AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement – Volume 1 - Chapter 18 Ground Conditions

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

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18. GROUND CONDITIONS

18.1. SCOPE OF THE ASSESSMENT

18.1.1. INTRODUCTION

18.1.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Development upon ground conditions. The Proposed Development that forms the basis of this assessment is described in Chapter 3 (Description of the Proposed Development) of the Environmental Statement ('ES') Volume 1 (document reference 6.1.3).

18.1.1.2. This ground conditions assessment considers the potential impacts associated with the following activities:

- The potential for disturbance of existing contaminated land associated with the construction, operational and decommissioning stages of the Proposed Development;
- The potential that construction could establish pathways between pollutants and receptors associated with the Construction Stage of the Proposed Development;
- Effects on users/adjacent users associated with the construction, operational and decommissioning stages of the Proposed Development;
- Effects on buried infrastructure (including buried services, foundations and the cable itself) associated with the construction, operational and decommissioning stages of the Proposed Development;
- Effects on controlled waters (from the mobilisation of contaminants) associated with the construction, operational and decommissioning stages of the Proposed Development; and
- Effects on sensitive geology or geological features including mineral resources due to contaminated land associated with the construction and operational stages of the Proposed Development.

18.1.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to the introductory chapters (Chapters 1-3 of the ES Volume 1 (document reference 6.1.1 - 6.1.3)), Chapter 16 (Onshore Ecology) of the ES Volume 1 (document deference 6.1.16), Chapter 19 (Groundwater) of the ES Volume 1 (document reference 6.1.19) and Chapter 20 (Surface Water Resources and Flood Risk) of the ES Volume 1 (document reference 6.1.20). Contamination effects on ecology are dealt with in Chapter 16 (Onshore Ecology).

18.1.1.4. This chapter addresses potential contamination from existing or past sources into the ground that might affect groundwater in all stages of the Proposed Development. Chapter 19 (Groundwater) addresses measures included in the scheme for the protection of groundwater from site pollutants during the construction and operational stages of the Proposed Development. Finally, Chapter 19 (Groundwater) also addresses the assessment of significant effects to groundwater quality along the route and groundwater as a resource for abstraction.

18.1.1.5. This chapter is supported by Appendix 18.1 (Preliminary Risk Assessment ('PRA') and a Generic Quantitative Risk Assessment ('GQRA')) of the ES Volume 3 (document reference 6.3.18.1). The PRA/GQRA incorporates the results of the ground investigation completed by WSP in 2018.

18.1.1.6. This chapter assesses the impacts arising from the Proposed Development within the Onshore Components of the Order Limits and the Site only (above Mean Low Water Springs ('MLWS')). Refences to the Order Limits and the Site in this chapter, any appendices to it and plans enclosed to it, is only in relation to the Order Limits and the Site as applicable to the Onshore Components as illustrated in Figure 3.9 of the ES Volume 2 (document reference 6.2.3.9).

18.1.2. STUDY AREA

18.1.2.1. The extent of the study area for the assessment of ground conditions and contamination encompasses information on current and historical anthropogenic activities for all options in the following areas:

- within the Order Limits;
- within 500 m of the Order Limits for Human Health Receptors; and
- within 500 m of the Order Limits for Controlled Water Receptors.

18.1.2.2. The extent of the zone for Controlled Water Receptors has been reduced from 1 km to 500 m since the PEIR on the basis that contamination migration beyond 500 m from the edge of the Order Limits is likely to be negligible.

18.1.2.3. The extent of this zone has been developed using professional judgement on the basis that contamination migration beyond this distance is likely to be negligible.

18.2. LEGISLATION, POLICY AND GUIDANCE

18.2.1.1. This assessment has taken into account the current legislation, policy and guidance relevant to ground conditions. These are listed below.

18.2.2. LEGISLATION

Environmental Protection Act 1990 ('EPA')

18.2.2.1. Specific legislation on contaminated land is principally contained within Part IIA of the Environmental Protection Act 1990. 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..

Environment Act 1995

18.2.2.2. The regulation of contaminated land is described in Part IIA of the Environmental Protection Act 1990 inserted by Section 57 of the Environment Act 1995.

18.2.2.3. Part IIA of the Environmental Protection Act 1990 (as inserted by The Environment Act 1995) defines "contaminated land" and provides for the Secretary of State to issue guidance on how local authorities should determine if land is contaminated land or not.

18.2.2.4. It states that "contaminated land" is any land which appears to the local authority in whose area it is situated to be in such as condition, by reason of substances, in or under the land that:

- Significant harm is being caused or there is a significant possibility of such harm being caused; or
- Significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused.

The Contaminated Land (England) Regulations 2006 (as amended)

18.2.2.5. The legacy of contaminated land on England is regulated by the 2006 regulations, which were amended in 2012 The accompanying 2012 statutory guidance ('Defra Contaminated Land Statutory Guidance') introduces a four-category test which is intended to clarify when land does, and does not, need to be remediated. The guidance describes a risk assessment methodology in terms of 'significant contaminants' and 'significant contaminant linkages' within a contaminant-pathway-receptor conceptual model.

The Water Framework Directive ('WFD') 2017

18.2.2.6. The WFD is a EU Directive 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.

18.2.2.7. The WFD is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and in order to address the requirements of the Directive, the EA has produced river basin management plans, which develop new ways of protecting and improving the water environment.

18.2.2.8. Defra produced Directions regarding the Water Framework Directive, which came into force on 11 July 2016 . That document presents UK-specific instructions and specifications for groundwater classification.

18.2.3. PLANNING POLICY

National Policy

National Policy Statement

18.2.3.1. In the s35 Direction letter, the Secretary of State (SoS) directed that the Proposed Development was, by itself nationally significant and that the Overarching National Policy for Energy (EN-1) should apply to the application as it would to a generating station of a similar generating capacity as the capacity of the interconnector. It should be noted that where there is conflict with the Local Planning Policy the NPS EN-1 will prevail. The EN-1 contains the following statements which are of key relevance:

- Applicants should identify the effects and seek to minimise impacts on soil quality considering any mitigation measures proposed. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination;
- Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place; and
- Where a proposed development has an impact upon a Mineral Safeguarding Area ('MSA'), the Infrastructure Planning Committee ('IPC') should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.

National Planning Policy Framework

18.2.3.2. The National Planning Policy Framework ('NPPF') sets out the Government's planning policies and how these are expected to be applied. In terms of land contamination, the environmental role aims to contribute to protecting and enhancing our environment, by (Section 15, paragraph 170):

- Protecting and enhancing valued landscapes, geological conservation interests and soils;
- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
- Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land where appropriate.

18.2.3.3. Section 15, sub section: Ground conditions and pollution, paragraph 178 of the revised NPPF states that planning policies and decisions should ensure that:

- (a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);
- (b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
- (c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.'

18.2.3.4. In addition, if a site is found to be contaminated or has land stability issues, the NPPF states that 'responsibility for securing a safe development rests with the developer and/or landowner' (paragraph 179).

Planning Practice Guidance ('PPG')

18.2.3.5. The Planning Practice Guidance Land Affected by Contamination, first released in June 2014 and updated in July 2019, provides guidance in support of the NPPF and states that the responsibility for securing a safe development, in relation to land contamination, rests with the developer and/or landowner. However, local planning authorities ('LPA's) should be satisfied that a proposed development will be appropriate for its location and not pose an unacceptable risk.

18.2.3.6. The PPG requires that where there is reason to believe contamination could be an issue, development should provide proportionate but sufficient site investigation information (a risk assessment) to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the 'receptors') so that these risks can be assessed and satisfactorily reduced to an acceptable level. A risk assessment of land affected by contamination should form part of an Environmental Impact Assessment ('EIA'), if one is required.

Local Policy

Portsmouth City Council

The Portsmouth Plan (Portsmouth's Core Strategy)

- Policy PCS1 - The council will need to be satisfied that an appropriate scheme for the remediation of the site is in place to deal with historical land contamination before development can take place. Such a scheme will need to consider the impacts on existing and future occupies as well as Portsmouth Harbour.
- Policy PCS2 – Port Solent and Horsea Island - Port Solent and Horsea Island have considerable contaminated land issues through previous industrial land uses, landfills and land reclamation. Therefore, before any development can take place the council will need to be satisfied that an appropriate scheme for remediation is in place. Such as scheme will need to have regard to potential impacts on existing and future occupiers as well as upon Portsmouth Harbour.

The Portsmouth City Local Plan Adopted July 2006

- Policy DC21 – Contaminated Land - Permission will only be granted for development on or near contaminated land where appropriate and sufficient measures can be taken to deal with the contamination. Measures must address the long-term safety of the development, including the future management of the site.

- Due to Portsmouth's coastal location and long history of industrial and military activities a legacy of pollution has been left throughout the city which must be addressed. Due to this the council will seek to ensure that any potential problems are identified by the developer as early as possible in the development process.
- Where contamination is known, or is suspected to be very significant for the longer-term safety of the site, the council will support land uses which provide a low risk beneficial use, whilst ensuring effective remediation.
- Where contamination is known, or suspected to be significant and a sensitive land use is proposed planning application must be supported by a desk study and intrusive investigation to demonstrate that remedial measures are available to deal with any hazards present in both the short and long term. Developers will be expected to seek sustainable solutions to the remediation of contaminated land.

The Portsmouth City Council Corporate Contaminated Land Strategy Document

18.2.3.7. Key Strategy Objectives are:

- Ensure compliance with and enforcement of statute;
- Ensure that where redevelopment of sites takes place in the City that the process deals effectively with any land contamination;
- Ensure that procedures are in place for the open provision of information to the public, developers/property surveyors; and
- Address the liability issues associated with the Council's existing land holdings and avoid any new liability associated with land acquisitions.

Havant Borough Council

The Havant Borough Local Plan (2011) Core Strategy

- Policy DM10 – Pollution - Development that may cause pollution of water, air or soil or pollution through smell, smoke, fumes, gages, steam, dust, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the relevant criteria can be met:
  - The health and safety of existing future users of the site, or nearby occupiers and residents is not put at risk;
  - The water environment would not be detrimentally affected; and
  - It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.

- Consideration will be given to any mitigating measures that could be implemented into development schemes to ensure its effects are sufficiently alleviated. It must be clearly demonstrated that any proposed mitigation measures will be effective and suitably reduce harm.

Winchester City Council

Winchester District Local Plan Part 1 Joint Core Strategy adopted March 2013

18.2.3.8. The adopted Local Plan Part 1 covers the administrative area of Winchester District including the area of the South Downs National Park Authority that's lies within the district. .

- Policy CP17 – Flooding, Flood Risk and the Water Environment - The LPA will support development which meets the following criteria:
  - A development that does not cause unacceptable deterioration to water quality by protecting surface water and groundwater through suitable pollution prevention measures.

Winchester District Local Plan (2006)

- Policy DP13 – Development on Contaminated Land - The development of land which is known or suspected to be contaminated or is likely to be affected in the vicinity will only be permitted where:
  - The full nature and extent of contamination is established.
  - Appropriate remedial measures are included to prevent risks to future site users and controlled waters.
  - All site investigations, risks assessment, remediation and associated works must be carried out to current industry best practice British Standards ('BS') guidelines.
  - The requirements of this Policy will be applied to developments affected by natural hazards e.g. radon gas as well as manmade contamination.

18.2.3.9. Developments that do not accord with other policies of the plan may be permitted where the LPA is satisfied that:

- Contamination is causing demonstrable harm or risk to human health, environment or property where action is needed to prevent it;
- The type and scale of the proposed development is the only way of dealing effectivity the with harm being caused by contamination, taking account of all other options and the remediation costs;
- The development will not cause undue harm or risk to health, amenities of the area, environment or property; and

- The LPA is satisfied that the remediation works proposed will achieve the long-term suitability for the site for its intended use.

East Hampshire District Council

East Hampshire District Council Draft Local Plan 2017-2036

18.2.3.10. Once this plan has been adopted it will only cover the area in East Hampshire outside the South Downs National Park and it will replace the Joint Core Strategy (the Adopted Local Plan).

