19.5.4.14 Groundwater was not recorded in exploratory boreholes during the ground investigation works (2018) completed in Route Section 1 of the Proposed Development. The BGS hydrogeology map and water features marked on ordnance survey maps indicate that groundwater occurs at depth (approximately 40.0mBGL or 35.0mOD) within the Chalk below the Converter Station.

19.5.4.15 No exploratory boreholes were installed for ongoing groundwater level monitoring in Route Section 1. This is due to the sensitivity of groundwater receptors in the area which have a High sensitivity.

19.5.4.16 The EA has no groundwater level monitoring boreholes located within Route Section 1.

19.5.4.17 Karstic features are present within Route Section 1 of the Site Boundary and the footprint for the Converter Station is located within Karst Zone 2 (see Figure 19.1).

19.5.4.18 A geophysical survey undertaken as part of the ground investigation between the 28th August and 6th September 2018 and identified two solution features within the footprint for the Converter Station.

19.5.4.19 Cone Penetration Testing ('CPT'), a method used to determine the geotechnical engineering properties of soils and soil stratigraphy, of the karstic features was scheduled in Phase 2 of the ground investigation. CPT data relating recorded in Phase 2 of the ground investigation was not available at the time of writing this chapter but will be included in the ES.

### Groundwater Abstractions

19.5.4.20 Review of the EA abstractions map indicates that there is one groundwater abstraction licence, located approximately 0.55km to the east of Route Section 1.

19.5.4.21 The licence is for public water supply for Portsmouth Water Ltd with a maximum daily abstraction above 2,500 $m^3$. It is assumed that the abstraction targets the Chalk for water supply and will have a High sensitivity.

19.5.4.22 Data requests to the EA, Portsmouth Water and appropriate Local Authorities have been made to obtain information on licensed and unlicensed groundwater abstractions respectively. This information will be included and assessed at ES stage.

### Groundwater Quality

19.5.4.23 Under the WFD, the EA has determined that Route Section 1 lies within the 'East Hants Chalk' Groundwater Waterbody (waterbody ID GB40701G502700). This has been assessed and assigned a 'Poor' status for both quantitative and chemical classifications based on the 2016 dataset. The main pressures that are resulting in a less than good status are from agricultural and rural land management and the water industry (groundwater abstraction). The groundwater waterbody is linked to protected areas under the Nitrates and Drinking Water Directives and the Safeguard Zone Directive for the Bedhampton and Havant spring complex.

19.5.4.24 No site-specific groundwater water quality data are available for Route Section 1.

### Groundwater Dependent Terrestrial Ecosystems

19.5.4.25 No Groundwater Dependent Terrestrial Ecosystems ('GDTEs') have been identified in Route Section 1.

### Groundwater Vulnerability

19.5.4.26 Route Section 1 falls within a Major Aquifer High and Major Aquifer Intermediate groundwater vulnerability zones, which are defined as a Principal aquifer with no retarding overburden. Any at surface pollution will freely percolate into the aquifer. Route Section 1 is located within a eutrophic water and groundwater Nitrate Vulnerable Zone ('NVZ') as specified by the EA (2018). This identifies a risk from agricultural nitrate pollution.

### Section 2 to Section 9 – Onshore Cable Corridor

19.5.4.27 Appendix 19.1 Table 4 provides a summary of the hydrogeological units present along the Onshore Cable Corridor between Section 2 and Section 9.

19.5.4.28 Appendix 19.1 Table 4 references the White Chalk Subgroup only.

19.5.4.29 Route Section 2 and Section 3 are located within SPZ Inner Zone (Zone 1) relating to abstractions from the Lovedean Pumping Station.

19.5.4.30 Section 2 is located in a Karst Zone 1 and Karst Zone 2 whereas Section 3 is located in a Karst Zone 1. The boundary between Section 2 and Section 3 is defined by the White Chalk Subgroup and Lambeth Group contact, where the White Chalk Subgroup dips to the south and below the Lambeth Group.

19.5.4.31 Section 3 and Section 4 are located within SPZ Zone 1 for subsurface activity and relates to the Karst Zones (Karst Zone 1) relating to the Bedhampton and Havant spring complex. The Onshore Cable Corridor Sections (Section 3 and Section 4) are therefore considered to have a High sensitivity Where the springs are used as a source of supply by Portsmouth Water Ltd, the SPZ is located 1.3 km east of Section 5, within the Bedhampton and Havant District.

19.5.4.32 Sections 5 to Section 9 are not located within a SPZ or a Karst Zone, therefore considered to have Low sensitivity.

**Groundwater Flow and Levels**

19.5.4.33 The Hydrogeological Map of Hampshire and the Isle of White (1979), which is also available on the BGS website, provides a regional piezometric map with 50.0m interval contours on the estimated minimum level water table for the Chalk aquifer and base of the Palaeogene deposits (see Appendix 19.1, Table 4). The water table level for both the Chalk aquifer and base of the Palaeogene varies along the Onshore Cable Corridor from north (Section 2 at Denmead) to south (Section 9 at Portsmouth Harbour).

19.5.4.34 The minimum level water table, as record on the BGS hydrogeological map (1979), for the Palaeogene Deposits is 0.0 mOD within Section 7, Section 8, and the southern-most part of Section 4 at Widley. The latter section marks the Portsdown anticline and it is here that the Bedhampton and Havant spring complex emerges at surface to the east of Section 4 alignment (NGR SU 70454 06460). A minimum level water table at the northern most part of Section 4 (at Soake) is 0.0 mOD.

19.5.4.35 The minimum level water table for the Chalk aquifer, which is present in the southern-most part of Section 4 (at Widley) to Section 7, is 50.0 mOD. The Chalk aquifer outcrops at surface in the southern-most part of Section 4 and it is here that the Bedhampton and Havant spring complex emerges at surface.

19.5.4.36 According to the BGS, and in relation to the Bedhampton and Havant spring complex, Section 2 falls within a Karst Zone 2 and, Section 3 to Section 5 fall within a Karst Zone 1 (see report Section 19.5.4). Karst Zone 1 is characterised by frequent stream sinks and dolines associated with the geological boundary between the White Chalk Subgroup and Lambeth Group.

19.5.4.37 These features contribute to a karstic environment with rapid transit times (see Appendix 19.1 Table 3) and are considered to have a High sensitivity, therefore pollution prevention is key. Phase 2 of the ground investigation works is located between Section 2 and Section 9 of the Onshore Cable Corridor.

19.5.4.38 Groundwater observations from Phase 2 of the ground investigation (2018) found water levels to be variable along the entire Onshore Cable Corridor. Shallow groundwater levels were recorded at 0.47mOD (0.28 mBGL) in BH16 (Section 7) within the White Chalk Subgroup. The deepest groundwater level was recorded at 1.61 mOD (2.48mGL) in BH34 (Section 9) within Tidal Flat Deposits.

19.5.4.39 Nine (9 no.) boreholes are available for groundwater level monitoring purposes and installation details are summarised in Appendix 19.1 Table 5. BH33 has a dual installation for shallow (BH33 s) and deep (BH33 d) strata. Records of groundwater monitoring to date are summarised in Appendix 19.1 Table 6.

19.5.4.40 Groundwater monitoring is ongoing along the Onshore Cable Corridor. As and when additional groundwater level data becomes available, this will be updated at ES stage.

### Groundwater Abstractions

19.5.4.41 Data requests to the EA, Portsmouth Water and appropriate Local Authorities have been made to obtain information on licensed and unlicensed groundwater abstractions respectively. This information will be included and assessed at ES stage.

### Groundwater Quality

19.5.4.42 Under the WFD, the EA has determined that Section 2 and Section 3 of the Onshore Cable Corridor lies within the 'East Hants Lambeth Group' Groundwater Waterbody (waterbody ID GB40702G500800), classified as holding a 'Poor' quantitative status and 'Good' chemical status classifications based on the 2016 dataset. The main pressures are classified 'no sector responsible', which applies where the pressure (and reason for status) is not related to the activities of a particular sector. The groundwater waterbody is linked to protected areas under the EU Nitrates Directive (1991) and Drinking Water Directives (98/83/EC).

19.5.4.43 Under the WFD, the EA has determined that the southernmost part of Section 4 (Portsdown Hill Road) to Section 7 lies within the 'East Hants Chalk' Groundwater Waterbody (waterbody ID GB40701G502700), classified as holding a 'Poor' status for both quantitative and chemical classifications based on the 2016 dataset. The main pressures are either from agricultural and rural land management and the water industry (groundwater abstraction). The groundwater waterbody is linked to protected areas under the Nitrates and Drinking Water Directives and the Safeguard Zone Directive for the Bedhampton and Havant spring complex.

19.5.4.44 Under the WFD, the EA has determined that the southernmost part of Section 4 (at Widley), Section 8 and the southernmost part of Section 7 (Airport Service Road) lie within the 'South Hants Lambeth Group' Groundwater Waterbody (waterbody ID GB40702G503700), classified as holding both 'Good' quantitative and chemical status classifications based on the 2016 dataset. The groundwater waterbody is linked to protected areas under the Nitrates and Drinking Water Directives.

19.5.4.45 Under the WFD, the EA has determined that Section 9 lies within the 'South East Hants Bracklesham Group' Groundwater Waterbody (waterbody ID GB40702G503000), classified as having 'Good' qualitative and 'Poor' chemical status classifications based on the 2016 dataset. The main pressures are from landfill leaching. The groundwater waterbody is linked to protected areas under the Drinking Water Directive.

19.5.4.46 Groundwater sampling and testing was undertaken as part of the Phase 2 ground investigation and results are discussed in detail in Chapter 18: Ground Conditions.

19.5.4.47 Appendix 19.1 Table 7 summarises the results of groundwater water quality along the entire Onshore Cable Corridor for 2018. The results are based on a groundwater quality campaign carried out on eleven (11 no.) boreholes in 2018 and, represent the latest data available. The monitoring campaign is ongoing along the entire Onshore Cable Corridor (Sections 2 to Section 9).

19.5.4.48 Groundwater water quality results are screened against UK Drinking Water Standards ('DWS') and exceedances are highlighted in Appendix 16.1 Table 7.

19.5.4.49 Exceedances in the UK DWS for chloride and sulphate (as SO4) is expected in coastal environments. High concentrations of chloride are also positively correlated to high conductivity levels within the boreholes which are located in a coastal environment

**Groundwater Dependent Terrestrial Ecosystems**

19.5.4.50 Two (2 no.) potential Groundwater Dependent Terrestrial Ecosystems ('GDTEs') have been identified in Section 3 and are described below.

19.5.4.51 Kings Pond (NGR SU 66732 11781) is a Priority Lowlands Meadow Habitat and a SINC. Kings Pond is potentially due to be designated as a SSSI. The area is known to be inundated during winter and a network of ephemeral surface water bodies are present. The hydraulic relationship between Kings Pond and groundwater in underlying aquifers and the groundwater dependency of the surrounding habitat is not known.

19.5.4.52 Denmead Meadow (NGR SU 66656 11427) is currently under consideration by Natural England to designate the site as a SSSI. The hydraulic relationship between Denmead Meadow and groundwater in underlying aquifers and the groundwater dependency of the surrounding habitat is not known.

19.5.4.53 Both sites are located within SPZ Inner Zone (Zone 1) and SPZ Zone 1 subsurface activity and may be susceptible and sensitive to changes in groundwater quantity and groundwater quality.

19.5.4.54 As a precautionary approach, Kings Pond and Denmead Meadow have also been considered as GDTEs until further details are provided for additional assessment and therefore, considered to have a High sensitivity. Chapter 16 – Onshore Ecology should be referred to for site-specific details and any assessment of the potential ecological effects associated with the site.