- Policy S26 – Protection of Natural resources - Development proposals will be permitted provided that they ensure that the Area's natural resources remain safe, protected and prudently used. Development proposals will be expected to demonstrate that they:
  - Do not give rise to soil contamination, or air, noise, radiation or water pollution where the level of discharge, emissions or contamination could cause harm, to sensitive receptors.
  - Ensure that where evidence of contamination exists, the land is made for its intended purposes and does not pose an unacceptable risk to sensitive receptors.
  - Does not result in a reduction in the quality of groundwater resources, including the protection of principal aquifers and Source Protection Zones ('SPZ's) associated with public supply boreholes.
- Policy DM29 – Water quality and water supply - DM29.2: new development will be required to incorporate well designed mitigation measures to ensure the water environment does not deteriorate, both during construction and during the lifetime of the development.

Hampshire County Council

18.2.3.11. Hampshire County Council ('HCC') does not have a policy related to pollution control or contaminated land and refers to district/borough councils and unitary authorities within the County on these matters.

Minerals and Waste Plan

18.2.3.12. The Hampshire, Portsmouth, Southampton, New Forest National Park and South Down National Park, Minerals and Waste Plan, adopted October 2013, Policy 15: Safeguarding – mineral resources states that:

- Hampshire sand and gravel, silica sand and brick making clay resources are safeguarded against needless sterilisation by non-minerals development unless 'prior extraction' takes places.
- Development without the prior extraction of mineral resources in the Mineral Safeguarding Area may be permitted if:
  - It can be demonstrated that the sterilisation of mineral resources will not occur; or
  - It would be inappropriate to extract mineral resources at that location; or
  - The development would not pose a serious hindrance to mineral development in the vicinity; or
  - The merits of the development outweigh the safeguarding of the mineral resource.

18.2.4. GUIDANCE

DEFRA Contaminated Land Statutory Guidance 2012

18.2.4.1. For land to be determined as 'contaminated' in a regulatory sense, all three elements (contaminant-pathway-receptor) of a significant contaminant linkage must be present . The legislation places a responsibility on the LPA to determine whether the land in its area is contaminated by consideration of whether:

- Significant harm is being caused;
- There is a possibility of significant harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

18.2.4.2. In the guidance that accompanies the Environmental Protection Act 1990, there is advice on what constitutes significant harm and what constitutes a significant possibility. The following documents provide further guidance on the risk assessment process:

- Environment Agency ('EA') and Department of Environment, Food and Rural Affairs ('DEFRA'). Model procedures for the management of Land Contamination (CLR11). (Environment Agency and Defra, 2004);
- DEFRA. Guidance on the legal definition of contaminated land.; and
- Environment Agency Guiding Principles on Land Contamination .

Guidance for Generic Assessment Criteria

18.2.4.3. Generic Assessment Criteria for soils, water, ground gas and vapours have been derived for human health and controlled waters in the following guidance:

Human Health Receptors

- Environment Agency. Science Report – SC050021/SR2 - Human Health Toxicological Assessment of Contaminants in Soil. (Environment Agency, 2008);
- Environment Agency. Science Report – SC050021/SR2 - Human Health Toxicological Assessment of Contaminants in Soil. (Environment Agency, 2008);
- Environment Agency. Science Report SC050021/SR3 - Updated Technical Background to the CLEA Model. (Environment Agency, 2008).
- CIRIA C665. Assessing risks posed by hazardous ground gases to buildings. (CIRIA C665, 2007); and
- The Society of Brownfield Risk Assessment (SOBRA). Development of Generic Assessment Criteria for Assessing Vapour Risks to Human health and Volatile Contaminants in Groundwater. (SOBRA, 2017).

Controlled Water Receptors

- EA's approach to groundwater protection, (Environment Agency, 2018);
- Anti-Pollution Works Regulations (1999);
- The Water Supply (Water Quality) Regulations (2016);
- The Water Framework Directive (2000/60/EC) (2003);
- Potable Water Supply Pipes and Buried Concrete;
- UK Water Industry Research (UKWIR). Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. (UKWIR, 2010); and
- Building Research Establishment ('BRE'). Special Digest 1. 3rd Edition (including February 2018 amendments), Concrete in aggressive ground. (BRE, 2017).

18.2.4.4. The EA's Waste Classification Guidance document (Environment Agency, 2015) provides the criteria for classification of waste as 'hazardous', 'non-hazardous' and 'inert' and the assessment methodology for the determination of these classifications. This classification is required to allow for the disposal of waste and also determines whether a waste requires classification or is suitable for re-use.

18.3. SCOPING OPINION AND CONSULTATION

18.3.1. SCOPING OPINION

18.3.1.1. As detailed within Chapter 1 (Introduction), a Scoping Opinion was received by the Applicant from PINS (on behalf of the SoS) on 7 December 2018, including formal responses from statutory consultees. Appendix 18.2 (Consultation Responses) of the ES Volume 3 (document reference 6.3.18.2) sets out full responses to the PINS Scoping Opinion and a summary of issues raised is presented below:

- Environment Surveys undertaken must include consideration of soils, potential contamination, geology, superficial cover, bedrock, hydrogeology, solution features, SPZs and nearby abstractions. This is addressed in the Baseline Environment (Section 18.5) of this chapter.
- Proposed Cable Route has solution features present which contribute to karstic environment. A consideration of the solution features must form part of the scope of work. This is addressed in the Predicted Impacts (Section 18.6) and the Residual Effects (Section 18.9). This has been further assessed within the Chapter 19 (Groundwater).
- Sites of geological interest should include solution features. This is addressed in the Baseline Environment and solution features are discussed within the Groundwater Chapter (Chapter 19).
- Secondary A Aquifers that overlie Principal Aquifers should have a receptor assessment of High. Secondary A and Secondary B Aquifers should have a Moderate Risk and that Unproductive Strata should have a Low Risk. This is addressed in the Sensitive Receptor tables in the Assessment Methodology Section (Section 18.4).
- All imported soils material must be clean and inert and not pose a contaminant threat to underlying aquifers, this is addressed within Chapter 27 (Waste and Material Resources) of the ES Volume 1 (document reference 6.1.27).
- The assessment must be designed to understand the potential for pathway creating through impacted soils/or long-term spill and incident management if preferential pathways are created. This is addressed in this Chapter and also within Chapter 19 (Groundwater) and Chapter 20 (Surface Water Resources and Flood Risk).
- The Conceptual Site Model should look at the development phase as well as legacy contamination. This is addressed within the conceptual site models in Appendix 18.1 (PRA and GQRA) and has been incorporated into the assessment of this chapter.

- A review of PCC records was required. This has been addressed with a review of PCC records on the 12 June 2019. Subsequently these have been incorporated in Appendix 18.1 (PRA and GQRA) and the baseline environment section below.

18.3.1.2. Appendix 18.2 (Consultation Responses) includes the responses to the PINS EIA Scoping Opinion.

18.3.2. CONSULTATION PRIOR TO PEIR

18.3.2.1. Prior to the publication of and consultation on the PEIR, consultation was undertaken with the EA, Winchester City Council ('WCC'), and PCC via email and included provision of baseline information.

18.3.2.2. Appendix 18.2 (Consultation Responses) includes a summary of consultation undertaken and outcome of discussions for this topic.

18.3.3. STATUTORY CONSULTATION

18.3.3.1. Consultation on the PEIR was undertaken between February and April 2019. Appendix 18.2 (Consultation Responses) includes the responses to the PEIR consultation in relation to this topic and how these have been addressed. Key comments are summarised below:

- WCC noted that there was an expectation that the footprint of the converter station could be set at a lower level and there is nothing in the ground conditions or groundwater chapters to show why this is not feasible. The response predominantly relates to a groundwater protection issue, therefore is addressed in Chapter 19 (Groundwater).
- The EA noted that there needs to be detail regarding pollution measures during construction and operation stages in the ES in order to provide assurance that there will be sufficiently robust protection for groundwater. Details on the pollution prevention measures during both the construction and operation stages are presented in the Proposed Mitigation and Enhancement Section (Section 18.9) of the ES.
- The EA noted that further consideration of the impacts of the development in relation to karst (solution) features and location within SPZ1 was required. Further consultation with the EA and Southern Water has been carried out in respect of potential impact on groundwater, particularly in relation to potential operational impacts related to the SPZ1 and karst conditions. The outcome of these discussions and the mitigation measures adopted in the scheme design are addressed in Chapter 19 (Groundwater).

- The EA noted that parts of the converter station are also within the SPZ1 for public water supply and that this needed to be recognised in all sections of the report. The risk to groundwater resources in this area has been addressed in Chapter 19 (Groundwater).
- PCC noted that there are areas of significant contamination along the identified route and areas that have been previously remediated. PCC also noted that a Conceptual Site Model ('CSM') needs to be created. PCC suggested that further ground investigation should target areas of pollution and be based on the CSM. A visit to PCC to review their in-house records was completed on 12 June 2019, subsequently this information has been incorporated into the ES. A CSM for each section of the route has been created using all the information available and can be found within Appendix 18.1 (PRA and GQRA). At present it is not intended to carry out additional ground investigation works before the submission of the ES. However, the ES will inform the design development including the need for additional ground investigation.

18.3.4. POST PEIR CONSULTATION

18.3.4.1. Following the PEIR, consultation was undertaken with PCC, the EA and Southern Water. For further information on the consultation undertaken, refer to Appendix 18.1 (PRA and GQRA).

18.3.4.2. Appendix 18.2 (Consultation Responses) includes a summary of consultation undertaken and outcome of discussions.

18.3.4.3. Full details of consultation undertaken to date is presented within the Consultation Report (document reference 5.1).

18.3.5. ELEMENTS SCOPED OUT OF THE ASSESSMENT

18.3.5.1. Risk arising from Unexploded Ordnance ('UXO') has been scoped out of this assessment as this is considered to be a health and safety concern rather than an environmental consideration or a risk to sensitive receptors (humans, controlled waters and below ground services) from contamination. The environmental risk from explosive residue resulting from WWII bombing is considered to be negligible due to the time elapsed and the sporadic nature of residual bombing residues, which would be mainly associated with UXO. In addition, the past military use of the landfall site is not considered to constitute an environmental or human health risk from contamination due to the historical and isolated nature of any residual explosives and has been scoped out of the assessment.

18.3.5.2. Ground stability is not considered in this assessment as it does not constitute a risk to receptors (humans, controlled waters and below ground services) from contamination.

18.3.5.3. It should be noted that Chapter 19 (Groundwater) addresses the assessment of significant effects to groundwater quality along the route as well as groundwater as a resource for abstraction and should be read alongside this Chapter.

18.3.6. ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Stage

18.3.6.1. The following impacts are considered to have the potential to give rise to likely significant effects during the Construction Stage of the Proposed Development and have therefore been considered within the ES:

- Potential effect on human health receptors (neighbouring land users, and construction workers) through direct contact, ingestion and inhalation of contaminated soils and possible also contaminated groundwater.
- Potential effect on controlled water receptors (groundwater and surface water), through the leaching of contaminants from soils, lateral and vertical migration of contaminants, introduction of preferential pathways (due to Trenchless techniques including horizontal directional drilling ('HDD') and/or trenching), migration of contaminated groundwater from upgradient sources and mobilisation via overground/surface water runoff.
- Potential effect on geology receptors (MSAs and Regionally Important Geological Sites ('RIGS')), as contamination could be mobilised resulting in cross contamination and potential sterilisation of mineral resources.

- Potential effect on below ground services (the cable itself, buried concrete and potable water supply pipes), due to the interaction with geology and soils that could impact the integrity of buried services through the effects of aggressive ground and contaminated soils and groundwater.

Operational Stage

18.3.6.2. Once the Proposed Development has been constructed, all necessary remediation will have been undertaken. However, there may still be some impacts.

18.3.6.3. The following impacts are considered to have the potential to give rise to likely significant effects during operation of the Proposed Development and have therefore been considered within the ES:

- Potential effect on human health receptors (maintenance workers and adjacent land users) as these receptors could come into contact with contaminated soil and groundwater if the cables need to be replaced. Impacts have the potential to arise through direct contact, ingestion and inhalation of contaminated soil or groundwater.
- Potential for effects on controlled water receptors (groundwater and surface water) through the leaching of contaminants from soils, introduction of preferential pathways, migration of contaminated groundwater from upgradient sources and mobilisation via overground/surface water runoff following earthworks including cable replacement.
- Potential effect on geology receptors (MSAs and RIGS) as contaminations could be mobilised resulting in cross contamination and potential sterilisation.
- Potential effect on below ground services (the cable itself, buried concrete and potable water supply pipes) due to the interaction with potentially contaminated soils and geology that could impact the integrity of buried services. Aggressive ground conditions could also cause an effect on below ground services.

Decommissioning Stage

18.3.6.4. Whilst the Proposed Development is designed to provide permanent electrical infrastructure, there may come a time where it may be appropriate to decommission the equipment.

18.3.6.5. When it is considered suitable, the Decommissioning Stage of the Converter Station may involve each item of equipment being removed for recycling or disposal, as appropriate. In this scenario, potential impacts on geology, human health, controlled waters and below ground services are expected to be similar or identical to those detailed for the Construction Stage.

18.3.6.6. The approach to decommissioning will be determined in the future by the contractor at the time of decommissioning. If the HVAC and HVDC cables are left in situ, potential impacts on geology, human health, controlled waters and below ground services are expected to be similar or identical to those detailed for the Operational Stage.

18.3.6.7. If the ducts are left in situ but the Cables removed (by opening joint bays) potential impacts on geology, human health, controlled waters and below ground services are expected to be less than those detailed for the Construction Stage as there will be less excavation and disturbance required.

18.4. ASSESSMENT METHODOLOGY

18.4.1.1. The assessment methodology used in this chapter is based upon guidance presented within BS10175:2017 and CLR11.

18.4.2. ESTABLISHING THE BASELINE

18.4.2.1. The PRA/GQRA, along with addendum reports and ground investigation, reports have been prepared using information from historical Ordnance Survey maps, environmental data reports (Envirocheck), British Geological Survey maps ('BGS') and ground investigations by WSP in 2018.

18.4.2.2. To inform the assessment, existing uses, soil, geological, hydrogeological, and hydrological conditions have been reviewed to derive a hydrogeological model and establish the environmental setting of the study area. The environmental setting establishes potential receptors of contamination.

18.4.2.3. An understanding of the likely existing environmental setting in terms of geology, mineral resources, geological features and contamination has been established with reference to the key information sources provided in the Table 18.1 below.

Table 18.1 - Key Information Sources

Source	Data	Comment
British Geological Survey ('BGS')	Solid and Drift BGS Map Sheet 316 – Fareham (1:50,000, 1998) and Map 331 – Portsmouth (1: 50,000, 1994) BGS Geology of Britain Viewer (accessed July 2019)	Provides information on both the Superficial and Bedrock geology underlying the proposed cable route. Helps determine the likely ground conditions and contaminant pathways.
MAGIC Map website	Natural England Multi-Agency Geographic Information for the Countryside (MAGIC) website (accessed July 2019);	Provides information on EA Aquifer Designations, Statutory and Non-statutory sites, and EA SPZ. Helps to determine likely receptors.

Source	Data	Comment
PCC **WCC** **HBC** **EHDC** **EA**	Contaminated Land Records including historical reports	Provides information relating to contaminated land including, landfills, previous industrial land uses, pollution incidents, remediation, ground conditions, potentially contaminated land uses and water quality records.
Landmark Information Group	Landmark Envirocheck Reports (Ref: 121347347_1_1 and 121347331_1_1)	Primary repository of information relating to historical land uses, pollution incidents to controlled waters, landfills, ecology, mineral extraction sites, waste management facilities, discharge consents, geology, water abstractions, and local authority pollution prevention and controls etc. Information helps to identify potential sources of contamination, receptors and also pathways.
WSP Desk Study Reports	Ground Risk and Remediation Reports PRA/GQRA dated July 2019 UK Cable Route Desk Study Route 3D, dated June 2017, Geotechnical Engineering Reports UK Cable Route Addendum Desk Study – Route 3D, Deviations	Desk study reports PRA and PRA/GQRA prepared by WSP GRR team, provides information needed for the baseline of this assessment including ground conditions, landfills, previous land uses, contamination, and a conceptual site model (source, pathway, receptor model) needed for the assessment of this report. Desk Study report prepared by WSP Geotech team provides information needed for the baseline of this assessment including information on ground conditions and previous land uses.
Ground Investigation Reports	WSP Geotech Reports Initial Ground Investigation Findings, Milton Common, October 2018 UK Converter Station Ground	Information useful in determining the ground conditions at the site e.g. thickness of Made Ground and Made Ground composition and information on groundwater levels. Helps determine potential sources of contamination,

Source	Data	Comment
	Investigation – Geotechnical Interpretative Design Development Report dated May 2019 UK Route, HDD and Landfall Ground Investigation - Geotechnical Interpretative Design Development Report dated May 2019 <u>Factual Reports</u> Geotechnics Ltd, 2018, UK - France HVDC Interconnector Onshore Work Package 1 (Option South), PE181480; Geotechnics Ltd, 2018, UK - France HVDC Interconnector Onshore Work Package 1A (Option West and Access Track), PE181477; Geotechnics Ltd, 2019, UK - France HVDC Interconnector Onshore Work Package 2, PE181481; and Geotechnics Ltd, 2019, UK - France HVDC Interconnector Onshore Work Package 3, PE18148.	pathways and receptors. Factual reports contain chemical results for soils and water. Also provides information on groundwater levels and ground gas (carbon dioxide and methane) concentrations. All of this information helps determine the likely risk of contamination along the route and helps with the assessment. These results have been summarised in the PRA/GQRA mentioned above.

18.4.2.4. A series of constraints drawings have been prepared based on a review of all the information sources and can be found within Figures 18.1 to 18.5 of the ES Volume 2 (document reference 6.2.18.1 – 6.2.18.5).

18.4.2.5. In order to be able to assess the possibility for land to be currently contaminated, potential sources and receptors needed to be identified, along with an evaluation of the potential existence of pathways between them to form complete contaminant linkages. Using all the information sources the likely significance of the risk for each plausible linkage has been assessed for this chapter.

18.4.2.6. The risk to receptors has been determined for the Construction, Operational and Decommissioning Stages of the Proposed Development.

Ground Investigation

18.4.2.7. Ground investigations were designed based on the findings of the PRA in 2018 and carried out in two stages. Stage 1 comprised the proposed Converter Station Area and Stage 2 comprised the Onshore Cable Route, Landfall and Trenchless crossing locations. Both investigations were undertaken by Geotechnics Ltd for WSP. Phase 1 was undertaken in April to May 2018 and the majority of Phase 2 was undertaken between July and October 2018.

18.4.2.8. Information from these investigations relating to ground conditions and contamination have been included in the assessment carried out as part of the ES.

18.4.2.9. It should be noted that it is likely that further area-specific ground investigation in relation to ground contamination will be carried out by the contractor for the Proposed Development to better understand specific ground risks identified and to allow for a safe method of working to be established. Detailed site-specific groundwater assessments are included within Chapter 19 (Groundwater).

18.4.3. SIGNIFICANCE CRITERIA

18.4.3.1. In determining the significance of a potential effect, the magnitude of impact arising from the Proposed Development is correlated with the sensitivity of the particular environmental attribute or process under consideration.

18.4.3.2. For contamination to present a significant potential effect, a contaminant linkage must first be established using the CSM approach. It must be demonstrated that there is an identifiable source of contamination (be it an on-site or off-site source), sensitive receptors and a viable pathway through which the source may affect the sensitive receptors.

Sensitivity of Receptors

18.4.3.3. The sensitivity of potential receptors has been described qualitatively using professional judgment as detailed in Table 18.2.

Table 18.2 - Sensitivity of Receptors

Sensitivity	High	Medium	Low	Negligible
Human Health (construction / maintenance workers and adjacent land users)	Residential properties with private gardens/schools/care homes/playing fields Construction/ maintenance workers	Residential properties without plant uptake Retail and business parks (public and work places)	Commercial/ industrial properties Public open spaces	N/A

Sensitivity	High	Medium	Low	Negligible
		Allotment and market gardens		
Controlled Waters (groundwater and surface water)	EA defined Principal Aquifers EA defined Secondary A Aquifers overlying Principal Aquifers EA groundwater SPZ1 Surface water bodies of High quality	EA defined Secondary A and B Aquifers (where not overlying Principal Aquifers) EA groundwater SPZ 2 and 3 Surface water bodies of Moderate quality	EA defined Unproductive Strata and Secondary Undifferentiated Aquifers Minor local drainage network	N/A
Geology	SSSIs Major strategic mineral resource areas Strategic underground storage space Solution features RIGS	Local geological sites and important mineral resource areas or MSAs	Mineral Areas of Search/ Consultation Areas ('MCA')	N/A
Below Ground Services (cable itself, potable water supply pipes and buried concrete)	N/A	Potable water supply pipes Buried concrete	N/A	N/A

Magnitude of Impact

18.4.3.4. The magnitude relates to the level at which the receptor will be impacted, using the duration of the impact, timing, scale, size and frequency to determine the magnitude of the impact to each receptor during Construction, Operational and Decommissioning Stages of the Proposed Development. Magnitude of impact is evaluated in accordance with the definitions set out in Table 18.3 below.

Table 18.3 - Definitions of 'magnitude' of impact

Magnitude of Impact	Definition	Example
High	Total loss or major alteration to key elements/features of the baseline. Results in loss of attribute and/or likely to cause exceedance of statutory objectives and/or breach of legalisation.	Likely significant human health impact. Contamination of a Principal aquifer or loss or isolation of strategic mineral resource.
Medium	Partial loss or alteration to one or more key elements/features of the baseline. Results in effect on integrity of attribute/or loss of part of attribute, and/or possibly cause exceedance of statutory objectives and/or breach of legislation.	Reduction in the value of a feature, Moderate human health impact, loss or isolation of regional/local mineral resource
Low	Minor shift away from baseline. Results in minor effects on attribute.	Measurable change in attribute, but of limited size/proportion.
Negligible	Very slight change from baseline Results in a very slight change or effect on attribute.	No significant loss in quality of feature/attribute.

Significance of Effects

18.4.3.5. The overall significance has been assessed using the matrix in Table 18.4. Further details on significance can be found within Chapter 4 (EIA Methodology) of the ES Volume 1 (document reference 6.1.4).

18.4.3.6. Generally, 'negligible', 'minor' and 'minor to moderate' effects are considered 'not significant'. 'Moderate', 'major to moderate' and 'major' effects are considered 'significant'. However, in all instances professional judgment is applied.

Table 18.4 - Matrix for classifying the significance of effects

		Sensitivity of receptor/receiving environment to change			
		High	Medium	Low	Negligible
Magnitude of Impact	High	Major	Major to Moderate	Moderate	Negligible
	Medium	Major to Moderate	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

18.4.4. ASSUMPTIONS AND LIMITATIONS

18.4.4.1. This assessment has been undertaken with information available at the time of writing. The methodology is robust, utilising available information, and conforming to the requirements of local and national guidance and planning policy. A range of sources have informed the desk-based assessments, including documentary sources, cartographic evidence, evidence from ground investigations and evaluation of results from ground investigations. As such, a reasonable assessment of the ground conditions and contamination has been presented.

18.4.4.2. During the ground investigation completed in 2018 by WSP, explosive and radioactive material were not tested for as these were scoped out of the assessment.

18.5. BASELINE ENVIRONMENT

18.5.1. INTRODUCTION

18.5.1.1. As set out in Chapter 3 (Description of the Proposed Development), the Order Limits have been divided into 10 Sections. The baseline assessment includes:

- Section 1 – Lovedean (Converter Station Area);
- Sections 2 to 9 - Onshore Cable Corridor; and
- Section 10 – Eastney (Landfall).