### Groundwater Vulnerability

19.5.4.55 Section 2 falls within a Major Aquifer Intermediate groundwater vulnerability zone and is located within a groundwater and eutrophic water NVZ, as specified by the EA (2018). This identifies a risk from agricultural nitrate pollution in the area. Eutrophic water NVZ are defined within the Nitrates Directive if they have elevated nitrate concentrations and are eutrophic.

19.5.4.56 The majority of Section 3 falls within a Minor Aquifer Low groundwater vulnerability zone. The northernmost section of Section 3 (at Anmore Road) falls within a Major Aquifer Intermediate groundwater vulnerability zone and is also located within a groundwater NVZ. The entire section is located within a eutrophic water NVZ and identifies a risk from agricultural nitrate pollution.

19.5.4.57 Section 4 (along the B2150 to the southernmost part of the section) falls within a Minor Aquifer High groundwater vulnerability zone and is located within a eutrophic water NVZ. The southernmost part of the section (at Widley along the B2177) is located within a groundwater and eutrophic water NVZ.

19.5.4.58 The southernmost section of Section 4 (at Widley along the B2177) to Section 8 fall within a Major Aquifer High groundwater vulnerability zone. The major aquifers include the White Chalk Subgroup, specifically the Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations, which are highly permeable formations and able to easily transmit pollution to groundwater.

19.5.4.59 Sections 4 to Section 9 are located within a eutrophic water NVZ.

19.5.4.60 Section 9 falls within a Minor Aquifer High groundwater vulnerability zone.

### Section 10 – Eastney (Landfall)

19.5.4.61 Superficial deposits comprising River Terrace Deposits and Storm Beach Deposits are designated Secondary A aquifers. The Tidal Flat Deposits are designated Secondary (Undifferentiated) aquifers. Local supplies of up to 0.5L/s have been obtained from the superficial deposits (BGS, 1979).

19.5.4.62 The underlying Wittering Formation is designated a Secondary A aquifer. Rapid lateral and vertical separations in the sand and clay content of this formation have a commensurate effect on aquifer properties (Jones et al, 2000). The variable low permeability characteristics of the formation will impede on water supply and yield. Flow is likely to be highly constrained both spatially and vertically.

19.5.4.63 Section 10 is not located within a SPZ or Karst Zone and for this reason, considered to have a Low sensitivity.

### Groundwater Flow and Levels

19.5.4.64 Two (2 no.) boreholes are available for groundwater level monitoring purposes and installation details are summarised in Appendix 19.1 Table 8. Records of groundwater level monitoring to date are summarised in Appendix 19.1 Table 9.

Tidal influence of groundwater within Section 10 of the Proposed Development is expected as it is located in a coastal setting. Groundwater level monitoring is ongoing in Section 10 and when additional groundwater level data becomes available, this will be updated at ES stage.

### Groundwater Abstractions

19.5.4.65 Data requests to the EA, Portsmouth Water and appropriate Local Authorities have been made to obtain information on licensed and unlicensed groundwater abstractions respectively. This information will be included and assessed at ES stage.

### Groundwater Quality

19.5.4.66 Under the WFD, the EA has determined that Section 10 lies within the 'South East Hants Bracklesham Group' Groundwater Waterbody (waterbody ID GB40702G503000), classified as having 'Good' qualitative and 'Poor' chemical status classifications based on the 2016 dataset. The main pressures are from landfill leaching. The groundwater waterbody is linked to protected areas under the Drinking Water Directive.

19.5.4.67 Site-specific groundwater water quality data are available at two (2 no.) boreholes in Section 10 and, are summarised in Appendix 19.1 Table 10. The results are based on a groundwater quality campaign carried out on eleven (11 no.) boreholes in 2018 along the entire Onshore Cable Corridor and, represent the latest data available.

19.5.4.68 The groundwater water quality monitoring campaign is ongoing in Section 10. As and when additional groundwater water quality data becomes available, this will be updated at ES stage.

19.5.4.69 Exceedances in the UK DWS for chloride and sulphate (as SO4) is expected in coastal environments. High concentrations of chloride are also positively correlated to high conductivity levels within the boreholes which are located in a coastal setting.

### Groundwater Dependent Terrestrial Ecosystems

19.5.4.70 No GDTEs have been identified in Section 10 and considered to have a Low sensitivity on this basis.

### Groundwater Vulnerability

19.5.4.71 Section 10 falls within a Minor Aquifer High groundwater vulnerability zone and is located within a eutrophic water NVZ, which identifies that there is a risk from agricultural nitrates pollution in the area.

## 19.5.5 FUTURE BASELINE GROUNDWATER

19.5.5.1 For the future baseline, the WFD objectives are assumed to be met for all groundwater waterbodies which relate to the Proposed Development.

### Section 1 – Lovedean (Converter Station Area)

19.5.5.2 For the future baseline, the WFD objectives are assumed to be met. The 'East Hants Chalk' (GB40701G502700), which is currently designated a 'Poor' WFD status will be assessed according to future 'Good' WFD status. The EA expect the groundwater waterbody to achieve 'Good' status of all assessment parameters by 2027. Any potential change in status would not affect the sensitivity of the receptor, which will remain a regionally important aquifer irrespective of designation. Based on the current available information no other changes are expected in baseline conditions.

### Section 2 to Section 9 – Onshore Cable Corridor

19.5.5.3 The 'East Hants Lambeth Group' (GB40702G500800) is currently designated a 'Poor' WFD status and will be assessed according to future 'Good' WFD status. The EA expect the groundwater waterbody to achieve 'Good' status of all assessment parameters by 2021 and maintain 'Good' chemical status. Any potential change in status would not affect the sensitivity of the receptor. Section 2 and Section 3 are located within this groundwater waterbody.

19.5.5.4 The 'East Hants Chalk' (GB40701G502700), corresponding to Section 4 to Section 7, is currently designated as 'Poor' WFD status and will be assessed according to future 'Good' WFD status. The EA expect the groundwater waterbody to achieve 'Good' status of all assessment parameters by 2027. Any potential change in status would not affect the importance of the receptor, which will remain a regionally important aquifer irrespective of designation.

19.5.5.5 The 'South Hants Lambeth Group' (GB40702G503700) is currently designated as having a 'Good' WFD status. The EA expect the groundwater waterbody to maintain a 'Good' status for both quantitative and chemical classifications. The southernmost parts of Section 4 and Section 7 and, all of Section 8 are located within this groundwater waterbody.

19.5.5.6 The 'South East Hants Bracklesham Group' (GB40702G503000) is currently designated as 'Poor' WFD status and will be assessed according to future 'Good' status. The EA expect the groundwater waterbody to achieve 'Good' status of all assessment parameters by 2027 and maintain 'Good' quantitative status. Section 9 is located within this groundwater waterbody.

19.5.5.7 Based on the current available information for the entire Onshore Cable Corridor, no other changes are expected in baseline conditions.

**Section 10 – Eastney (Landfall)**

19.5.5.8 The 'South East Hants Bracklesham Group' (GB40702G503000) is currently designated as 'Poor' WFD status and will be assessed according to future 'Good' status. The EA expect the groundwater waterbody to achieve 'Good' status of all assessment parameters by 2027 and maintain 'Good' quantitative status. Any potential change in status would not affect the important of the receptor, which will remain a locally important aquifer irrespective of designation.

### 19.5.6 SURFACE WATER FEATURES (CATCHMENTS, WATERCOURSES AND WATER QUALITY)

19.5.6.1 The EA's Catchment Data Explorer provides detail about the water environment, builds upon the data in the river basin management plans, and details catchment and water body classifications.

19.5.6.2 Based on the Catchment Data Explorer the study area is located within:

- **River Basin District**: South East;
- **Management Catchment(s)**: East Hampshire and South East Transitional and Coastal; and
- **Operational Catchment(s):** East Hampshire Rivers, Hampshire East Transitional and Coastal and Solent.

19.5.6.3 Thereafter, the study area is located within a number of different sub-catchments with a number of identified water bodies within. A number of water bodies, namely ordinary watercourses, within these catchments are not defined waterbodies however fall within the overall catchment.

**Watercourses and Waterbodies**

19.5.6.4 A summary of all water bodies, including main rivers, ordinary watercourses and other surface water features, such as ponds, based on OS mapping and Flood Map for Planning are summarised within Appendix 19.1 Table 11 and as shown on Figure 19.5 appended.

19.5.6.5 Onshore, transitional and coastal catchments are illustrated on Figure 19.10 appended with groundwater catchments illustrated on Figure 19.11 appended.

**Surface Water Quality**

19.5.6.6 The EA 'Catchment Data Explorer – Water Body Classification' classifies water bodies for each catchment based on their ecological and chemical status expressed in terms of five classes (high, good, moderate, poor or bad).

19.5.6.7 An ecological status is based on biological parameters and physicochemical parameters supporting the biology of the water body where 'High' represents largely undisturbed conditions. Other classes show increasing deviation from undisturbed conditions towards a 'Bad' status.

19.5.6.8 The chemical status is intended to check compliance with certain European Directives regarding defined chemical content within a watercourse. The status grading follows the same approach as ecological status, from 'High' to 'Bad', where 'Bad' represents the worst possible conditions.

19.5.6.9 A summary of all catchments classification can be found in Appendix 19.1, Table 12.

### 19.5.7 FLOOD DEFENCES

19.5.7.1 A summary of all known flood defences for the watercourses presented in Appendix 19.1, Table 13 are summarised in Appendix 19.1 Table 13 and is based on the following information/data sets:

- EA Product 4 data and gov.uk spatial data 'spatial flood defences (including standardised attributes)' – which provides a summary of known fluvial and tidal main river flood defences; and
- Information based on correspondence with ESCP.

19.5.7.2 Based on correspondence with ESCP it is understood that a programme of improvement works to the coastal/ tidal flood defences within Portsea Island is being undertaken.

19.5.7.3 A number of these schemes have been completed, however there are a number of proposed schemes still to be implemented. Appendix 19.1 Table 14 summarises the current implemented and proposed flood defence schemes on Portsea Island.

19.5.7.4 Based on correspondence with ESCP it is understood that the majority of the costal flood defences adjacent to Site Boundary between Section 7 and Section 10 are owned by PCC, however there are a number of other privately-owned flood defences as summarised in Appendix 19.1 Table 15.

### 19.5.8 LICENCED SURFACE WATER ABSTRACTIONS AND DISCHARGES

19.5.8.1 Based on information provided by the EA through consultation it is understood that there are two licenced surface water abstractions in the near vicinity of the Onshore Cable Corridor, including:

- **Licence No**.:28/032 (approximately 400m west of Section 3 of Site Boundary)
  - **Purpose**: Industrial, Commercial and Public Services/ Golf Courses/ Spray Irrigation – Direct,
  - **Source/ Point Name**: Southern Region Surface Waters/ River Wallington At Furzely Farm Lake, Denmead (SU66001067).

- **Licence No**.: So/042/0028/002 (approximately 600m east of Section 9 of Site Boundary)
  - **Purpose**: Agriculture/ Aquaculture Fish/ Fish Farm/Cress Pond Throughflow,
  - **Source/ Point Name:** Southern Region Tidal Waters/ Hayling Island Ferry Pontoon (SU6847200125).

19.5.8.2 EA data has also identified a number of licenced surface water discharges located in the vicinity of Section 1 of the Site Boundary which have a range of discharge types including:

- Agriculture;
- Domestic property;
- Making of machinery/Engine/Pump;
- Miscellaneous;
- Pumping station/sewerage network;
- Sewage – non-water company;
- Sewage - water company;
- Sport, amusement and recreation;
- Storm tank/CSO on sewerage Network;
- Treated foul effluent; and
- Unidentified.

### 19.5.9 EXISTING SEWERS/ DRAINAGE

19.5.9.1 Within this section of the report only public sewage networks have been considered. Within the study area SW is the statutory undertaker for public sewage. It is anticipated that there are a number of highway drainage networks within the study area however these have not been reviewed at this stage as the Proposed Development is not anticipated to alter the highway drainage network; however, they will be considered in the context of flood risk at ES stage.

19.5.9.2 A summary of the public drainage network based on SW records is detailed in Appendix 19.1 Table 16.

### 19.5.10 EXISTING POTABLE WATER NETWORK

19.5.10.1 Within the Site Boundary PW supply potable water. A summary of the existing potable water network within the study area is provided in Appendix 19.1 Table 17.

### 19.5.11 EXISTING SOURCES OF FLOOD RISK

19.5.11.1 This section of the report provides an overview of the flood risk profile from various flood risk sources. Appendix 19.1 Table 19 presents a summary of the flood risk profile from the considered flood risk sources.

19.5.11.2 The flood risk profile is primarily based on the following data sets:

- **Tidal/ fluvial** – based on gov.uk "Flood Map for Planning":
- **Surface Water** – based on gov.uk "Long term flood risk information" flood risk from surface water mapping: flood extent and LiDAR data:
- **Reservoir** – based on gov.uk "Long term flood risk information" flood risk from reservoir mapping: flood extent;
- **Groundwater** – based on the Hampshire (2018) Hampshire GWMP: Figure 7 Areas susceptible to groundwater flooding; and
- **Sewer Flooding** – based on LLFA/ Borough Council strategic flood risk documents.

19.5.11.3 The flood risk profile relevant to individual sources is detailed in the proceeding sections and will be further investigated through a FRA alongside further consultation with relevant stakeholders e.g. EA, LLFA's (Counties and Unitary Authorities), SDNPA, Local District Flood and Drainage Teams and reference to relevant reports (e.g. PUSH, ESCP).

19.5.11.4 Appended figures relevant to the flood risk profile include:

- LiDAR – Figure 19.3;
- Watercourses – Figure 19.5;
- Flood Map for Planning – Figure 19.6;
- Flood Risk from Surface Water – Figure 19.7;
- Flood Risk from Reservoirs – Figure 19.8; and
- History of Flooding – Figure 19.9.

### Tidal and Fluvial

19.5.11.5 Based on the Flood Map for Planning, areas of the study area lie within a combination of Flood Zone 1, 2, and 3, as illustrated in Figure 19.6 appended. Flood Zones are defined in the NPPF as:

- **Flood Zone 1** is land assessed as having a less than 0.1% annual probability of flooding from the sea or rivers in any given year in the absence of flood defences;
- **Flood Zone 2** is land assessed as having between a 0.5% and 0.1% annual probability of flooding from the sea (between 1 in 200 and 1 in 1,000 year return period) or between 1% and 0.1% annual probability of flooding from rivers (between 1 in 100 and 1 in 1,000 year return period event or greater) in any given year in the absence of flood defences; and
- **Flood Zone 3** is land assessed as having a 0.5% or greater annual probability of flooding from sea flooding (1 in 200 return period event or greater) or 1% or greater annual probability of flooding from river flooding (1 in 100 return period event or greater) in any given year in the absence of flood defences.

19.5.11.6 A summary of the areas that appear to be at risk of tidal and fluvial flooding are dealt with separately below. Further detail of the flood risk profile will be provided as part of the ES through a FRA.

### Tidal

19.5.11.7 Within the study area elements located within Section 5 to Section 10 are subject to a combined tidal and fluvial risk of flooding.

19.5.11.8 Tidal water levels within Langstone Harbour, which are relevant to the study area between Section 5 to Section 10 (Landfall) are based on EA Product 4 sea levels (still water design estimates) data at node 160 for the 0.5% and the 0.1% annual exceedance probabilities in any given year, and provided in Appendix 19.1 Table 18. Node 160 (Easting, Northing: 468789, 100080) is located at the entrance to Langstone Harbour and is the closest node to the study area (approximately 600 m east of Section 9).

19.5.11.9 It should be noted that these levels are based on 2011 base data, and take into account the latest allowances for climate change and sea level rise (Flood risk assessments: climate change allowances, Feb 2016). However, it should be noted that extreme sea level values are for still water sea levels only. Extreme sea level values include the effect of storm surge but do not account for any local increase in sea level that may be induced by onshore wave action. Wave set-up would need to be estimated separately if deemed appropriate at ES stage.

19.5.11.10 The presence of flood defences along the eastern frontage of Portsea Island (adjacent to Section 7 to Section 10 – Landfall ) as summarised above defend Portsea Island from tidal and coastal flooding with a standard of protection ranging up to a maximum of 1 in 500 years based on correspondence with ESCP with the defences providing a combination of erosion protection and protection from tidal inundation.

19.5.11.11 Based on the presence of flood defences the actual risk of tidal flooding is typically low throughout Section 7 to Section 10 (Landfall) of the study area, however a residual risk of a breach in the defences and tidal flooding remains. Furthermore, areas located below the extreme sea levels and areas not benefitting from raised flood defences remain with a medium and high probability of flooding based on their areas flood zone designation. This will be further considered as part of a FRA within the ES as further consultation with relevant stakeholders is needed to define with precision which areas are defended and to what standard.

19.5.11.12 It should also be noted that a risk of fluvial flooding is still present within Great Salterns Lake as large parts of Portsea Island drain through the golf course to Great Salterns Lake before discharging via an upgraded (early 2011) EA maintained pump system through an outfall to sea. The lake has recently had its capacity increased (early 2011), and reed beds realigned to improve flow. Due to the low-lying nature of the land during extensive heavy rainfall events localised flooding occurs, particularly when there is tide locking at the outfall caused by a high tide.

19.5.11.13 North of ‘Ports Downs’ (Section 4) ground levels are significantly above the tidal still water design estimates and, based on the information available all areas north of the ‘Ports Downs’ are considered to have a negligible probability of tidal flooding.

**Fluvial**

19.5.11.14 With reference to Figure 19.6 appended and as summarised in Appendix 19.1 Table 19, the majority of the study area is located within Flood Zone 1 due to the site's higher elevation in comparison to the rivers located within the study area. The areas within Flood Zone 1 are considered to have a low probability of fluvial flooding.

19.5.11.15 There are, however, a number of watercourses within the study area and, locally to these watercourses as illustrated in Figure 19.6 appended, land is typically located within a combination of Flood Zone 2 and 3. These areas will be further considered as part of a FRA within the ES.

19.5.11.16 Based on the Flood Map for Planning the following watercourses are located within the Site Boundary:

- Soake Farm (North);
- Soake Farm (East);
- Old Park Farm;
- River Wallington;
- North Purbrook Heath (North);
- North Purbrook Heath (South); and
- Great Solent Drain.

19.5.11.17 Land within Flood Zone 2 and 3 (undefended) are considered to have a medium to high probability of flooding respectively.

**Surface Water**

19.5.11.18 Surface water flood risk is illustrated in Figure 19.7 appended based on gov.uk/ EA Risk of Flooding from Surface Water (‘RoFSW’) mapping. Surface water flood risk is considered in two main parts within the study area:

- Location within study area within or passes through a surface water overland flow path as summarised within Appendix 19.1 Table 19; and
- Location within study area within isolated area(s) of identified surface water flood risk.

19.5.11.19 It should be noted that the modelling used to predict surface water flooding does not accurately take into consideration the public drainage network, highway drainage and other drainage features and, as a result, tend to be overestimating the predicted flood extent.

### Surface Water Overland Flow Paths

19.5.11.20 Within the study area a number of locations pass through or are located within overland flow routes, identified on the gov.uk "Long term flood risk information" flood risk from surface water mapping, which are consistent with the topographic data for the Site Boundary and include the following:

- Overland flow paths where valleys are noted within the natural landscape, which are expected to convey surface water through the low spot of the valley;
- Overland flow paths have also been identified within roads, where the impermeable surface of roads identify a risk of overland flow in extreme scenarios, however it is anticipated that generally the overland flow would be managed, at least partially, by the highway drainage network; and
- Overland flow routes shown to be located along watercourses.

19.5.11.21 The risk profile considered for surface water overland flow paths is based on the gov.uk "Long term flood risk information" flood risk from surface water mapping which represents flood risk on a scale of very low, low, medium through to high which are defined as:

- **Very Low risk** - means that each year this area has a chance of flooding of less than 0.1%;
- **Low risk** - means that each year this area has a chance of flooding of between 0.1% and 1%;
- **Medium risk**- means that each year this area has a chance of flooding of between 1% and 3.3%; and
- **High risk**- means that each year this area has a chance of flooding of greater than 3.3%.

### Localised Surface Water Flood Risk

19.5.11.22 A number of areas within the study area are identified to have a risk of localised surface water flooding based on the gov.uk long term flood risk mapping as illustrated in Figure 19.7 appended. It is anticipated that these identified areas are associated to local low spots within the surrounding landscape and represent areas that are potentially susceptible to local ponding. The actual risk of surface water flooding is however likely to be reduced by any local drainage systems. There are isolated areas of flood risk present within the study area that have a low to medium probability of flooding subject to any local drainage features present with no significant isolated areas with a high surface water probability of flooding.

19.5.11.23 As part of the ES, the FRA will further consider localised areas that are at risk of surface water flooding.

### Reservoir

19.5.11.24 The majority of the study area is located outside of the maximum extent of reservoir flooding based on the gov.uk "Long term flood risk information" flood risk from reservoirs, as illustrated on Figure 19.8. The areas located outside the maximum extent of reservoir flooding are considered to have a negligible risk of reservoir flooding and negligible magnitude of effect.

19.5.11.25 There are two areas within the study area at risk of flooding from reservoirs as summarised below with the approximate distance to the Site Boundary detailed:

- Risk associated to Purbrook Regulating Reservoir (0.7km from Section 4); and
- Risk Associated to Farlington No 9 (0.1km from Section 5).

19.5.11.26 It should be noted that flooding from reservoirs is extremely unlikely and there has been no loss of life in the UK from reservoir flooding since 1925.

19.5.11.27 Based on the information available it is therefore considered that the probability of flooding from reservoirs is low within the areas identified within the maximum reservoir flood extent only and negligible elsewhere.

### Groundwater Flood Emergence

19.5.11.28 The initial assessment of groundwater flood risk has been based on the 2018 Hampshire GWMP "*Areas susceptible to groundwater flooding map*" (Figure 7) which delineates the anticipated susceptibility to groundwater flood emergence classified in the following categories:

- Greater than 75%;
- 50% to 75%;
- 25% to 50%;
- Less than 25%; and
- None.

19.5.11.29 The risk of groundwater emergence above ground is typically considered to be low along the entire Onshore Cable Corridor due to the general depth to the water table in the Principal aquifer. However, there are a number of areas where shallow groundwater is anticipated. These typically correspond to the areas of >75% groundwater flood emergence as indicated on Figure 7 of the GWMP.

19.5.11.30 The Hydrogeological Map of Hampshire and the Isle of Wight (1979) indicates that the elevation and gradient of the water table in the Chalk fluctuates seasonally in response to recharge. The risk from groundwater flooding is higher during late winter and early spring.

19.5.11.31 Groundwater levels in the Chalk are likely to be close to ground surface where the Chalk becomes confined as it passes below the Tertiary deposits in the extreme south of Section 2 and Section 3. High Chalk groundwater levels may contribute local inundation and the generally water-logged ground conditions experienced in low lying areas near Kings Pond and Denmead Meadows.