18.5.1.2. Where various route options remain (such as in the location of Milton Common) and the final route is yet to be decided, each option is discussed and assessed separately.

18.5.1.3. The sections below summarise the geology profile and conceptual site model, and provide a brief summary of the baseline conditions along each section of the Proposed Development.

18.5.1.4. Detailed descriptions of the hydrology and hydrogeology of the study are available in Chapter 19 (Groundwater) and Chapter 20 (Surface Water Resources and Flood Risk). The baseline features and identified sources are shown on the constraints drawings (Figures 18.1 to 18.5).

18.5.2. GEOLOGY PROFILE

18.5.2.1. The BGS online viewer, map sheets 316 and 331 and the ground conditions encountered during the WSP ground investigation dated 2018 have been reviewed and the underlying geology (bedrock and superficial) including EA Aquifer Designations that are anticipated to be encountered at the Proposed Development are summarised below.

18.5.2.2. The anticipated superficial geology along the route comprises:

- Head Deposits (Secondary Undifferentiated Aquifers)– gravel, sand and clay.
- River Terrace Deposits (Undifferentiated and Second) (Secondary A Aquifer) – Sand silt and clay.
- Raised marine Deposits (Secondary Undifferentiated Aquifer) – Sand, gravel, silt and clay commonly charged with organic debris.
- Beach and Tidal Flat Deposits (Secondary Undifferentiated Aquifer) – 'Beach Deposits' shingle, sand, silt and clay and 'Tidal Flat Deposits' commonly silt and clay with sand and gravel layers.

18.5.2.3. The bedrock geology and EA aquifer designations for the relevant geological units are set out below:

- The Wittering Formation (Secondary A Aquifer) – Greyish brown laminated clay.

- London Clay Formation (Thames Group) (Unproductive Stratum) – Bioturbated or poorly laminated blue grey or grey-brown slightly calcareous silty clay with some layers of sandy clay.
  - Durley Sand Member (formerly Whitecliff Sand Member) (Secondary A Aquifer).
  - Portsmouth Sand Member (Secondary A Aquifer).
  - Bognor Sand Member (Secondary A Aquifer) – Glauconitic bioturbated or cross-bedded fine and medium grained sands, partially cemented.
- The Lambeth Group (Secondary A Aquifer) – Clay with some silty or sandy sand and some sand and gravel with minor limestones and lignite.
- White Chalk Subgroup (Principal Aquifers).
  - Portsdown Chalk Member – White chalk with marl seams and flint bands.
  - Spetisbury Chalk Member – Firm white chalk with regular large flint seams.
  - Tarrant Chalk Member – Soft white chalk with relative widely space large sized flints.
  - Newhaven Chalk Formation – Soft to medium hard, smooth white chalk with numerous marl seams and flint bands.
  - Seaford Chalk Formation – Firm white chalk with nodular and tabular flint seams.
  - Lewes Nodular Chalk Formation – Hard nodular chalk with flints.

18.5.3. CONCEPTUAL SITE MODEL

18.5.3.1. The CSMs created for all Sections were based upon environmental conditions including historical uses and results from the GQRA. The CSMs for each section are provided in Appendix 18.1 (Consultation Responses). Environmental risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. The existence of a contaminant linkage is primarily dependant on site usage and environmental conditions.

18.5.3.2. The EIA has been carried out by identifying and evaluating the significance of the following:

- Potential Sources of Contamination: these include any actual or potentially contaminating materials and activities, located on or within 500 m of the Order Limits;
- Potential Pathways for Contamination Migration: these are the routes or mechanisms by which contaminants may migrate from the source to the receptor; and

- Potential Receptors of Contamination: these include present or future land users, activities or persons at the site.

Potential Receptors

18.5.3.3. As the Onshore Cable Route is going to be buried and the vast majority within roads with an impermeable road surface on top, the potential influence on human health from the cable route is restricted to disturbance of contaminated material during initial construction (including repair and maintenance), operation and decommissioning.

18.5.3.4. The following receptors of potential contamination for all Sections of the Proposed Development were identified:

Human Health

- Workers during construction and maintenance; and
- Surrounding general public during construction and maintenance.

Controlled Waters

- Shallow groundwater within identified Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers; and
- Identified surface water features.

Below Ground Services

- The cable itself;
- Buried concrete; and
- Potable water supply pipes.

Contamination Pathways

18.5.3.5. The plausible contaminant pathways that have been designed for all Sections of the Proposed Development include (numbers in brackets relate to the contamination source potential pathway):

- Human health (Pathway 1):
  - Dermal contact;
  - Direct ingestion;
  - Direct exposure to impacted shallow groundwater and/or surface water; and
  - Consumption of home-grown produce.
- Human health (Pathway 2):
  - Inhalation of particulates/fibres and/or soil/water derived vapours; and
  - Asphyxiation by accumulation of ground gases in internal/confined spaces.
- Groundwater (Pathway 3):
  - Leaching of contaminants through the unsaturated zone and subsequent impact on groundwater; and
  - Lateral migration of impacted groundwater.
- Surface water features/ecologically sensitive areas (Pathway 4):
  - Surface water runoff; and
  - Migration of immiscible contaminants.
- Below ground services (Pathway 5):
  - Direct contact with corrosive substances (e.g. sulphates and hydrocarbons) in the soil and shallow groundwater.

18.5.3.6. The receptors identified at paragraph 18.5.3.4 above have the potential to be impacted via one or more of these pathways along each section of the Proposed Development (as discussed in detail below).

18.5.4. BASELINE CONDITIONS

18.5.4.1. The following sections summarise the baseline ground conditions along each section of the Proposed Development as follows:

- Geology – for each section of the Proposed Development the geology is discussed in terms of anticipated bedrock and superficial geology at each section (including likely depths). Anticipated geology at each section has been derived from BGS Maps and ground and groundwater conditions encountered during the WSP ground investigation in 2018.

- Hydrogeology and Hydrology (Controlled Waters) - for each section of the Proposed Development the hydrogeology and hydrology is discussed in terms of EA aquifer designations, Source Protection Zones (SPZs), and surface water features within 500 m of the study area. The hydrogeology and hydrology identifies the controlled water receptors (groundwater and surface water) within the section.
- Potential contamination sources - for each section of the Proposed Development the potential contamination sources are discussed (both current and historical) including landfills, mineral extraction sites, local authority pollution prevention controls and discharge consents and previous industrial land uses. Details on the pollution incidents to controlled waters can be found in Appendix 18.1 (PRA and GQRA). They are not discussed any further in this ES as they all occurred over 10 years ago and therefore are unlikely to pose a significant risk to the Proposed Development. The results of the WSP ground investigation in terms of contamination in soils and groundwater are also discussed. Where the text refers to 'exceedances' or 'elevated concentrations', these relate to measured laboratory concentrations relative to the adopted acceptability criteria used in the assessment of contamination risk.
- Sensitivity – for each section of the Proposed Development the baseline sensitivity has been highlighted.

18.5.4.2. Further details including the CSM are provided in Appendix 18.1 (Consultation Responses).

Section 1 – Lovedean (Converter Station Area)

Geology

18.5.4.3. The bedrock geology across both areas comprises the Tarrant Chalk Member and is indicated to be close to or at the surface. The ground investigation carried out by WSP in 2018 identified Head Deposits predominately gravelly clays (1.10 m – 2.90 m in thickness), overlying the Tarrant Chalk Member (unproven depth).

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.4. There are no significant surface water features within the study area. The section is located within an EA SPZ 1 associated with the Bedhampton and Havant Springs Lovedean Source Protection Zone. The area is also located within a SPZ 1 for public water supply.

18.5.4.5. The Tarrant Chalk Member is designated as a Principal Aquifer and the Head Deposits are designated as a Secondary Undifferentiated Aquifer.

18.5.4.6. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.7. Earliest available historical mapping (1869) indicated that the Order Limits comprised of agricultural fields with frequent former chalk pits. 12 historical mineral extraction sites are located within 500 m of the Converter Station (Crabdens Copse, Hinton Daubney Chalk Pit, Stonemere Copse Chalk Pit, Greasteds Copse Chalk Pit, Crossways Chalk Pit, three at Denmead Farm Chalk Pit, two at Broadway Farm Chalk Pit, Lovedean Farm Chalk Pit and Crabdens Row Chalk Pit). All these pits were recorded as chalk pits, opencast and ceased. Crabdens Row Chalk Pit was located adjacent to the east of Lovedean Substation. All of these pits have the potential to be infilled with Made Ground.

18.5.4.8. Lovedean Substation is also present on the mapping within the Order Limits from 1980 to the present day.

18.5.4.9. There were no exceedances of the relevant human health or controlled waters assessment criteria for potential contaminants within the soil or groundwater samples in the 2018 ground investigation.

Sensitivity

18.5.4.10. The sources of contamination identified include infilled land (numerous identified historical mineral extraction sites) within, and including a 500 m buffer of, the Order Limits and historical and current uses as agricultural land.

18.5.4.11. The sensitivity of Geology receptors (MSAs) is **medium**, Human Health receptors (construction workers and adjacent site users) is **low**, Controlled Waters (Tarrant Chalk member – Principal Aquifer) is **high**, and Below Ground Services is **medium**.

Section 2 – Anmore

Geology

18.5.4.12. The bedrock geology across the area generally comprises the Tarrant Chalk Member. The 2018 ground investigation encountered Topsoil generally overlying the Head Deposits predominately gravelly clays (1.10 m – 2.90 m in thickness).

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.13. There are no significant surface water features within the study area. The section is located within an EA SPZ 1 associated with the Bedhampton and Havant Springs Lovedean Source Protection Zone. The area is also located within a SPZ 1 for public water supply.

18.5.4.14. The Tarrant Chalk Member is designated as a Principal Aquifer and the Head Deposits are designated as a Secondary Undifferentiated Aquifer.

18.5.4.15. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination sources

18.5.4.16. Earliest available mapping of the area (1869) indicates that the area comprised of agricultural fields with frequent former chalk pits.

18.5.4.17. Five historical mineral extraction sites were located within 500 m of the area (two at Denmead Chalk Pit, Merits Farms Chalk Pit and Anmore Dell Chalk Pit and Anmore Dell. These pits were recorded as chalk pits, opencast and ceased; these have the potential to be infilled with Made Ground.

18.5.4.18. Anmore Dell historical landfill was located approximately 270 m east of the area; deposited waste included inert waste.

18.5.4.19. There were no exceedances of the relevant human health assessment criteria for potential contaminants within the soil samples in the 2018 ground investigation. There were elevated concentrations of potential contaminants in groundwater when compared to the surface water assessment criteria including cooper, nickel, zinc, fluoranthene, naphthalene and bis(2-ethylhexyl) phthalate. However, there are no surface water features within 500 m of the area, therefore unlikely to pose a significant risk. An isolated groundwater exceedance for ammoniacal nitrogen was identified.

Sensitivity

18.5.4.20. The sources of potential contamination identified include infilled land (historical mineral extraction sites) within, and including a 500 m buffer of, the Order Limits and agricultural land uses (both historical and current).

18.5.4.21. The sensitivity of Geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **low**, Controlled Waters (Tarrant Chalk member – Principal Aquifer) is **high**, and Below Ground Services is **low**.

Section 3 - Denmead/Kings Pond Meadow

Geology

18.5.4.22. The bedrock geology in this section generally comprised the Lambeth Group (Secondary A Aquifer – 2.00 m to >13.70 m in thickness) overlying the Tarrant Chalk Member (unproven depth). The Lambeth Group generally thickened towards the south of the area. The superficial deposits generally comprised either Topsoil or Made Ground (overlying the Head Deposits which ranged from 0.40 – 3.00 m in thickness).

18.5.4.23. The London Clay Formation was not encountered during the WSP investigation in 2018. However, from BGS geology maps is likely to be encountered overlying the Lambeth Group to the far south of the route. The London Clay Formation thickens towards the south.