19.5.11.32 Based on the information available the probability of groundwater flood emergence above ground is considered to be low in higher topographic areas of the route (e.g. Section 1 Converter Station) with an increased probability of groundwater flood emergence in low-lying areas along the Onshore Cable Corridor. This risk will be assessed and confirmed at ES stage when additional GI data are available.

### Sewer Flooding

19.5.11.33 Sewer flooding occurs when the below ground sewer network cannot cope with the volume of water that is entering it and flood water emerges from the below ground system. Where a sewer serves more than two properties it is classified as a public sewer and all public sewers are owned and maintained by the water and sewerage company.

19.5.11.34 The majority of sewer flooding is the result of temporary problems such as capacity overload, blockage, siltation, collapses, groundwater inundation and equipment or operational failure.

19.5.11.35 Surface water sewer flooding often occurs at the same time as other types of flooding (particularly surface water flooding). Surface water flooding can also contribute to sewer flooding in areas where combined sewers are present (surface water and foul water in the same sewer) or where misconnections have taken place to a foul sewer (surface water wrongly drains into the foul sewer).

19.5.11.36 The risk of sewer flooding will be further investigated as part of the FRA at ES stage in consultation with SW to identify key sewer flooding “hot spots”.

### Flood Risk Summary

19.5.11.37 Based on the information available and review undertaken the primary risk of flooding includes:

- Tidal flooding adjacent to Portsea Island;
- Fluvial flooding adjacent to inland rivers, Great Salterns Drain (combined tide lock) and Great Solent Drain (combined tide lock);
- Surface water flooding within isolated low spots and along or through overland flow paths (e.g. valleys); and
- Groundwater flooding in isolated low-lying areas.

19.5.11.38 A summary of the Magnitude of Effect/ Probability of Flooding is presented in Appendix 19.1 Table 19. The severity and more detailed consideration for these sources of flood risk will be further investigated within the FRA as part of the ES.

### 19.5.12 FUTURE BASELINE SURFACE WATER

19.5.12.1 If the Proposed Development does not proceed, it is considered that in the future baseline, the conditions in relation to Water Resources and Flood Risk at all areas of the Site would remain relatively unchanged over the short/medium term. However, they would be subject to climate change in the long-term. The intensity of precipitation falling could increase due to climate change. This could have a corresponding effect on flood risk associated with the surface water features within the study area.

19.5.12.2 With climate change (UKCOP18) projections, there is increasing evidence to show that the supply and demand of potable water is likely to change within the South East as a result of climate change, this is further re-iterated as part of the Future Flows and Groundwater Levels work undertaken by Centre for Ecology and Hydrology ('CEH') in partnership with the EA and others. However, as with most climate change predictions there are significant amounts of variance and this will need to be further assessed as modelling accuracy improves.

## 19.6 SENSITIVE RECEPTORS

19.6.1.1 Based on the review of baseline conditions and our current understanding of the sensitive receptors to the Proposed Development, sensitive receptors have been identified and detailed in Table 19.6, Table 19.7 and Table 19.8 below.

**Table 19.6 – Sensitive Groundwater Receptors**

| Development Area | Receptor | Key Features | Sensitivity |
|---|---|---|---|
| **WATER QUANTITY** | | | |
| **Converter Station Area** | Superficial aquifers | No formal WFD designation is assigned and they do not appear to support any abstraction sources in the local area but may support relatively minor base-flow to ponds, streams and rivers. | **Low** |
| | Bedrock aquifers | Principal aquifer (Tarrant Chalk Member)<br>No known biodiversity of significance is supported by local bedrock groundwater | **High** |
| | Bedhampton and Havant Spring Complex | Springs used as a drinking water source by Portsmouth Water Ltd | **High** |
| | Groundwater Users | Licensed and unlicensed groundwater abstractors | **High** |
| **Onshore Cable Corridor** | Superficial aquifers | No formal WFD designation is assigned and they do not appear to support any abstraction sources in the local area but may support relatively minor base-flow to ponds, streams and rivers<br>Local drift deposits form perched minor aquifers that may not be in hydraulic continuity with the underlying major bedrock aquifers | **Low** |
| | Bedrock aquifers | Principal aquifer - White Chalk Subgroup<br>WFD groundwater waterbodies (listed above) form part of the regional aquifer system and provide groundwater supply to abstractions locally. | **High** |

| Development Area | Receptor | Key Features | Sensitivity |
|---|---|---|---|
| | | Principal aquifer- White Chalk Subgroup may provide groundwater supply to GDTEs. | |
| | Bedhampton and Havant Spring Complex | Springs used as a drinking water source by Portsmouth Water Ltd | **High** |
| | Groundwater Users | Licensed and unlicensed groundwater abstractors | **High** |
| **Landfall** | Superficial aquifers | No formal WFD designation is assigned to the local drift deposits and they do not appear to support any abstraction sources in the local area but may support relatively minor base flow to ponds, streams and rivers.<br>Local drift deposits form perched minor aquifers that may not be in hydraulic continuity with the underlying major bedrock aquifers | **Low** |
| | Bedrock aquifers | Secondary A aquifer – Wittering Formation<br>Does not support any current abstraction licences | **Medium** |
| **WATER QUALITY** | | | |
| **Converter Station Area** | Superficial aquifers | Secondary (undifferentiated) – Head Deposits<br>The on-site Head deposits are composed predominantly of clay and are likely retarding vertical movement of surface water infiltration, opposed to facilitating flow (as per a productive aquifer), to the Tarrant Chalk Member bedrock aquifer.<br>No formal WFD designation assigned and they do not appear to support any abstraction sources in the local area.<br>Poor water quality where located in Eutrophic Water NVZ (2017) | **Low** |
| | Bedrock aquifers | Principal aquifer (Tarrant Chalk Member) | **High** |

| Development Area | Receptor | Key Features | Sensitivity |
|---|---|---|---|
| | | 'East Hants Chalk' (GB40701G502700) WFD groundwater waterbody forming part of the regional aquifer system designated under the WFD as holding 'Poor' qualitative and chemical status<br>SPZ Inner Zone 1<br>Supports abstraction licences in the local area.<br>Major Aquifer High and Major Aquifer Intermediate Groundwater Vulnerability.<br>No known biodiversity of significance is supported by local bedrock groundwater. | |
| | Bedhampton and Havant spring complex | Located in Karst Zone 2 the Chalk around the Converter Station may be connected with Karst Zone 1 and provide groundwater supply to local abstractions. | **High** |
| | Groundwater Users | Licensed and unlicensed groundwater abstractors. | **High** |
| **Onshore Cable Corridor** | Superficial aquifers | Secondary (undifferentiated) – Head Deposits/Raised Marine Deposits<br>Secondary A aquifer – River Terrace Deposits.<br>No formal WFD designation is assigned and they do not appear to support any abstraction sources in the local area but may support relatively minor base-flow to ponds, streams and rivers. | **Medium** |
| | Bedrock aquifers | Principal aquifer - White Chalk Subgroup<br>'East Hants Chalk' (GB40701G502700) WFD groundwater waterbody designated under the WFD as holding 'Poor' qualitative and chemical status<br>WFD groundwater waterbodies form part of the regional aquifer system.<br>Major Aquifer High and Minor Aquifer High groundwater vulnerability<br>Source Protection Zone Inner Zone (Zone 1) and subsurface activity<br>Groundwater and Eutrophic Water NVZ (Onshore Cable Corridor Section 4 and Section 5) | **High** |

| Development Area | Receptor | Key Features | Sensitivity |
|---|---|---|---|
| | | Eutrophic Water NVZ over entire Onshore Cable Corridor alignment. | |
| | Bedrock aquifers | Secondary A aquifers - Lambeth Group, Wittering Formation, Portsmouth Sand Member, Whitecliff Sand Member<br>'East Hants Lambeth Group' (GB40702G500800) forming part of the regional aquifer system designated under the WFD as holding Poor' quantitative and 'Good' chemical status.<br>'South Hants Lambeth Group' (GB40702G503700) WFD groundwater waterbody designated as holding 'Good' quantitative and chemical status.<br>'South East Hants Bracklesham Group' (GB40702G503000) WFD groundwater waterbody designated as holding 'Good' qualitative and 'Poor' chemical status. | **Medium** |
| | Bedhampton and Havant spring complex | Section 2 falls within Karst Zone 2<br>Sections 3 to Section 5 fall within Karst Zone 1 where there is potential connectivity with the Chalk aquifer and the Bedhampton and Havant spring complex. | **High** |
| | Groundwater Users | Licensed and unlicensed groundwater abstractors | **High** |
| **Landfall** | Superficial aquifers | Secondary A aquifers – River Terrace Deposits/Storm Beach Deposits<br>No formal WFD designation is assigned and they do not appear to support any abstraction sources in the local area but may support relatively minor base-flow to ponds, streams and rivers<br>Eutrophic Water NVZ | **Medium** |
| | Bedrock aquifers | Secondary A aquifer - Wittering Formation<br>May provide groundwater supply to abstractions locally<br>Minor Aquifer High groundwater vulnerability | **Medium** |

**Table 19.7 – Sensitive Flood Risk Receptors**

| Sensitive Receptors | Location | Stage | Sensitivity | Description |
|---|---|---|---|---|
| **Effects of flooding on human receptors (all sources of flood risk)** | | | | |
| **Construction workers** | All | Construction | **Medium** | Flooding may impact upon construction workers. Their sensitivity is lowered as a result of a level of competence attained and presence only during working hours in teams. |
| **Local residents/users of surrounding area** | All | Construction and Operation | **High** | Residents/users of the surrounding areas might have limited or no awareness of flood risk; sensitivity of residents is the highest due to their presence overnight (sleeping accommodation). |
| **Staff** | Primarily Converter Station Area, however all | Operation | **Medium** | Flooding may impact upon future staff. Their sensitivity is lowered as a result of a level of competence attained and presence only during working hours in teams. |

**Table 19.8 – Sensitive Surface Water Receptors**

| Sensitive Receptors | Location | Stage | Sensitivity | Description |
|---|---|---|---|---|
| **Water Quantity** | | | | |
| **Surface water drainage patterns** | Converter Station Area<br>Onshore Cable Corridor<br>Landfall | Construction | **Medium** | Watercourses within the study area contain limited hydromorphological features and have been subject to past modification such as straightening, bank protection and culverting. |
| **Public Sewers Network** | Converter Station Area<br>Onshore Cable Corridor<br>Landfall | Construction and Operation | **High, Medium and Low** | Sensitivity of public sewer network to be identified through consultation as appropriate by appropriate specialist team. |
| **Public Water Supply Network** | Converter Station Area<br>Onshore Cable Corridor<br>Landfall | Construction and Operation | **High, Medium and Low** | Sensitivity of public water supply network to be identified through consultation as appropriate by appropriate specialist team. |

| Sensitive Receptors | Location | Stage | Sensitivity | Description |
|---|---|---|---|---|
| **Water Quality** | | | | |
| **Surface water bodies (ordinary and main water courses)** | Onshore Cable Corridor | Construction | **Medium** | The water bodies that cross along the Onshore Cable Corridor are in a catchment classified as 'moderate'. |
| **Public Sewers Network** | Converter Station Area<br>Onshore Cable Corridor<br>Landfall | Construction and Operation | Surface Water Sewers (**Medium**)<br>Combined Sewers (**Low**)<br>Foul Sewers **(Negligible**) | Surface water sewers are sensitive to potential pollutants due to potential discharge to open surface water features whilst foul and combined sewers are considered to be less sensitive due to their subsequent treatment prior to discharge to onwards surface water features. |

## 19.7 PREDICTED IMPACTS

19.7.1.1 A full description of the Proposed Development is included in Chapter 3 – Description of the Proposed Development. For the purposes of this assessment, Onshore Cable Corridor Section 2 to Section 9 have been combined to assess the Onshore Cable Corridor as a whole. The following assessments assess significance in accordance with the matrix set out in Table 19.5 and considers multiple sensitivity of receptors and the magnitude/scale of change where variable receptors and magnitudes/scale of change are present. The assessment identifies the worst case key areas of concern are identified, where applicable.