18.5.4.24. The Onshore Cable Corridor passes through a clay Mineral Safeguard Area as determined by HCC.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.25. Kings Pond is located adjacent west of the area within Kings Pond Meadow. A drain flowing west crosses the area towards the south and joins up with another drain (flowing south) approximately 150 m west.

18.5.4.26. The area is located within an EA SPZ 1 (The Bedhampton and Havant Springs and Lovedean SPZ) and Inner Zone 1c relating to subsurface activity only.

18.5.4.27. The Tarrant Chalk Member is designated as a Principal Aquifer, the Lambeth group as a Secondary A Aquifer, the Head Deposits as a Secondary Undifferentiated Aquifer and the London Clay Formation as Unproductive Stratum.

18.5.4.28. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.29. Earliest available mapping (1869) indicates that the site comprised agricultural fields with an area of forestry. Denmead town (various residential, commercial and industrial uses) is present on the earliest maps and is shown to have undergone considerable expansion in the 1970s.

18.5.4.30. Anmore Dell Chalk Pit, Anmore Gravel Pit and Soak Sand Pit were located within 500 m of the area.

18.5.4.31. Anmore Dell historical landfill was located approximately 250 m east of the eastern boundary of the area. Deposited waste included inert waste.

18.5.4.32. There were no exceedances of the relevant human health assessment criteria for potential contaminants within the soil samples in the 2018 ground investigation. Amosite and Chrysotile asbestos were identified as bundles of fibres within one sample. Exceedances of the surface water assessment criteria for cooper (two samples), lead (three samples) and zinc (one sample) were identified within the soil leachate samples within the Made Ground.

Sensitivity

18.5.4.33. The sources of contamination identified include infilled land (mineral extraction sites and landfills) identified within, and including a 500 m buffer of, the Order Limits and historical and current agricultural land uses.

18.5.4.34. The sensitivity of Geology receptors (MSAs) is **medium**, Human Health receptors (construction workers and adjacent site users) is **low**, Controlled Waters (Principal Aquifer, Secondary (A) Aquifer and Secondary (Undifferentiated) Aquifer) is **high**, and Below Ground Services is **medium**.

Section 4 – Hambledon Road to Farlington Avenue

Geology

18.5.4.35. From the ground investigation the bedrock geology generally comprised, the Wittering Formation overlying the Thames Group (London Clay Formation, Whitecliff Sand Member, Portsmouth Sand Member, and the Bognor Sand Member). The Lambeth Group was encountered within one hole (the base was not proven in that location). The superficial deposits that were generally encountered were Topsoil 0.1-0.4 m thick or Made Ground slightly to very sandy very clayey gravel and slightly gravelly slightly silty sand, with chalk, flint and chert gravel) 0.35 – 1.7 m thick. The Topsoil and Made Ground were encountered overlying the Head Deposits (0.7 m to 2.85 m in thickness) in some places. The Head Deposits are associated with existing relic water courses.

18.5.4.36. During the WSP 2018 ground investigation the bases of neither the Lambeth Group nor the London Clay Formation were not encountered and it is considered they are underlain by the White Chalk Subgroup.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.37. A number of drainage ditches are located within 500 m of the area.

18.5.4.38. Portsdown Hill Reservoir (covered reservoir) was located approximately 150 m east of the southern section of the area.

18.5.4.39. The majority of the area is located within an EA SPZ Inner Zone 1c relating to subsurface activity only. The southernmost section of the Section 4 area is not located within an EA SPZ.

18.5.4.40. The underlying geology is designated as Principal Aquifers, Secondary A Aquifers, Secondary Undifferentiated Aquifers and as Unproductive Stratum.

18.5.4.41. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.42. 11 named and two un-named historical mineral extraction sites were located within 500 m of the Order Limits, all concentrated in the southern half of Section 4. Of these nine are recorded as chalk pit, opencast and ceased (Dell Garden, Belle Isle Chalk Pit, Collgers Pit, Wymering Chalk Pit, Candy's Pit, two unnamed chalk pits, Privet Coppice Chalk Pit and Purbrook Park Chalk Pit). The remaining pits were The Pack Gravel Pit and Purbeck Park Sand Pits (3 pits in that location).

18.5.4.43. Fielders Park landfill is located approximately 50 m east of the central section of the area. Deposited waste included household waste.

18.5.4.44. Earliest available mapping (1869) indicates that the area comprised of agricultural fields until the residential development occurred in 1930s and 1960s. From that time, the area consisted of former industrial land uses including filling stations, saw mills, depots, smithy, engineering works and sewage works.

18.5.4.45. There were no exceedances of the relevant human health or controlled waters assessment criteria for potential contaminants within the soil or groundwater samples in the 2018 ground investigation.

Sensitivity

18.5.4.46. The sources of contamination identified within, and including a 500 m buffer of, the Order Limits include infilled land (mineral extraction sites within 250 m of the southern section of the area), Fielders Park landfill, and former and current industrial land users including filling station, saw mills, depots and sewage works.

18.5.4.47. The sensitivity of geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Principal, Secondary (A) Aquifers and Secondary (Undifferentiated Aquifers)) is **High**, and below ground services is **medium**.

Section 5 – Farlington

Geology

18.5.4.48. From the ground investigation the bedrock geology generally comprised the Lewes Nodular Chalk Formation (unproven depth). The BGS Map indicated the potential for the Lambeth group to be present towards the north of the area. The superficial deposits generally comprised, Topsoil (0.3 m thick) or Made Ground (0.40 -0.90 m in thickness). The Made Ground was encountered overlying the Head Deposits (1.8 m thick) and the River Terrace Deposits (1.8 m thick) (Undifferentiated) in sequence.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.49. A number of drainage ditches and streams are located within 500 m of the area.

18.5.4.50. Drayton covered reservoir is located approximately 155 m east of Farlington Avenue.

18.5.4.51. The area is not located within an EA SPZ.

18.5.4.52. The underlying geology is designated as Principal Aquifers, Secondary A Aquifers and Secondary Undifferentiated Aquifers.

18.5.4.53. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.54. Two historical sand/chalk pits were located approximately 155 m east of Farlington Avenue in the vicinity of Drayton covered reservoir. Pumping Station (adjacent to historical pumping station) (reference EAHLD20790 historical/registered landfill was located approximately 60 m east of Farlington Avenue further details provided in Appendix 18.1 (PRA and GQRA).

18.5.4.55. Earliest available mapping (1869) indicates that the area comprised agricultural fields until residential development occurred from 1910. A series of potentially contaminative historical land uses have been identified including a pumping station (1932 to 2000), a school (2000 to present), a reservoir (1869 to 1932, covered from 1931), Portsdown Hill filtration works (1898 to present) and Fort Purbrook (1933 to present).

18.5.4.56. There were no exceedances of the relevant human health or controlled waters assessment criteria for potential contaminants within the soil or groundwater samples in the 2018 ground investigation.

Sensitivity

18.5.4.57. The sources of contamination identified within, and including a 500 m buffer of, the Order Limits include infilled land (two historical sand/chalk pits), pumping station, landfill and former and current industrial land uses including reservoirs and pumping station.

18.5.4.58. The sensitivity of geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers) is **high**, and below ground services is **medium**.

Section 6 – Zetland Field and Sainsbury's Car Park

Geology

18.5.4.59. From the ground investigation the bedrock geology generally comprised, the White Chalk Subgroup particularly the Lewes Nodular Chalk Formation. The superficial deposits that were generally encountered were Made Ground which varied between 0.70-0.90 m in thickness, overlying the River Terrace Deposits (Undifferentiated. The Raised Marine Deposits are likely to be present towards the east and south of the area.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.60. A number of drainage ditches and streams are located within 500 m of the area (closet located approximately 320 m south of the area).

18.5.4.61. The area is not located within an EA SPZ.

18.5.4.62. The underlying geology is designated as Principal Aquifers, Secondary A Aquifers and Secondary Undifferentiated Aquifers.

18.5.4.63. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.64. Earliest available mapping (1869) indicates that Section 6 comprised agricultural fields and Farlington Water Works/Sewage Works from 1869 to 1955. The area comprises former and current industrial land uses including railway, factory, works, sewage works and petrol station.

18.5.4.65. There were no exceedances of the relevant human health assessment criteria for potential contaminants within the soil samples in the 2018 ground investigation. There were exceedances of the surface water assessment criteria for lead in one soil leachate sample within the Made Ground. Minor concentrations above the surface water assessment criteria were identified for cooper (one sample), lead (one sample), zinc (two samples), and fluoranthene (one sample) within the groundwater samples. Elevated concentrations above the groundwater assessment criteria were identified for ammoniacal nitrogen (two samples) and chloride (one sample) within the groundwater samples.

Sensitivity

18.5.4.66. The sources of contamination identified within, and including a 500 m buffer of, the Order Limits include current and former industrial land uses including railway, factory, sewage works and petrol station.

18.5.4.67. The sensitivity of geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers) is **high**, and below ground services is **medium**.

Section 7 – Farlington Junction to Airport Service Road

Geology

18.5.4.68. From the ground investigation the bedrock geology generally comprised the White Chalk Subgroup particularly the Lewes Nodular Chalk Formation (unproven depth). The superficial deposits that were generally encountered were either Topsoil (0.10 to 0.90 m thick), or Made Ground (0.6 m to 2.70 m thick) overlying either the River Terrace Deposits (3.2 to >4.3 m in thickness) or the Beach and Tidal Flat deposits (0.7 m in thickness). The Beach and Tidal Flat deposits are in close proximity to the Broom Channel.

18.5.4.69. The Lambeth Group was not encountered during WSP 2018 ground investigation although has the potential to be present.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.70. The Broom Channel runs through the Onshore Cable Corridor just north of Kendall's Wharf. A number of lakes including Shut Lake and Sluice lakes are located within 500 m of the area.

18.5.4.71. A number of drainage ditches and streams are located on route and within 500 m of the area.

18.5.4.72. The area is not located within EA SPZ.

18.5.4.73. The underlying geology is designated as Principal Aquifers, Secondary A Aquifers and Secondary Undifferentiated Aquifers.

18.5.4.74. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.75. Two historical landfills (Kendall's Quarry and Sports Field East of Eastern Road) were recorded adjacent and to the east of Eastern Road. The Onshore Cable Corridor runs through these landfills. For both landfills, the deposited waste material is unknown.

18.5.4.76. Kendall's Wharf mineral extraction site is located adjacent and to the east of the Order Limits; the wharf is active and is associated with the extraction of Marine Deposits.

18.5.4.77. Earliest available mapping (1869) indicates that Section 7 comprised undeveloped fields and marshlands until the 1960s when the extension of Eastern Road and the construction of the Havant bypass was undertaken providing a water and rail crossing point. The area comprises former and current land uses including a racecourse, petrol filling station, railway, former Portsmouth City Airport, works, electrical substations and riffle range.

18.5.4.78. During the 2018 ground investigation chrysotile was identified as fibre bundles within one soil sample (Made Ground) at Kendall's Wharf. There were no exceedances of the relevant human health assessment criteria for potential contaminants within the soil samples in the 2018 ground investigation. Exceedances of the surface water assessment criteria for lead (one sample), copper (one sample) and zinc (one sample) were identified within the Made Ground soils. Minor concentrations above the surface water assessment criteria were identified for copper (one sample), lead (one sample), and nickel (one sample) with elevated zinc concentrations (three samples) within the groundwater samples. Elevated concentrations above the groundwater assessment criteria were identified for ammoniacal nitrogen (two samples), chloride (one sample) and electrical conductivity (one sample) within the groundwater samples.

Sensitivity

18.5.4.79. The sources of contamination identified include infilled land (one historical mineral extraction site), two historical landfills, and current and former industrial land uses including the racecourse, petrol filling station, former Portsmouth and City Airport, works, and riffle range within, and including a 500 m buffer of, the Order Limits.

18.5.4.80. The sensitivity of geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers) is **high**, and below ground services is **medium**.

Section 8 – Eastern Road (adjacent to Great Salterns Golf Course) to Moorings Way

Geology

18.5.4.81. From the previous ground investigation Made Ground (>0.3 to >5.00 m in thickness and comprised of brick, concrete rotting clothes, plastic, wood, metal etc) was encountered across the entire area of Milton Common generally thicker towards the east. The Made Ground either overlaid the River Terrace Deposits (0.8 m to >3.50 m in thickness) or the Beach and Tidal Flat Deposits (1.80 m to >3.40 m in thickness). The Bedrock geology comprises the London Clay Formation and the Lambeth Group (unproven depths).

18.5.4.82. During WSP 2018 ground investigation the Bognor Sand Member was not encountered at Milton Common. However, based on BGS maps this has the potential to be present towards the north of Section 8.

18.5.4.83. Milton Common is a recorded historical landfill. Exploratory holes at Milton Common during the 2018 investigation were commonly abandoned short of the 5m target due to obstructions, asbestos or underground metallic anomalies. The depth at which obstructions were encountered (causing abandonment of exploratory holes) varied significantly across the landfill. However, in the west and south of the landfill, abandonments occurred at 1.50m bgl and 3.75m bgl. In the east of the landfill, abandonments occurred at 0.75m bgl and 3.75m bgl. Removal of obstructions through over-digging of the cable trench is known to be an engineering requirement of the construction process.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.84. Frog Lake, Duck Lake and Swan Lake are located within Milton Common, approximately adjacent east to 90 m east of the proposed on-shore cable route.

18.5.4.85. The area is not located within EA SPZ.

18.5.4.86. The underlying geology is designated as Secondary A Aquifers and Secondary Undifferentiated Aquifers overlying an Unproductive Stratum.

18.5.4.87. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.88. Earliest available mapping of the Order Limits (1869) indicates that the Order Limits comprised undeveloped agricultural fields and marshland. Eastern Road first appears on mapping in the 1930s. A residential development is noted adjacent to the west and south of Milton Common from 1932 to 1932 and increasing development noted from 1963. Increasing development south of Milton Common occurred from 1990.

18.5.4.89. Potentially contaminative land uses include Milton Common Landfill (1973 to present), golf courses (1931 to present), a refuse destructor (1931 to 1932), allotment gardens (1932 to 1963), and St Mary's Hospital (1911 to 1963) and a sewage lifting station (1910 to 1963). Further details of these land uses are included in Appendix 18.1.

Milton Common

18.5.4.90. The proposed route passes through the historical Milton Common Landfill along the path that forms part of the sea defence at the eastern edge of the landfill.

18.5.4.91. Milton Common was formed by the creation of a bund across the mouth of Milton Lake in 1962, followed by progressive drainage and infilling of the lake behind the bund with domestic refuse and other wastes until 1970 when filling operations ceased. Notably, an in-ground waste fire occurred in the early 1980s, which is understood to have been caused by ignition of methane in the ground.

18.5.4.92. Milton Common is a recorded historical landfill; however, it is unknown if Milton Common is regulated under an Environmental Permit. Based on comments from the Contaminated Land Officer ("This site was filled up to '70s and so is before current regulations and designs were used") and the age of the landfill, it is not expected that the site will be regulated under an existing Environmental Permit.

18.5.4.93. Earliest available mapping (1869) indicated that the area comprised of Milton Lake and marshlands until filling commenced in 1962.

18.5.4.94. A number of ground investigations have been carried out in the past (mainly mid-90s by Parkman Environmental) which have characterised the landfill and provided significant data on its form and make-up.

18.5.4.95. Towards the centre and east of Milton Common the waste comprises >4m of highly putrescible domestic waste that is highly variable but comprises mixtures of wood, paper, cardboard, brick, glass, metal, rubble and plastic etc, in a dark grey/black silty sandy gravel matrix with a strong anaerobic odour of decay.

18.5.4.96. Around the north, west and south perimeter of Milton Common, the Made Ground is between 0.4 m and 1.1 m thick and comprised dark brown silty clays or clayey silt. The material was generally inert or with low concentrations of potential contaminants.

18.5.4.97. The bund is typically comprised of fragments of brick, concrete metal, gravel and a little wood.

18.5.4.98. The Made Ground across Milton Common Landfill is thicker, more contaminated, contains more obstructions and a greater proportion of domestic/commercial waste towards the centre and east of Milton Common.

18.5.4.99. The landfill is understood not to be engineered in any way (no formal liner, cover, drainage. Gas collection systems). However, a series of remedial measures were carried out in the 1990s which included:

- Installation of a perimeter gas vent trench and vent stacks to prevent migration of landfill gas beyond
- Repairs to a number of crack in the informal landfill cap.

18.5.4.100. The most recent gas data from the 1995 ground investigation recorded high concretions and flow rates of landfill gases in parts of the site and recommended the installation of the gas vent which has now been installed. The gas regime is likely to be significantly different to that recorded in the 1995. Therefore, it is not possible to assess gas risk at Milton Common based on currently available information.

18.5.4.101. Groundwater appears to be shallow in the western part of the landfill, deeper in the eastern part of the landfill and then shallow again towards the sea wall. In almost all locations, groundwater was deeper than the likely cable trench depth of 1.0 m bgl.

18.5.4.102. The ground investigation in 2018 targeted Milton Common Landfill. Evidence of landfill waste was identified within the logs with glass, paper, plastic, rotting clothes, pottery, metal and cardboard recorded as present within the Made Ground. Chrysotile was identified as fibre bundles within one sample of Made Ground towards the east of Milton Common. Hydrocarbon odours were identified within the Made Ground across Milton Common.

18.5.4.103. There were no exceedances of the relevant human health or controlled waters assessment criteria for potential contaminants within the soil or groundwater samples in the 2018 ground investigation.

Sensitivity

18.5.4.104. The sources of contamination identified within, and including a 500 m buffer of, the Order Limits include Milton Common Landfill.

18.5.4.105. The sensitivity of geology receptors (MSAs) is **medium**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Secondary (A) and Secondary (Undifferentiated) Aquifers is **medium**, and below ground services is **medium**.

Section 9 –Moorings Way to Bransbury Road

Geology

18.5.4.106. From the previous ground investigation, topsoil (0.1 m to 0.2 m in thickness) or Made Ground (0.80 m to >3.00 m in thickness) was located overlying the River Terrace Deposits (0.30 m to >4.00 m in thickness), Beach and Tidal Flat deposits (0.80 m to 1.50 m in thickness) or the Raised Marine (0.80 m to 1.50 m in thickness) Deposits. The bedrock geology comprises the Wittering Formation (south of the area) overlying the London Clay Formation (unproven depths). The Whitecliff and Portsmouth Sand Member may be present towards the south and the Bognor Sand Member may be present towards the north of the area (these were not identified during the previous ground investigation.

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.107. Langstone Harbour and associated Eastney Lake, Lock Lake and Langstone Channel are located east of the area.

18.5.4.108. The area is not located within EA SPZ.

18.5.4.109. The underlying geology is designated as Secondary A Aquifers and Secondary Undifferentiated Aquifers overlying an Unproductive Stratum.

18.5.4.110. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater)

Potential Contamination Sources

18.5.4.111. Eastney Lake historical landfill is noted adjacent and to the south-east of Milton and Eastney Allotments. Deposited waste included industrial, commercial and household waste. No further information is known for this historical landfill.

18.5.4.112. Earliest available mapping (1869) indicates that the area comprised undeveloped agricultural land. The Milton and Eastney Allotments were noted from 1931 to present. The area comprises former and current land uses including allotments, old canal, smithy, brickworks and St James Hospital.

18.5.4.113. The 2018 ground investigation identified the following potential contamination along the route options:

Portsmouth University (Langstone Campus):

- Elevated concentrations above the surface water standards for lead were identified within two soil leachate samples, and zinc within one soil leachate samples both within the Made Ground.
- Marginally elevated concentrations above the surface water standards for nickel was identified, and elevated concentrations were identified for zinc in one groundwater water sample.
- Elevated concentrations above the groundwater standards for electrical conductivity, ammoniacal nitrogen and chloride have been identified within one groundwater sample.
- There were no elevated concentrations detected within the soil samples along this route.

Milton and Eastney Allotments:

- Chrysotile was identified within two soil samples, as bundles of fibres and as cement fragments within the Made Ground.
- Elevated concentrations for lead were identified above the GAC/SGV for allotments within four soil samples in the Made Ground.
- Elevated concentration for arsenic above the groundwater standards for arsenic have been identified in one soil leachate sample within the Made Ground.
- Elevated concentrations for copper (six samples), lead (three samples) and zinc (three samples) above the surface water standards have been identified in the soil leachate samples within the Made Ground.
- Elevated concentrations above the surface water standards for copper (one samples) and zinc (two samples) have been identified with minor concentrations for nickel (one samples) within the groundwater samples.
- Elevated concentrations above the groundwater standards for electrical conductivity (one sample), and chloride (two samples) have been identified within the groundwater samples.

Sensitivity

18.5.4.114. The sources of potential contamination identified include infilled land, Eastney Lake Landfill, and former and current commercial/industrial land uses including Portsmouth University, Milton and Eastney Allotments, old canal, smithy, brickworks and St James Hospital within, and including a 500 m buffer of, the Order Limits.

18.5.4.115. The sensitivity of geology receptors (MSAs) is **low**, Human Health receptors (construction workers and adjacent site users) is **medium** (due to use as allotments), controlled wasters (Secondary (A) and Secondary (Undifferentiated) Aquifers is **medium**, and below ground services is **medium**.

Section 10 – Eastney (Landfall)

Geology

18.5.4.116. From the ground investigation the bedrock geology generally comprised the Wittering Formation (20.10 m to >21.20 in in thickness. The superficial deposits that were generally encountered were either Topsoil (0.10 m thick), or Made Ground (0.30 m to 2.80 m in thickness) overlying either the River Terrace Deposits (1.00 m to 2.5 m in thickness), the Beach and Tidal Flat deposits (0.40 m thick) or the Storm Beach Deposits (1.00 to 2.5 m in thickness) (south-east of the area).

Hydrogeology and Hydrology (Controlled Waters)

18.5.4.117. The Solent is located adjacent south of the area. Langstone Harbour and Eastney lake are located approximately 370 m north of the area.

18.5.4.118. The area is not located within an EA SPZ.

18.5.4.119. The underlying geology is designated as Secondary A Aquifers and Secondary Undifferentiated Aquifers overlying an Unproductive Stratum.

18.5.4.120. Further detail on the hydrogeology is provided in Chapter 19 (Groundwater).

Potential Contamination Sources

18.5.4.121. Eastney Farm Gravel Pit (BGS Recorded Mineral Extraction Site) was located approximately 100 m south and west of the Order Limits; the site extracted River Terrace Deposits and was recorded as opencast and ceased (date unknown).

18.5.4.122. Four historical landfills are recorded within 500 m of the Order Limits with The Glory Hole and Henderson Road Caravan Park landfills located adjacent north.

18.5.4.123. The south of this Section has a military history that pre-dates the earliest available maps. The area comprises former and current land uses including former Military of Defence Land, rifle ranges, sea service battery/central gunnery school, sewage pumping station, Fraser Range – firing range and a gas chamber (details unknown).

18.5.4.124. The 2018 ground investigation identified the following at this Section of the Proposed Development:

- Chrysotile asbestos was identified as bundles of fibres at Fraser Range within one sample.
- No elevated concentrations were detected within the soil samples.
- Exceedances for surface water for copper have been identified within the soil leachate samples within the Made Ground at one location.
- Minor concentrations above the surface water standards have been identified for cooper (one sample), with elevated concentrations identified for zinc (two samples), and bis(2-ethylhexyl) phthalate (one sample) (car park) within the groundwater samples.
- Elevated concentrations above drinking water stands have been identified for ammoniacal nitrogen, electrical conductivity and chloride both at Fraser Range and the car park within two groundwater samples.