19.7.1.2 Comprehensive details for construction activities and temporary works are not yet available. A CEMP will be developed at ES stage to mitigate potential impacts during construction.

19.7.1.3 This topic area covers the assessment of the following potential impacts of the Proposed Development on groundwater, surface water and flood risk receptors, respectively.

### 19.7.2 WATER QUANTITY

19.7.2.1 The impacts on surface water quantity are applicable only to non-tidal water courses; this is because tidal watercourses are influenced by tidal levels rather than river flows. Impacts on water quantity resulting in an impact to flood risk are considered within the flood risk section.

#### Section 1 - Lovedean (Converter Station Area)

#### Construction

19.7.2.2 Based on the initial water strikes recorded (during drilling) in Phase 1 of the ground investigation (2018), it is assumed that no groundwater control measures (i.e. dewatering the Chalk aquifer) will be required at the Converter Station.

19.7.2.3 The Proposed Development directly overlays and will directly interact with the bedrock Tarrant Chalk Member aquifer, which is designated a Principal aquifer and is therefore assessed to have a **High** sensitivity.

19.7.2.4 Additionally, interactions with the superficial aquifers, designated Secondary (undifferentiated), are composed of low permeability material and any potential effect is likely to be highly constrained both spatially and vertically (with depth). The superficial Head Deposits are deemed to have a **Low** sensitivity.

19.7.2.5 With regards to any potential temporary loss of water from storage and a reduction in water levels within the Tarrant Chalk Member and at groundwater abstractions, the magnitude of change for water quantity, prior to mitigation is considered to be **Negligible**, resulting in a **Negligible** effect, and is therefore not significant.

19.7.2.6 There are no water quantity impacts related to surface water drainage patterns predicted during construction in the converter area as no surface water features exist there.

19.7.2.7 The same applies for sewerage as there are no public sewer networks within Section 1. The magnitude of change in relation to surface water runoff is expected to be **minor** to **moderate;** specific solutions for the management of runoff generated during construction will need to be identified as part of a construction drainage strategy.

19.7.2.8 Similarly, the magnitude of change in relation to water supply during construction is expected to be **minor** and will need to be managed, as there is currently no water supply network within Section 1. Any construction demand for water supply would require appropriate approval for connection from PW which would require demonstration that there is no significant impact on the surrounding network

19.7.2.9 Impacts on overland flow routes are considered within the impacts to human receptors within the flood risk section.

### Operation

19.7.2.10 In the Operational Stage of the Proposed Development at the Converter Station, the presence of hardstanding will change the pattern of infiltration to the underlying Tarrant Chalk Member (Principal aquifer) and may reduce infiltration locally, but overall it will remain similar.

19.7.2.11 The sensitivity of Principal aquifers (Tarrant Chalk Member) and Secondary (Undifferentiated) superficial aquifers is **High**, and the magnitude of change to groundwater quantity is considered to be **Negligible**, resulting in a **Negligible** effect on groundwater flow.

19.7.2.12 There are no water quantity impacts related to surface water drainage patterns predicted during operation in the converter area as no surface water features exist in the area. The same applies for sewerage.

19.7.2.13 The Proposed Development will require a permanent water supply from the public PW network. The quantity is subject to design development to ensure specific requirements are provided within the proposed Converter Station; however, the demand is expected to be low and the expected magnitude of change in relation to the public water supply network is assessed as **Minor** to **Negligible**. Sensitivity of the public water supply network is currently unknown and will need to be investigated as part of the ES. No connection, that would significantly stress the networks, would be approved by PW.

19.7.2.14 It should be noted that further design development will occur and the impact on the existing water supply network will be assessed accordingly.

## Section 2 to Section 9 – Onshore Cable Corridor

### Construction

19.7.2.15 At present, it is understood that the cable will be encased in concrete below the ground surface and the trench will be backfilled with indigenous material along the Onshore Cable Corridor. The dug ground material's native permeability will be reduced during the reinstatement process, as the ground material is mechanically compacted on construction completion, creating low flow zones where groundwater interceptions occur. Groundwater will percolate around the trench and infiltration will be minimised.

19.7.2.16 The sensitivity of groundwater receptors, magnitude of change and the significance of effect on groundwater receptors along the entire Onshore Cable Corridor before implementation of mitigation measures are summarised in Appendix 19.1 Table 4.

19.7.2.17 The groundwater receptors are as follows:

- Principal aquifers:
  - The Tarrant Chalk Member (Section 2);
  - The Portsdown Chalk Formation (Section 4); and
  - White Chalk Subgroup (Section 4 to Section 7).
- Secondary A aquifers:
  - The Lambeth Group (Section 2 to Section 4 and Section 8);
  - The Wittering Formation (Section 4 and Section 9);
  - Bognor Sand Member (Section 8);
  - Portsmouth Sand Member (Section 8 and Section 9);
  - Whitecliff Sand Member (Section 4); and
  - River Terrace Deposits – superficial aquifers (Section 6 to Section 8 and Section 9).
- Secondary (Undifferentiated) aquifers – superficial aquifers:
  - Head Deposits (Section 2 to Section 6);
  - Raised Marine Deposits (Section 6 to Section 9); and
  - Beach and Tidal Flat Deposits (Section 9).

19.7.2.18 The following potential construction effects on groundwater receptors that may affect groundwater quantity along the Onshore Cable Corridor are:

- Modifications to groundwater conditions (locally) including groundwater level and flow by excavation dewatering/pumping and other groundwater control methods which may cause alteration to groundwater elevations at water user receptors such as groundwater fed water supplies and/or local abstractions;

- Temporary loss of water from storage and the reduction in water levels within bedrock aquifers, superficial aquifers and, therefore, potentially, water availability to GWDTEs. Kings Pond and Denmead Meadow are potentially due to be designated SSSI status and both may be susceptible to changes in groundwater quantity; and,
- Temporary change to groundwater baseflow pathways affecting surface water receptors as a result of groundwater control measures. Tributaries of the Wallington River are present along the Onshore Cable Corridor and groundwater may provide baseflow to these surface water features.

19.7.2.19 Table 19.9 summarises the predicated impacts during the construction stage.

19.7.2.20 Groundwater levels were found to be variable along the Onshore Cable Corridor (see paragraph 19.5.4.33 - 19.5.4.40). Shallow groundwater levels were recorded at 0.47mOD and the deepest recorded at 1.61 mOD. Where the proposed Onshore Cable Corridor intercepts groundwater, groundwater dewatering may be required. At present, no detailed design for the trench excavations along the Onshore Cable Corridor is available. This will be assessed further in the ES. It is assumed that directional drilling cable alignment will be grouted in-situ and no groundwater dewatering will be required at these locations. It is also assumed that groundwater interceptions along the trenched sections of the Onshore Cable Corridor will occur and groundwater controls at these locations will be required. It is likely that sump pump dewatering will be required to construct and install the cable in the trench locations. Local groundwater modifications may result from the sump pump dewatering, which may temporarily divert a proportion of baseflow to water user receptors such as groundwater fed water supplies and/or local abstractions.

19.7.2.21 The sensitivity of Principal aquifers and Secondary A superficial aquifers is grouped as **High**, and the magnitude of change is considered to be **Minor**, resulting in a **Moderate** effect on groundwater flow prior to the implementation of mitigation measures.

19.7.2.22 At present, it is understood that the HDD works will be confined to the Lambeth Group in Section 3, where Kings Pond and Denmead Meadow are located. This would reduce/remove hydraulic linkages between the HDD works and the Chalk aquifer.

**Table 19.9 – Predicated Impacts during the Construction Stage**

| Predicted Impact | Onshore Cable Corridor Section Reference | Sensitivity | Magnitude of Change | Significance |
|---|---|---|---|---|
| **Modifications to groundwater conditions (locally) including groundwater level and flow** | Section 2 to Section 9 | High | Moderate | **Moderate to major** |
| **Temporary loss of water from storage and the reduction in water levels and groundwater abstractions (Principal aquifers)** | Section 2, Section 4 to Section 7 | High | Minor | **Moderate** |
| **Temporary loss of water from storage and the reduction in water levels and groundwater abstractions (Superficial aquifers)** | Section 2 to Section 9 | High | Minor | **Moderate** |
| **Temporary change to groundwater baseflow pathways to groundwater dependent ecosystems** | Section 3 | High | Moderate | **Moderate to major** |

19.7.2.23 Surface flows could be impeded by construction activities in or adjacent to stream channels. Blockages could be caused by inadequate control of earthmoving plant, sedimentation and poor waste management, all of which could lead to an increased or reduced quantity of water upstream or downstream.

19.7.2.24 Earthworks could restrict the infiltration of rainfall into the soil and underlying superficial deposits, resulting in localised increased volumes of surface runoff. The interception of diffuse overland flow by the trench, when in preparation for cable installation, could disrupt the natural drainage regime of the site by concentrating flows and influencing drainage in soils.

19.7.2.25 The sensitivity of the surface water drainage patterns is **Medium** as a change in baseflow and works through the watercourses could affect the watercourse levels either upstream and/ or downstream; the magnitude of change, prior to mitigation, is considered to be **Major**, resulting in a **Major to Moderate** effect on the receptor prior to the implementation of mitigation measures.

19.7.2.26 During construction there is likely to be no additional direct requirement for use of the public sewer network or water demand network within the Onshore Cable Corridor. Due to the nature of the proposed development within the Onshore Cable Corridor there will be no likely increase in impermeable areas however works could result in over land flow routes becoming redirected and temporarily changing their route to discharge which could contribute to a change in the quantity within the surface water sewers resulting in a **Minor to Moderate** magnitude of change prior to mitigation.

19.7.2.27 Furthermore, any construction activities requiring discharge of foul water and/or a public water supply will require specific consent from either Southern Water (foul water) or PW (water supply) and will be considered at the ES stage when further information will be known with regards to specific construction activities. However, there will be a limited or no requirement to connect to the public sewer and water supply network, subject to confirmation of the detailed construction methodologies, resulting in an anticipated **Minor** to **Negligible** magnitude of change. Sensitivity of the public drainage and water supply network is currently unknown and will need to be investigated as part of the ES at a strategic level due to the scale of the proposed development. No connection, that would significantly stress the networks, would be approved by Southern Water and Portsmouth Water and would therefore not be feasible.

### Operation

19.7.2.28 Locally, the Onshore Cable Corridor will provide a zone of low permeability due to the compaction of the backfilled material (native soil) and increased runoff that could result in pooling if no immediate percolation of groundwater can occur. However, from a waterbody perspective, groundwater will eventually percolate through the backfill material and no direct impact on water quantity is expected.

19.7.2.29 On that basis, the effect is assessed to be **Negligible** and is therefore unlikely to be significant.

19.7.2.30 The cable route has no significant proposed permanent infrastructure above ground that will impact upon existing overland flow routes and runoff. On this basis, the magnitude of change, to surface water drainage patterns and surface water drainage networks prior to mitigation, is **negligible** resulting in a **Negligible** effect.