Sensitivity and Impact on Receptors

18.5.4.125. The sources of contamination identified include infilled land (mineral extraction sites), four landfills and former and current industrial land uses including Former Military of Defence Land, riffle ranges, and a sewage pumping station within, and including a 500 m buffer of, the Order Limits.

18.5.4.126. The sensitivity of geology receptors (MSAs) is **medium**, Human Health receptors (construction workers and adjacent site users) is **low**, controlled wasters (Secondary (A) and Secondary (Undifferentiated) Aquifers is **medium**, and below ground services is **medium**.

18.6. SUMMARY OF IDENTIFIED SENSITIVE RECEPTORS

18.6.1.1. Based on the review of baseline conditions, Table 18.5 summarises the sensitive receptors that form part of the baseline environment.

18.6.1.2. Where sensitive receptors and their sensitivity are common throughout the Proposed Development (e.g. various members or formations of the White Chalk Subgroup) or common to multiple locations (e.g. Secondary Aquifers overlying Principal Aquifers) they have been grouped within this assessment.

18.6.1.3. Where receptors have a variance in their sensitivity, professional judgement has been used to consider a worst-case scenario.

Table 18.5 - Summary of Receptors

Section										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sensitivity of Receptor										
Receptors										
Geology (MSAs)	M (due to solution features)	L	M (due to MSA)	L	L	L	L	M (due to MSA)	L	L
Human Health Receptors (Construction workers and adjacent site users)	L	L	L	L	L	L	L	M (due to landfill)	M (due to allotments)	L
Controlled Waters (Principal Aquifers, Secondary (A) Aquifers, Secondary (Undifferentiated) Aquifers and Surface Waters Features)	H (due to Principal Aquifers / Secondary A) overlying Principal	H	H	M (Due to Secondary A Aquifers (not overlying) Principal) and Secondary (Undifferentiated) Aquifers)	H	H	H	M	M	M
Below Ground Services (cable itself, potable water supply and buried concrete)	M	M	M	M	M	M	M	M	M	M

Key – L – Low, M– Medium, H – High

18.6.2. FUTURE BASELINE

18.6.2.1. If the Proposed Development does not proceed, it is considered that in the future baseline, the conditions in relation to Ground Conditions at all areas would remain relatively unchanged over the short/medium/long-term.

18.7. PREDICTED IMPACTS

18.7.1.1. This section describes the effects on ground conditions which might potentially occur from the construction, operation (including repair and maintenance) and decommissioning of the Proposed Development for the following sections:

- Section 1 – Lovedean (Converter Station Area);
- Sections 2 to 9 Onshore Cable Corridor; and
- Section 10 – Eastney (Landfall).

18.7.2. EMBEDDED MITIGATION

18.7.2.1. No embedded mitigation will apply to Ground Conditions during the construction, operation and decommissioning stages of the Proposed Development.

18.7.3. CONSTRUCTION STAGE

Section 1 – Lovedean (Converter Station Area)

18.7.3.1. Construction work is likely to cause disturbance to the geology and soils and this includes potentially contaminated ground which could then impact upon identified receptors.

Geology

18.7.3.2. Contamination is anticipated to be localised and associated with historical and current site uses. During construction contaminants could be mobilised resulting in cross contamination of uncontaminated ground or controlled waters. The sensitivity of geology receptors is Medium and the magnitude of change is considered to be Low resulting in a direct, permanent, long-term **Minor to Moderate** adverse effect on geology (MSAs and solution features) receptors prior to the implementation of mitigation measures.

Human Health (Construction Workers and adjacent land users)

18.7.3.3. Construction and adjacent land users (Human Health Receptors) could be impacted during construction activities by the use of heavy machinery, excavation, stockpiling and filling. In addition, there could be impact through direct contact, ingestion and inhalation of contaminated soils and potentially contaminated groundwater. The sensitivity of Human Health Receptors is Low (as no significant human health receptors), and the magnitude of change, prior to mitigation is predicted to be Low, resulting in a direct, permanent, long-term **Minor** adverse effect on Human Health Receptors (construction workers and adjacent land users) prior to the implementation of mitigation.

Controlled Waters (Groundwater and Surface water)

18.7.3.4. Exposure of contaminated soils through construction activities including excavation may increase the leachability of contaminants to groundwater specifically Principal Aquifers, if contaminants or groundwater are present. Mobilised potential contamination could affect controlled waters by vertical and lateral migration. The sensitivity of controlled waters receptors relating to the Principal Aquifer (Tarrant Chalk Member and The Bedhampton and Havant Springs and Lovedean SPZ1) within the area are assessed to be High. Due to the absence of known contamination within the area, a Low magnitude of change results in a direct permanent long-term **Moderate** adverse effect on controlled waters.

18.7.3.5. Spillages during construction activities could affect groundwater by seeping into the ground. The sensitivity of the Controlled Waters Receptors relating to Principal Aquifers is High and a Medium magnitude of change prior to mitigation results in indirect, temporary short-term **Major to Moderate** adverse effect on Controlled Water Receptors (Principal Aquifer) prior to the implementation of mitigation measures as outlined in Section 18.9.

18.7.3.6. Additionally, the superficial aquifers, designated Secondary (undifferentiated) are generally composed of low permeability material and any potential effect is likely to be highly constrained both spatially and vertically (with depth). Therefore, contamination is likely to be localised due to a lack of permeability and relative size of the aquifers. The superficial Head Deposits are deemed to have a Low sensitivity and a Medium magnitude of change resulting in a direct, permanent long-term **Minor to Moderate** adverse effect on Controlled Water Receptors (Secondary Undifferentiated Aquifer) prior to the implement of mitigation measures.

18.7.3.7. There are no predicted impacts relating to Controlled Water Receptors (Surface Water) surface water during construction in the Converter Station Area as no surface water features exist within 500 m of the area.

18.7.3.8. As part of the construction process potentially contaminated material may be removed off-site and will be treated and disposed of in accordance with the waste hierarchy. Material where possible will be reused on site. Removal of these materials would result in betterment of groundwaters within the Order Limits and in the surrounding area.

Below Ground Services

18.7.3.9. The works will include the construction of below ground services that will interact with the geology and soils (aggressive ground) and potentially contaminated ground which has the potential to impact the integrity of below ground services (potable water supply pipes and buried services). The sensitivity of below ground services is Medium and the magnitude of change is Low resulting in a direct, permeant, long-term **Minor to Moderate** adverse effect on below ground services (if any) (prior to the implementation of mitigation measures.

Section 2 to 9 – Onshore Cable Corridor

Geology

18.7.3.10. Contamination is anticipated to be localised associated with historical and current site uses. During construction contaminants could be mobilised by heavy machinery, excavation, stockpiling and filling, which would result in cross contamination of uncontaminated ground or controlled waters.

18.7.3.11. For the majority of the Onshore Cable Corridor (Sections 2, 4, 5, 6, 7 and 9) the sensitivity for geology receptors are Low and the magnitude of change is considered to be Low resulting in a direct, permeant, long-term **Minor** adverse effect on geology receptors prior to the implementation of mitigation measures.

18.7.3.12. Section 3 and Section 8 contain MSAs within the study area therefore the sensitivity of the geology receptors here is Medium and the magnitude of change is considered to be Low resulting in a direct, permanent, long-term **Minor to Moderate** adverse effect on geology receptors (MSAs) within Section 3 and Section 8 prior to the implementation of mitigation measures.

Human Health (Construction Workers and Adjacent Land Users)

18.7.3.13. Construction workers and adjacent land users could be impacted during construction activities. This could be through the use of heavy machinery, excavation, stockpiling and filling, through direct contact, ingestion and inhalation of contaminated soils and possibly contaminated groundwater.

18.7.3.14. For the majority of the Onshore Cable Route (Sections 2 to 7) the sensitivity of Human Health Receptors (construction and maintenance workers and adjacent land users) is Low and the magnitude of change, prior to mitigation is Low resulting in a direct, permanent, long-term **Minor** adverse effect on human health receptors, prior to the implementation of mitigation.

18.7.3.15. For Section 8 (specifically Milton Common area) the sensitivity of Human Health Receptors (construction and maintenance works and adjacent land users) is Medium and the magnitude of change prior to mitigation is Medium (due to land use as landfill) resulting in a direct, permanent, long-term **Moderate** adverse effect on human health receptors, prior to the implementation of mitigation.

18.7.3.16. For Section 9 (specifically Milton and Eastney Allotments area) the sensitivity of Human Health Receptors (construction and maintenance works and adjacent land users) is Medium and the magnitude of change prior to mitigation is Medium (due to land use as allotments) resulting in a direct, permanent, long-term **Moderate** adverse effect on human health receptors, prior to the implementation of mitigation.

Controlled Waters (Groundwater and Surface Water)

18.7.3.17. Exposure of contaminated soils through construction activities including excavation of soil during trenching may increase the leachability of contaminants to groundwater specifically Principal and Secondary (A) Aquifers, if contaminants or groundwater is present. This leachate could affect controlled waters by vertical and lateral migration. Spillages could affect groundwater receptors by a vertical migration mechanism.

18.7.3.18. Spillages during construction activities including trenching could affect groundwater receptors by a vertical migration mechanism.

18.7.3.19. 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).

18.7.3.20. The controlled water receptors are as follows:

Principal Aquifers:

- Tarrant Chalk Member (Sections 2,3,4,5,6,7);
- The Portsdown Chalk Formation (Sections 4,5, 6, 7);
- Spetisbury Chalk Member (Sections 5, 6, 7);
- Newhaven Chalk Member (Sections 4, 5, 6, 7);
- Seaford Chalk Formation (Sections 5, 6, 7); and
- Lewes Nodular Chalk Formation (Sections 5, 6, 7).

Secondary A Aquifers:

- The Lambeth Group (Sections 3, 4, 7, 5);
- The River Terrace Deposits (Sections 5, 6, 7, 8, 9);
- The Wittering Formation (Sections 4, 9);
- Bognor Sand Member (Sections 4, 8, 9);

- Portsmouth Sand Member (Sections 4, 8, 9); and
- Whitecliff Sand Member (Sections 4, 8, 9).

Secondary Undifferentiated Aquifers:

- Head Deposits (Sections 2, 3);
- Raised Marine Deposits (Sections 6, 7, 8, 9); and
- Beach and Tidal Flat Deposits (Sections 7, 8).

18.7.3.21. Construction activities such as HDD and/or trenching could affect groundwater by creating preferential pathways for contaminants. It is understood that the HDD works will be confined to the Lambeth Group in Section 3 of the Onshore Cable Route, where Kings Pond and Denmead Meadow are located. As there will be no direct drilling within the Chalk aquifer, this will reduce/remove potential hydraulic linkages between the HDD works and the Principal Aquifer beneath. However, HDD could affect groundwater by creating preferential pathways for contaminants within Section 9, Section 8, Section 7 and Section 6, without the implementation of mitigation measures.

18.7.3.22. The sensitivity of the controlled water receptors identified above for Section 2 to 9 and the magnitude of change, as well as the effect on controlled water receptors for the individual proposed sections of the Onshore Cable Corridor, are shown in Table 18.6.

Table 18.6 - Summary of Predicted Impacts on Controlled Waters during Construction Stage

Predicted Impacts	Section	Sensitivity	Magnitude of change	Effect
Mobilisation of contaminated materials	2,3,4,5, 6, 7	High	Medium	Direct, Permanent, long-term **Major to Moderate**
	8, 9	Medium	Medium	Direct, permanent long-term **Moderate**
Spills associated with construction works	2,3,4, 5, 6, 7	High	Medium	Indirect, temporary short-term **Major to Moderate**
	8, 9	Medium	Medium	Indirect, temporary short-term **Moderate**

Below Ground Services

18.7.3.23. The works will include the construction of below ground services that will interact with the geology and soils and potentially contaminated ground which has the potential to impact the integrity of below ground services (through aggressive ground). The sensitivity of below ground services (potable water supply pipes and buried services) is Medium and the magnitude of change is Low resulting in a direct, permeant, long-term **Minor to Moderate** adverse effect below ground services prior to the implementation of mitigation measures.