19.7.2.31 Furthermore, as there is no permanent infrastructure within the Onshore Cable Corridor there is no requirement for foul sewage or water supply; on this basis the magnitude of change on the existing foul sewage or water supply networks along the Onshore Cable Corridor is **negligible** resulting in a **Negligible** effect.

### Section 10 - Eastney (Landfall)

#### Construction

19.7.2.32 The Proposed Development directly overlays and will directly interact with Secondary A aquifers, designated to both superficial and bedrock aquifers. The superficial deposits are considered to be in hydraulic continuity where no low permeable geologies segregate these aquifers. These aquifers are deemed to have a **Medium** sensitivity.

At Landfall, in addition to the siting of the Optical Regeneration Station building(s) (location to be determined), HDD and trenching will also be required. It is assumed that directional drilling cable alignment will be grouted in-situ and no groundwater dewatering will be required at these locations. It is also assumed that groundwater interceptions along the trenched sections of the Onshore Cable Corridor will occur and groundwater controls at these locations will be required. It is likely that sump pump dewatering will be required to construct and install the cable in the trench locations. Local groundwater modifications may result from the sump pump dewatering, which may temporarily divert a proportion of baseflow to water user receptors such as groundwater fed water supplies and/or local abstractions.

19.7.2.33 The sensitivity of Secondary A superficial aquifers is **Medium**, and the magnitude of change is considered to be **Minor**, resulting in a **Minor to Moderate** effect on the aquifers prior to the implementation of mitigation measures.

19.7.2.34 There are no surface water drainage pattern impacts predicted at Landfall as there are no surface water bodies within Section 10.

19.7.2.35 During construction there is no anticipated increase in surface water runoff as there are no proposed significant increases of impermeable areas, furthermore there are no surface water features within Section 10 that will be impacted due to the Landfall HDD proposed. Based on this a **Negligible magnitude of change** is expected in relation to surface water features and surface water sewers.

19.7.2.36 Similarly, to the Onshore Cable Corridor, there will be a **Minor** to **Negligible** magnitude of change in relation to the foul water and water supply network. Sensitivity of the public drainage and water supply network is currently unknown and will need to be investigated as part of the ES. No connection, that would significantly stress the networks, would be approved by Southern Water and Portsmouth Water and would therefore not be feasible as a connection that would significantly stress the networks would not be approved by Southern Water and Portsmouth Water and would therefore not be feasible.

### Operation

19.7.2.37 At present, it is understood that the trenched cable alignment will be encased in concrete below the ground surface and the trench will be backfilled with compacted native soil along the trenched sections of the cable route. Groundwater will percolate around the trench and infiltration will be minimised. Locally, the cable route will provide a zone of low permeability due to the compaction of the backfilled material and increased runoff that could result in pooling if no immediate percolation of groundwater can occur. However, from a waterbody perspective, groundwater will eventually percolate through the backfill material and no direct impact on water quantity is expected.

19.7.2.38 On that basis, the effect is likely to be **Negligible** and is therefore unlikely to be significant.

19.7.2.39 There are no water quantity impacts related to surface water drainage patterns or public sewer predicted during operation in Section 10.

19.7.2.40 There are no significant proposed changes to the land profile and/or impermeable land areas; therefore, there is a negligible impact to the surface water drainage network. However, it is noted that an Optical Regeneration Station, which may introduce an impermeable area, will have a **minor** magnitude of change on the existing surface water drainage.

19.7.2.41 There is no permanent habitable infrastructure within the Onshore Cable Route so there is no requirement for foul sewage or water supply resulting in a **negligible** magnitude of change on the existing foul sewage or water supply networks along the Onshore Cable Corridor.

## 19.7.3 WATER QUALITY

### Section 1 – Lovedean (Converter Station Area)

### Construction

19.7.3.1 Based on the initial water strikes recorded (during drilling) in Phase 1 of the ground investigation (2018), it is assumed that no groundwater control measures (i.e. dewatering the Chalk aquifer) will be required at the location of the Converter Station. However, the ground investigation data have indicated that the ground conditions may not be sufficiently load bearing for the Converter Station platform and would require piles to provide suitable load bearing capacity (see Chapter 3 - Description of the Proposed Development).

19.7.3.2 Where piles are required, it is envisaged that driven piled options would be utilised to a depth of up to 15 m. Bored piled techniques are assumed to pose an unacceptable risk to the SPZ Zone 1 and the Chalk aquifer beneath the Converter Station.

19.7.3.3 The Proposed Development directly overlays and will directly interact with the bedrock Tarrant Chalk Member aquifer designated a Principal aquifer deemed to have a **High** sensitivity. Pollutant risk to the Tarrant Chalk Member and contamination of groundwater supported supplied because of construction activities such as piling turbidity, creating preferential pathways for the transmission of contaminants to migrate, and seepage of spillages is also considered to be **Medium**. Resulting in a potential **Moderate** to **Major** significance of effect on groundwater quality prior to the implementation of mitigation measures.

19.7.3.4 As part of the construction process potentially contaminated material may be removed off-site. Removal of these materials would result in betterment of groundwater quality at the indicative Converter Station location.

19.7.3.5 Increased turbidity in the groundwater regime may occur during development of Sustainable Drainage Systems ('SuDS') or any other excavation works associated with drainage i.e. filter drains at the indicative location of the Converter Station. There is no detailed design for drainage at the indicative location of the Converter Station available at this stage.

19.7.3.6 The sensitivity of groundwater receptors is **High** and the magnitude of change, prior to mitigation, is considered to be **Minor**, resulting in a potential **Moderate** effect on groundwater receptors prior to the implementation of mitigation measures. Groundwater turbidity must not exceed 4 NTU's (Drinking Water Inspectorate, 2018).

19.7.3.7 The sensitivity of the Bedhampton and Havant spring complex (Karst Zone 2 and Karst Zone 1) is **High** and the magnitude of change with regard to the potential for turbidity, prior to mitigation, is considered to be **Moderate**, resulting in a **Moderate** to **Major** effect on the receptor prior to the implementation of mitigation measures

19.7.3.8 There are no surface water and surface water sewer quality impacts predicted at the Converter Station as there are no surface water bodies and/or sewer networks within the area.

### Operation

19.7.3.9 Storm water management that infiltrates to ground introduces preferential pathways for any surface contamination, including increasing turbidity (suspended solid). Where soakaway features are proposed to discharge to ground there is potential for pollution to the below lying Principal aquifers, the Tarrant Chalk Formation. Presently it is understood the discharge system will include for storm water attenuation which will stop/greatly retard suspended solids being discharged directly to groundwater.

19.7.3.10 The grouped sensitivity of Principal aquifers (Tarrant Chalk Formation) and Secondary (Undifferentiated) superficial aquifers is **High**, and the magnitude of change is considered to be **Minor**, resulting in a **Moderate** effect on the Principal aquifer and associated water user receptors prior to the implementation of mitigation measures.

19.7.3.11 There are no surface water and surface water sewer quality impacts predicted during operation in Section 1 as there are no surface water bodies and/or sewer networks within the area.

## Section 2 to Section 9 – Onshore Cable Corridor

### Construction

19.7.3.12 At present, no detailed design for the trench excavations along the Onshore Cable Corridor are available. This will be assessed in the ES.

19.7.3.13 Changes in groundwater level, flows and groundwater quality in the Chalk aquifer have not been assessed in detail at this stage. This will be assessed in further detail at ES stage when all ground investigation data are available.

19.7.3.14 The groundwater receptors are as follows:

- Principal aquifers:
  - The Tarrant Chalk Formation (Section 2);
  - The Portsdown Chalk Formation (Section 4); and
  - White Chalk Subgroup (Section 4 to Section 7).
- Secondary A aquifers:
  - The Lambeth Group (Section 2 to Section 4 and Section 8;
  - The Wittering Formation (Section 4 and Section 9);
  - Bognor Sand Member (Section 8);
  - Portsmouth Sand Member (Section 8 and Section 9);
  - Whitecliff Sand Member (Section 4); and

- River Terrace Deposits – superficial aquifers (Section 6 to Section 8 and Section 9).

- Secondary (Undifferentiated) Aquifers – superficial aquifers:
  - Head Deposits (Section 2 to Section 6);
  - Raised Marine Deposits (Section 6 to Section 9); and
  - Beach and Tidal Flat Deposits (Section 9).

19.7.3.15 Groundwater turbidity may occur during the construction within the Onshore Cable Corridor; where directional drilling generates fines within the water column and, where trench excavations are exposed for prolonged periods, where rainfall enters the open trench and becomes high in sediment load (turbidity) before percolating to ground.

19.7.3.16 The sensitivity of Principal aquifers (Tarrant Chalk Formation) and Secondary (Undifferentiated) superficial aquifers is grouped as **High**, and the magnitude of change is considered to be **Moderate,** resulting in a **Moderate** to **Major** effect on the principal aquifer and associated water user receptors prior to the implementation of mitigation measures.

19.7.3.17 The sensitivity of the Bedhampton and Havant spring complex (Karst Zone 1) in the area of Section 2 is **High** and the magnitude of change, prior to mitigation, is considered to be **Moderate,** resulting in a **Major** significance of effect on the receptor prior to the implementation of mitigation measures.

19.7.3.18 Presently it is understood that the HDD works will be confined to the Lambeth Group in Section 3, where Kings Pond and Denmead Meadow are located. This will reduce/remove hydraulic linkages between the HDD works and the Chalk aquifer.

19.7.3.19 At present, no design for the watercourse crossings along the Onshore Cable Corridor is available. However, this assessment assumes that all watercourses will either be trenched to place the cable or installed using HDD.

19.7.3.20 A number of potential pollutants would be present onsite to facilitate civil engineering activities, including oil, fuels, chemicals, unset cement and concrete and waste and wastewater from construction activities. With chemicals and oil being stored and used onsite, there is the potential for an incident. Any pollution incident occurring on the site could have a detrimental effect on the water quality of the nearby surface waters, groundwater and/or soil, thereby also indirectly affecting ecology.

19.7.3.21 Soil erosion, loss of soil and sediment generation may occur in areas where the ground has been disturbed during construction including in situations where: engineering activities occur close to watercourses, such as where the Onshore Cable Corridor crosses watercourses and where higher velocity surface water flows may occur due to local slopes and drainage design. Any surface water diverted as a consequence of the construction activities could exhibit high localised flows, increasing the potential for bank erosion and increase in suspended soils within the watercourses without appropriate control measures being adopted.

19.7.3.22 Sediment transport in watercourses can result in high turbidity levels which affect the ecology, particularly fish stocks, by reducing the light and oxygen levels in the water. Sediment deposition can further affect watercourses by potentially smothering plant life, invertebrates and spawning grounds.

19.7.3.23 The sensitivity of the surface water bodies is **Medium** and the magnitude of change, prior to mitigation, is considered to be **Major**, resulting in a **Major to Moderate** effect on the receptor prior to the implementation of mitigation measures.

19.7.3.24 There are no proposed significant changes in the amount of surface water runoff discharged to surface water sewers however without appropriate control measures there will be an increased risk of pollution (e.g. suspended solids, oils etc.) to be transported into surface water sewers where works fall within the catchment of a surface water sewer. The sensitivity of surface water sewer is **Medium** and the magnitude of change, prior to mitigation, is assessed to be **Minor**, resulting in a **Minor to Moderate** effect on the receptor prior to the implementation of mitigation measures Thereafter discharge into a combined and or foul sewer would have a **Low** to **Negligible** effect on the water quality assuming a **Low** and **Negligible** sensitivity respectively.

19.7.3.25 Specific consideration of impacts associated directly to licenced surface water abstractions will be made as part of the ES.

### Operation

19.7.3.26 At present, it is understood that the trenched cable alignment will be encased in concrete below the ground surface and the trench will be backfilled with native soil along the Onshore Cable Corridor. Groundwater recharge will percolate around the trench and infiltration will be minimised. A **Negligible** effect is assigned for trenching turbidity contamination.

19.7.3.27 The directionally drilled cable alignment is expected to be grout lined in situ. On the assumption that inert grout is used, a **Negligible** effect is assigned.

19.7.3.28 There are no surface water quality impacts predicted during operation along the Onshore Cable Corridor.

## Section 10 – Eastney (Landfall)

### Construction

19.7.3.29 The Proposed Development directly overlays and will directly interact with Secondary A aquifers, designated to both superficial and bedrock aquifers. The superficial deposits are considered to be in hydraulic continuity where no low permeable geologies segregate these aquifers. These aquifers are deemed to have a **Medium** sensitivity.

19.7.3.30 Pollution of Secondary A aquifers and contamination of groundwater supported supplies because of construction activities such as HDD and/or trenching, which create preferential pathways for transmission of contaminants, and seepage of spillages, to the underlying groundwater bodies. The magnitude of change, prior to mitigation, is considered to be **Moderate**, resulting in a **Moderate** effect.

19.7.3.31 There are no surface water impacts predicted at Landfall as there are no surface water bodies within Section 10. Impacts on the marine environment are considered in the marine chapters.

19.7.3.32 Similarly, to the Cable Route, without appropriate control measures there will be an increased risk of pollution (e.g. suspended solids, oils etc.) to be transported into surface water sewers where works fall within the catchment of a surface water sewer. The sensitivity of the public surface water sewers network is **Medium** and the magnitude of change, prior to mitigation, is considered to be **Minor,** resulting in a **Minor to Moderate** effect on the receptor prior to the implementation of mitigation measures. Thereafter discharge into a combined and or foul sewer would have a **Low** to **Negligible** effect on the water quality assuming a **Low** and **Negligible** sensitivity respectively.

### Operation

19.7.3.33 At present, it is understood that the trenched cable alignment will be encased in concrete below the ground surface and the trench will be backfilled with native soil along the Onshore Cable Corridor. Groundwater recharge will percolate around the trench and infiltration will be minimised. A **Negligible** effect is assigned for trenching turbidity contamination.

19.7.3.34 The directionally drilled cable alignment is expected to be grout lined in situ. As long as inert grout is used, a **Negligible** effect is assigned.

19.7.3.35 There are no surface water quality impacts predicted during operation at the Landfall subject to confirmation of the proposed reinstatement of the Landfall and the siting of the anticipated FOC infrastructure, which will be further considered during the ES.

## 19.7.4 FLOOD RISK

### Section 1 – Lovedean (Converter Station Area)

### Construction

19.7.4.1 During construction the main risk associated to the Converter Station will be impacts on the existing overland flow route (e.g. surface water flooding) and potentially groundwater flooding associated to excavation works subject to confirmation of depth of groundwater from ground investigation and summer/ winter groundwater monitoring levels.

19.7.4.2 Modifications to surface water runoff routes and impermeable areas compared to the existing environment could change runoff velocity and volume which might impact on the probability of surface water flooding if not appropriately managed.

19.7.4.3 A change in groundwater recharge and flow as a result of increasing the impermeable surface and redirecting drainage may also be expected. Additional hard cover is expected to result in a reduction of natural groundwater recharge, reducing the likelihood of groundwater emergence and associated flood risk, however groundwater flooding may be possible during excavation at significant depth below ground level.

19.7.4.4 The sensitivity of construction workers to the risk of flooding is considered **Medium** due to their presence on site only being during working hours, their awareness and training.

19.7.4.5 During construction there will not be any site occupants (staff, public and residents).

19.7.4.6 A residential property (Easting, Northing: 466544, 113042) is located directly downstream of an identified surface water flow path that passes through the Converter Station Area Section 1. The sensitivity to flooding of residents of the property in the area is considered **High.** The residents live and sleep within their property, are not formally trained and are likely to have less awareness of the activities being undertaken at the site during the construction works.

19.7.4.7 Prior to appropriate mitigation, works are likely to have a **Moderate to Major** magnitude of impact primarily in relation to potential overland flow to construction workers and local residents and groundwater emergence resulting in flooding of the below ground works to construction workers.

19.7.4.8 As a result of the above it is considered that the works would have a **Moderate to Major** magnitude of impact on **Medium to High** sensitivity receptors prior to mitigation resulting in a **Moderate to Major** significance of effect.

### Operation

19.7.4.9 Due to the increase in volumetric runoff generated at the Converter Station as a consequence of the increase in impermeable areas there is likely to be a large increase of surface water runoff generated at the Site; modifications to the surface water runoff routes might also occur as a consequence of the Proposed Development. However, the effects are limited by the isolated location of the Converter Station; this would result in a **Moderate** magnitude of impact on surface water runoff which might affect residents of the surrounding land which have a **High** sensitivity.

19.7.4.10 Based on the current understanding of baseline groundwater levels at the converter site it is unlikely that groundwater flood risk will increase as a consequence of the Proposed Development due to the anticipated depth of the Proposed Development relative to the underlying aquifer and also due to the isolated location of the site. Where groundwater soakaways are proposed to discharge to ground, localised groundwater mounding could arise but as groundwater is at a significant depth a **Negligible** change is expected.

19.7.4.11 As a result of the above, it is considered that during operations there would be a **Moderate** magnitude of impact onto **High** sensitivity receptors prior to mitigation resulting in a **Moderate to Major** significance linked to surface water runoff.

## Section 2 to Section 9 – Onshore Cable Corridor

### Construction

19.7.4.12 Proposed works along the Onshore Cable Corridor might have an impact on the following human flood risk receptors: construction workers, local residents and users located along the Onshore Cable Corridor. More specifically the following activities might have a potential effect:

- Excavation and associated works within floodplain especially in correspondence to river crossings;
- Excavation and associated works affecting surface water overland flow paths; and
- Excavation and associated works within areas susceptible to groundwater flooding.

19.7.4.13 As a consequence of works prior to appropriate mitigation such works are likely to have a **Moderate to Major** magnitude of impact on the receptors. Although impacts are generally limited by the localised and small-scale nature of each section of the works, construction activities at river crossings might cause a significant impact on conveyance and flood risk unless properly managed.

19.7.4.14 Open trenching within the Onshore Cable Corridor passes through a number of isolated areas with anticipated elevated perched groundwater. Subject to confirmation of ground water levels, it is anticipated that contact with perched groundwater will be made within open trenches in isolated areas and without appropriate management would have a **Moderate** magnitude of impact to construction workers who may be working within the trenches with a **Negligible** magnitude of impact on local residents as the excavations are not anticipated to cause elevation of groundwater levels and flooding outside of the excavations.

19.7.4.15 As a result of the above it is considered that the works would have a **Moderate to Major** magnitude of impact onto **Medium to High** sensitivity receptors prior to mitigation resulting in a **Moderate to Major** significance of effect.

### Operation

19.7.4.16 During operation the cable will be buried and therefore will have no impact on the surface water, tidal and fluvial flood risk profile and resultant impacts on human receptors.

19.7.4.17 Where permanent structures are located above ground (e.g. proposed utility cabinets) these could impact on the flood risk profile; however, due to the minimal scale of these above ground installations it is anticipated that they would have a **Negligible** impact on the flood risk profile and on human receptors. It is understood that there are no permanent structures proposed within any watercourses above the existing natural bed profile resulting in a **Negligible** impact on watercourse conveyance and resultant flood risk profile.

19.7.4.18 On the trenched cable alignment, a change to groundwater recharge may arise due to reduced ground material permeability, as the native replaced ground materials will be mechanically compressed. This may lead to localised pooling of water which would have otherwise naturally infiltrated to ground. Where baseline groundwater levels are close or at surface during the winter, groundwater could arise or be adversely impacted.

19.7.4.19 However, the effects are expected to be localised, limited in magnitude and can be assumed as **Negligible**.

19.7.4.20 As a result of the above it is considered that the works would have a **Negligible** magnitude of impact onto **Medium to High** sensitivity receptors prior to mitigation resulting in a **Negligible** significance of effect.

## Section 10 – Eastney (Landfall)

### Construction

19.7.4.21 Works associated with the Landfall may impact on the existing management of surface water and may result in a change in volumetric runoff. Furthermore, excavation works are likely to be at risk of surface water and ground water flood risk.

19.7.4.22 The sensitivity of construction workers to the risk of flooding is considered **Medium** due to their presence on site only being during working hours, their awareness and training.

19.7.4.23 The sensitivity of residents and occupants of the surrounding area (e.g. Southsea Leisure Park and residents along Fort Cumberland Road), to flooding, is considered **High** as local residents live and sleep within their properties and are not formally trained how to manage the risk of flooding and as a consequence generally have less the awareness of the dangers of flood risk.

19.7.4.24 Prior to appropriate mitigation, works are likely to have a **Moderate** magnitude of impact primarily in relation to potential impacts to existing overland flow routes affecting local residents and groundwater emergence resulting in flooding of the below ground works affecting construction workers.

19.7.4.25 As a result of the above it is considered that the construction works would have a **Moderate** magnitude of impact to **Medium to High** sensitivity receptors prior to mitigation resulting in a **Moderate to Major** significance.

#### Operation

19.7.4.26 During operation the Landfall works will be buried and therefore will have no impact on the surface water, tidal and fluvial flood risk profile and a **Negligible** resultant impact on human receptors.

19.7.4.27 Where permanent structures are located above ground these could impact on the flood risk profile however due to the minimal scale of these above ground installations it is anticipated that they would have a **Negligible** impact on the flood risk profile and effect on human receptors.

19.7.4.28 As a result of the above it is considered that the works would have a **Negligible** magnitude of impact to **Medium to High** sensitivity receptors prior to mitigation resulting in a **Negligible** significance.

### 19.7.5 CUMULATIVE EFFECTS ASSESSMENT

19.7.5.1 The potential for cumulative effects has been considered for the construction and operation stages of the Proposed Development with reference to Chapter 29 - Cumulative Effects.

19.7.5.2 With specific reference to flood risk the indicative location of the Converter Station is isolated and no surface water features exist in the area; therefore, no cumulative effects are expected. Along the Onshore Cable Corridor and Landfall, the works associated with the project are expected to be localised and limited in scale; however, some cumulative impacts might occur where other construction activities are going on nearby.

19.7.5.3 The implementation of the mitigation measures set out within Section 19.8 below is proposed to minimise any potential impacts to groundwater, surface water and flood risk receptors during construction and operation to an acceptable level and will be further investigated at the ES stage to further assess the residual effects following implementation of mitigation measures.

## 19.8 PROPOSED MITIGATION

### 19.8.1 EMBEDDED MITIGATION

19.8.1.1 At this stage of the Proposed Development no embedded mitigation has been considered.

### 19.8.2 ADDITIONAL MITIGATION

19.8.2.1 Mitigation beyond the commitments described in the drainage strategy has still to be determined however it is expected that further mitigation as necessary will be incorporated into the design of the Proposed Development and that a CEMP will be developed for the Proposed Development to mitigate risks associated with construction activities.

**Section 1 – Lovedean (Converter Station Area)**

**Construction**

19.8.2.2 More detail of proposed measures will be incorporated into the ES once these have been defined however, examples of appropriate mitigation measures are as described below. These will be implemented through the CEMP that is also expected to include appropriate training and monitoring procedures.

19.8.2.3 It is anticipated that a piling method which does not allow the 'dragging down' of contaminants and does not create pathways from near surface soils to the aquifers shall be adopted where required depending on site conditions.

19.8.2.4 Any excavation will require the use of groundwater controls, i.e. groundwater dewatering which may draw contaminants into freshwater bodies. These risks may need to be defined by a quantitative risk assessment when detailed construction design becomes available.

19.8.2.5 Cleaning drilling techniques into the Chalk aquifer will be required to avoid cross contamination and aquifer deterioration. Discussions with the EA and other relevant statutory bodies will be required to ensure the Regulator is satisfied with the assessment and proposed construction methodology.

19.8.2.6 To reduce the modification of surface water drainage patterns, artificial drainage would be installed only where necessary. All structures would be designed and constructed following good practice techniques and would be of sufficient capacity to receive storm flows. Key measures identified to minimise alterations to surface water drainage patterns include:

- application of sustainable drainage techniques to increase peak lag time and implementation of cross-drains at appropriate intervals and frequent discharge points to reduce scour potential;
- minimising the creation of new flow paths through a review of the proposed earthworks; and
- minimising the size and duration of works within identified flow paths.

19.8.2.7 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the full CEMP. To reduce the probability of an incident occurring and also reduce the magnitude of any incident due to a combination of good site environmental management procedures, including additional precautions when operating machinery close to watercourses, soil management, staff training, contingency equipment and emergency plans. Key measures identified to reduce erosion and sedimentation include:

- secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- emergency spill kits retained onsite at sensitive locations;
- special measures at concrete batching plants with pre-cast structures used where appropriate;
- cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- silt traps would be employed and maintained in appropriate locations;
- temporary interception bunds and drainage ditches would be constructed upslope of excavations to minimise surface runoff ingress and in advance of excavation activities; and
- excavation and earthworks would be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage.

19.8.2.8 Construction activities should also be undertaken in accordance with appropriate CIRIA guidance. Specifically, this should include:

- CIRIA C741. Environmental Good Practice on site (4th Edition) (CIRIA C741, 2015); and
- CIRIA C532. Control of Water Pollution from Construction Sites (CIRIA C532, 2001).

19.8.2.9 It is anticipated that a programme of groundwater quality and level monitoring will need to be implemented during the construction period due to the high sensitivity of the Chalk aquifer and may be extended into the operational stage of the Proposed Development.

19.8.2.10 Similarly, a programme of groundwater level monitoring is also anticipated, which may utilise nearby EA groundwater monitoring boreholes within 1.0km of the Converter Station, will be implemented throughout the Construction Stage to refine the assessment of groundwater flood risk.

19.8.2.11 Local flood prevention measures would comply with policy and guidance. In addition, temporary drainage facilities would be provided at the Converter Station to ensure the management of surface water runoff until the permanent surface water drainage solutions are incorporated including appropriate management of pollution and changes to overland flow routes.

### Operation

19.8.2.12 A programme of groundwater water quality and water level monitoring will be implemented during the construction period and may be extended into the Operational Stage of the Proposed Development.

#### Surface Water Management Proposed Principles

19.8.2.13 The implementation of a surface water management strategy will manage the increase in volumetric runoff from the pre-development scenario and ensure no increase of runoff and impact on flood risk, with appropriate pollution treatment prior to infiltration. The solution will be discussed in the ES once detailed designs are confirmed, however, is anticipated to be based on the principles set out below.

19.8.2.14 The proposed surface water drainage solution would capture the runoff from all proposed impermeable surfaces and drainage of the platform through filter drains. It is currently undecided whether the platform shall require capping in order to reduce the infiltration on the platform area itself and will be further investigated during design development.

19.8.2.15 Captured surface water would be collected and transferred to a lined attenuation pond where it shall be stored temporarily before being discharged at a restricted flow rate targeted at the equivalent greenfield runoff rate for the site subject to confirmation of rates during detailed design.

19.8.2.16 The required volume of attenuation has not been calculated at present as this would be dependent on the amount of impermeable surface based on the detailed design and the amount of time it takes for the water to travel through the drainage system before entering the pond.

19.8.2.17 The discharge location is not known at present, it is currently proposed that an infiltration field is to be constructed for the discharge of the attenuation pond subject to further design development.

*19.8.2.18* There are opportunities to locate pollution monitors/detectors within the manholes before and/or after the attenuation pond inlet/outlet. This would then allow any pollutants to be captured before discharging into the watercourse.

19.8.2.19 An oily water drainage system for the converter system would provide a separate system with containment systems built in. The transforms are expected to have a full containment bund which is sized for catastrophic failure with provision for firefighting water. This would then be connected to an oil separator which is sized for the largest transformer/oil container on the site. Both the bunds and interceptor would be alarmed and connected to the control room with automatic closure valves so that in the event of oil being detected, the oil is contained and can be collected and removed from the site. The oily water drainage system would be in accordance with NGTS2.20. Where required the sections of the roads may be made from a concrete construction and also connected to the oily water system in order to capture any potential oil spillages from transformer oil delivery vehicles.

19.8.2.20 Once the water has passed through the oily water separator it would be classed as 'clean surface water' and shall pass into the surface water system and attenuation pond for discharge through the infiltration field.

### Foul Water Drainage Management Proposed Principles

19.8.2.21 Foul water generated at the Converter Station is expected to incorporate WCs plus hand wash, sink within the battery room for eyewash and mess facilities within the control building for visiting maintenance staff and 3rd party contractors. Although the site is essentially unmanned there is a requirement to dispose of foul water drainage with due regard to environmental regulations and best practice.

19.8.2.22 It is considered that the provision of composting or chemical toilets unacceptable at the proposed Converter Station due to maintenance requirements and compromise to staff comfort. Foul water effluent must therefore be treated to acceptable quality on site before discharge to the environment.

19.8.2.23 Due to the expected infrequent flows, provision of a packaged sewage treatment plant is likely to be unsuitable. The microorganisms within packaged treatment plants that clean the sewage rely on semi-constant biological 'loading' to function effectively hence this system would not be appropriate for an unmanned substation which has been corroborated by a leading manufacturer of sewage treatment solutions during consultations on commencement of design.

19.8.2.24 Following elimination of the above treatment option, the adoption of a septic tank and associated drainage field would be the preferred option for treatment of sewage and effluent. It is proposed to use a proprietary septic tank for primary settlement followed by secondary treatment of effluent within a soakaway. The ground investigation for the Lovedean site identifies a thin layer of topsoil and clay with varying grades of putty chalk and chalk at variable depths below existing ground level. Permeability of the subsoil is assumed to be very low thereby making a conventional sand-filled soakaway feasible for the required treatment time within the constraints of the site. It is therefore proposed to use a drainage mound filter system to treat and dispose of septic tank effluent.

19.8.2.25 Drainage filter systems have been developed during the twentieth century, primarily in North America and Europe, to dispose of waste water they typically consist of a sand filter with effluent distribution pipes throughout. Distributor pipes release septic tank effluent gradually into the sand filter where a combination of screening of fine suspended solids, microbial digestion of pathogens and assimilation of dissolved nitrates etc. occurs. The treated effluent finally exits the base of the mound and percolates to ground. Monitoring tubes will be provided to enable sampling of effluent within the mound as necessary to ensure treatment is effective.

19.8.2.26 Mitigation incorporated into design will be discussed further in the ES.

**Section 2 to Section 10 – Onshore Cable Route and Landfall**

19.8.2.27 The proposed mitigation for the Onshore Cable Corridor and Landfall have been considered together at this stage and summarised below.

**Construction**

19.8.2.28 Any excavation will require the use of groundwater controls i.e. groundwater dewatering which may draw contaminants into freshwater bodies. These risks may need to be defined by a quantitative risk assessment when detailed construction design becomes available.

19.8.2.29 Cleaning drilling techniques into the Chalk aquifer will be required to avoid cross contamination and aquifer deterioration. Discussions with the EA and other relevant statutory bodies will be required to ensure the Regulator is satisfied with the assessment and proposed construction methodology. This will be assessed further in the ES.

19.8.2.30 Where appropriate HDD will be undertaken to avoid works in watercourses. Exact locations for HDD are still to be confirmed.

19.8.2.31 To reduce the modification of surface water drainage patterns, artificial drainage would be installed only where necessary and would, wherever practical, be installed in advance of Onshore Cable Route construction. Measures listed above for the Converter Station to minimise alterations to surface water drainage patterns, reduce flood risk, prevent pollution and use best practise would also apply to the Onshore Cable Route.

19.8.2.32 Any works within the fluvial and tidal flood plain will need to ensure there is a negligible impact on the flood risk profile on and off site, this is likely to include:

- No storage or stockpiling within flood plain;
- Maintaining all flood defences and required crest levels; and
- Ensuring main river, ordinary watercourse and overland flow routes conveyance is not reduced (e.g. by overpumping).

### Operation

19.8.2.33 The anticipated programme of groundwater water quality and water level monitoring that would be implemented during the construction period may be extended into the Operational Stage of the Proposed Development.

19.8.2.34 To minimise the impact to the flood risk environment, where feasible, permanent features above ground level will be located outside of flood risk areas identified within the baseline of this assessment.

### Summary

19.8.2.35 In view of the information currently available a summary of the anticipated mitigation measures is presented in Table 19.10 to Table 19.13.

## 19.9 SUMMARY AND CONCLUSIONS

### 19.9.1 BASELINE

19.9.1.1 A review of the baseline environment has been provided within Appendix 19.1 for the Converter Station Area, the Landfall area, and each of the sections of the route in between including alternate route options where required. For each section, the baseline review includes details of groundwater, surface water and human receptors as a consequence of flood risk.

### 19.9.2 ASSESSMENT

19.9.2.1 The preliminary assessment of potential impacts and resulting significance of effects from the construction and operation of the Proposed Development has identified a number of significant effects prior to the development and implementation of mitigation. The key receptors which have been assessed as having a resultant Major or Moderate effect prior to mitigation include:

- Groundwater water quantity and quality (associated to superficial and bedrock aquifers, groundwater users and the Bedhampton and Havant spring);
- Human receptors affected by flood risk in specific locations (associated to works adjacent to watercourses, overland flow routes and areas of anticipated high groundwater); and
- Surface water quantity (e.g. drainage patterns).

### 19.9.3 MITIGATION

19.9.3.1 In view of the information currently available and assessment undertaken to date, a number of proposed mitigation measures have been presented within the PEIR that will be further considered and developed as part of the ES in order to assess the resultant potential construction and operational impacts and to minimise those impacts.

### 19.9.4 CONCLUSION

19.9.4.1 On completion of the ground investigation works and subsequent assessment of the potential water resource receptors, the potential construction and operational impacts will be further assessed and appropriate mitigation developed to minimise the potential impacts.

## 19.10 ASSESSMENTS AND SURVEYS STILL TO BE UNDERTAKEN

19.10.1.1 The following will be undertaken and presented in the ES:

- Further consultation to identify local abstractions within 1.25 km of the Proposed Development area;
- Groundwater level monitoring;
- Site visit to be undertaken at the indicative location of the Converter Station within Karstic Zones 2 and 1;

- A dewatering impact assessment, subject to confirmation that dewatering will potentially be required;
- Detailed assessment on the water environment (groundwater, surface water and flood risk) once the design has been further progressed;
- The preliminary drainage strategy at the location(s) of the Converter Station includes SuDS. An assessment of the potential impacts these will pose on the local aquifers and associated water users will be required once the design has been further progressed alongside consultee engagement;
- Temporary works outline drainage strategy to support CEMP;
- Onshore WFD Assessment;
- Water Feature Survey; and
- Flood Risk Assessment.

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