Section 10 – Eastney (Landfall)

18.7.3.24. It is noted that the anticipated FOC Infrastructure, i.e. up to two Optical Regeneration Stations ('ORS's), will be located at the Fort Cumberland carpark at the Landfall. It is considered that there are unlikely to be any ground related impact to potential receptors associated with these structures.

Geology

18.7.3.25. Contamination is anticipated to be localised and associated with historical and current site uses. During construction contaminants could be mobilised via excavation resulting in cross contamination of uncontaminated ground or controlled waters. The sensitivity of geology receptors is Low and the magnitude of change is considered to be Low resulting in a direct, permanent, long-term **Minor** adverse effect on geology receptors prior to the implementation of mitigation measures.

Human Health (Construction Workers and adjacent land users)

18.7.3.26. Construction and maintenance and adjacent land users works could be impacted during construction activities by the use of heavy machinery, excavation, stockpiling and filling, through direct contact, ingestion and inhalation of contaminated soils and possibly contaminated groundwater. The sensitivity of Human Health Receptors (construction and maintenance workers and adjacent land users) is Low, and the magnitude of change, prior to mitigation to Low, resulting in a direct, permanent, long-term **Minor** adverse effect on Human Health Receptors prior to the implementation of mitigation.

Controlled Waters (Groundwater and Surface water)

18.7.3.27. Exposure of contaminated soils through construction activities including excavation may increase the leachability of contaminants to groundwater specifically Secondary A Aquifers, if contaminants or groundwater is present. This leachate could affect controlled waters (Secondary A Aquifers) by vertical and lateral migration. The sensitivity of controlled waters receptors (Secondary A) are assessed to have a Medium sensitivity and a Medium magnitude of change prior to mitigation relating in a direct permanent long-term **Moderate** adverse effect on controlled waters (Secondary A Aquifer) prior to the implementation of mitigation measures.

18.7.3.28. Spillages during construction activities could affect groundwater by a vertical migration mechanism. The sensitivity of the controlled waters relating to Secondary (A) Aquifers is Medium and a Medium magnitude of change prior to medium resulting in indirect, temporary short-term **Moderate** adverse effect on controlled waters prior to the implementation of mitigation measures.

18.7.3.29. Additionally, interactions with the superficial aquifers, designated Secondary (undifferentiated), are generally composed of low permeability material and any potential effect is likely to be highly constrained both spatially and vertically (with depth). The superficial Deposits are deemed to have a Low sensitivity and a medium magnitude of change resulting in a direct, permanent long-term **Minor** adverse effect on controlled waters prior to the implementation of mitigation measures.

18.7.3.30. As part of the construction process potentially contaminated material may be removed off-site and will be treated and disposed of in accordance with the waste hierarchy. Material where possible will be reused on site. Removal of these materials would result in betterment of groundwaters within the Order Limits and the surrounding area.

18.7.3.31. Construction activities such as HDD and/or trenching could affect groundwater by creating pathways for contaminants.

18.7.3.32. On-site storage of potentially contaminated material prior to removal or remediation could result in entrainment and dissolution of contaminants in surface water and infiltration or run-off to controlled waters receptors.

Below Ground Services

18.7.3.33. The works will include the construction of below ground services that will interact with the geology and soils and potentially contaminated ground which has the potential to impact the integrity of buried structures (aggressive ground). The sensitivity of below ground services is Medium and the magnitude of change is Low resulting in a direct, permeant, long-term **Minor to Moderate** adverse effect on below ground services (potable water supply pipes and buried services) prior to the implementation of mitigation measures.

18.7.4. OPERATIONAL STAGE

Section 1 – Lovedean (Converter Station Area)

Geology

18.7.4.1. Once the Proposed Development has been constructed, all necessary mitigation will have been undertaken. However, there may be some impact to the geology and soils in rural areas particularly during cable maintenance or replacement. The sensitivity to geology receptors is Low and the magnitude of change is considered to be Low, resulting in a direct, permanent, long-term **Minor** adverse effect on geology receptors prior to the implementation of mitigation measures.

Human Health (Maintenance Workers and Adjacent Site Users)

18.7.4.2. It is unlikely that site users will come into contact with geology or soils; however, this could occur in areas such as landscaping. It may be possible for maintenance workers to come into contact with soil or groundwater if excavation is required. Impacts could therefore arise through direct contact, ingestion or inhalation of contaminated soils or groundwater. The sensitivity of human health receptors is Low, and the magnitude of change, prior to mitigation, is considered to be Low, resulting in a direct, temporary, short-term **Minor** adverse effect on human health receptors prior to the implementation of mitigation measures.

Controlled Waters (Groundwater and Surface water)

18.7.4.3. In the Operational Stage of the Proposed Development the presence of hardstanding will limit potential infiltration. However, if contaminated ground remains present beneath the Order Limits the potential mechanisms which may affect controlled waters receptors include:

- Leaching of contaminants from soils;
- Introduction of preferential pathways during maintenance ground works;
- Migration of contaminated groundwater from upgradient sources; and
- Mobilisation via overground/surface water runoff following earthworks.

18.7.4.4. A detailed and comprehensive pollution prevention system and surface water drainage system is to be put in place at the Converter Station. This is described in further detail in Chapter 19 (Groundwater) and Chapter 20 (Surface Water Resources and Flood Risk).

18.7.4.5. With the introduction of the pollution prevention system, it is considered that the risk of spillage during operation of the site affecting groundwater is substantially mitigated. The sensitivity of the controlled waters relating to Principal Aquifers is High and a Low magnitude of change allowing for the pollution prevention system results in indirect, temporary short-term **Moderate** adverse effect on controlled waters.

Below Ground Services

18.7.4.6. Onsite infrastructure could be impacted through direct contact with geology, soils and contamination and onsite infrastructure could also impact geology and soils through the creation of new pathways for migration of contamination. There is a potential for elevated sulphate concentrations to be present in the ground. This could detrimentally affect buried concrete.

18.7.4.7. The sensitivity of buried concrete is Low, the magnitude of change, prior to mitigation is considered to be Low, resulting in a direct, permanent, long-term **Minor** adverse effect on buried concrete.

18.7.4.8. There is the potential for ground based contamination to detrimentally affect potable water supply pipes. The sensitivity of potable water supply pipes is Low, the magnitude of change prior to mitigation is Low, resulting in a direct, permanent, long-term **Minor** adverse effect on potable water supply pipes prior to the implementation of mitigation measures.

Section 2 to 9 – Onshore Cable Corridor and Section 10 – Eastney (Landfall)

Geology

18.7.4.9. Once the Proposed Development has been constructed, all necessary remediation will have been undertaken, there is unlikely to be any impact to the geology as the MSA are in urban areas therefore there is unlikely to be any sterilisation of the resources. The sensitivity to geology receptors is Low apart from Section 3 and Section 8 which is Medium and the magnitude of change is Low. This results in a direct, permanent, long-term **Minor** adverse effect on geology receptors within Sections 2, 4, 5, 6, 7 and 9, and a direct, permanent, long-term **Minor to Moderate** adverse effect for Section 3 and 8 prior to the implementation of mitigation measures.

Human Health (Maintenance Workers and adjacent land users)

18.7.4.10. It is unlikely that humans will come into contact with contaminated soils and groundwater; however, maintenance workers could be impacted. Maintenance workers could be impacted if the ground needs to be excavated in order to maintain the cable, they could be impacted through direct contact, ingestion, or inhalation of contaminated soil or groundwater.

18.7.4.11. For the majority of the cable route (Sections 2 to 7) the sensitivity of maintenance workers and is Low due to the route being predominantly in highway land and the magnitude of change, prior to mitigation is Low resulting in a direct, temporary, medium-term **Minor** adverse effect on human health receptors, prior to the implementation of mitigation.

18.7.4.12. For Section 8 (specifically for the Milton Common area) the sensitivity of maintenance workers is Medium and the magnitude of change prior to mitigation is Medium resulting in a direct, temporary, medium-term **Moderate** adverse effect on human health receptors, prior to the implementation of mitigation.

18.7.4.13. For Section 9 (specifically in the Milton and Eastney Allotments area) the sensitivity of maintenance workers is Medium and the magnitude of change prior to mitigation is Low resulting in a direct, temporary, medium-term **Minor to Moderate** adverse effect on human health receptors, prior to the implementation of mitigation.

Controlled Waters (Groundwater and Surface Water)

18.7.4.14. In the operational stage of the Proposed Development the presence of hardstanding will limit potential infiltration. Maintenance works that would create a preferential pathway for contamination are likely to be very infrequent. However, if contaminated ground remains present beneath the Order Limits the potential mechanisms which may affect controlled waters receptors in the operational stage include:

- Leaching of contaminants from soils;
- Introduction of preferential pathways during maintenance ground works;
- Migration of contaminated groundwater from upgradient sources; and
- Mobilisation via overground/surface water runoff following earthworks.

18.7.4.15. The sensitivity of the controlled water receptors and the magnitude of change, as well as the effect on controlled water receptors for the individual proposed sections of the Onshore Cable Corridor, are shown in Table 18.7.

Table 18.7 - Summary of Predicted Impacts on Controlled Waters during Operational Stage

Predicted Impacts	Section	Sensitivity	Magnitude of change	Effect
Mobilisation of contaminated materials	2, 3, 4, 5, 6, 7	High	Medium	Direct, Temporary, short-term **Major to Moderate**
	8, 9	Medium	Medium	Direct, Temporary, short-term **Moderate**

Below Ground Services

18.7.4.16. The works will include the construction of below ground structures that will interact with the geology and soils and potentially contaminated ground which has the potential to impact the integrity of buried structures (aggressive ground). The sensitivity of buried services is Low and the magnitude of change is Low resulting in a direct, permeant, long-term **Minor** adverse effect on potable water supply pipes and buried services prior to the implementation of mitigation measures.

18.7.5. DECOMMISSIONING STAGE

18.7.5.1. Whilst the Proposed Development will be designed to provide permanent electrical infrastructure, there may come a time where it may be appropriate to decommission the equipment.

18.7.5.2. When it is considered suitable, the Decommissioning Stage of the Converter Station will involve each item of equipment being removed for recycling or disposal, as appropriate. In this scenario, potential impacts on geology, human health, controlled waters and below ground services are expected to be similar or identical to those detailed for the Construction Stage.

18.7.5.3. The approach to decommissioning will be determined in the future by the contractor at the time of decommissioning. However, where the HVAC and HVDC cables are left in situ potential impacts on geology, human health, controlled waters and below ground services are expected to be similar or identical to those detailed for the Operational Stage.

18.7.5.4. Where the ducts are left in situ but the cables removed, by opening up joint bays potential impacts on geology, human health, controlled waters and below ground services are expected to be less than those detailed for the Construction Stage as there will be less excavation and disturbance required.

18.8. CUMULATIVE EFFECTS

18.8.1. CUMULATIVE EFFECTS

18.8.1.1. The implementation of the mitigation measures set out above will ensure that soil and water pollution during construction and operation is minimised to an acceptable level.

18.8.1.2. The proposed development would remove (where necessary) and remediate (where required) sources of contamination, so any elevated levels in the soil and groundwater would be reduced.

18.8.1.3. Therefore, during the construction, operation and the demolition phases, providing all mitigation measures are implemented it is considered that the Proposed Development will have a negligible effect on the adjacent developments with regard to contamination and ground conditions.

18.8.1.4. See Appendix 18.3 (Cumulative Effects Assessment Matrix (Stage 1 & 2)) of the ES Volume 3 (document reference 6.3.18.3) for the cumulative effects assessment table.

18.9. PROPOSED MITIGATION AND ENHANCEMENT

18.9.1.1. The assessment has identified that mitigation measures are required for the construction, operational and decommissioning stages of the Proposed Development.

18.9.2. CONSTRUCTION AND DECOMMISSIONING

18.9.2.1. Additional Mitigation proposed for the Proposed Development includes:

- The Proposed Development will adhere to EA pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.
- All construction personnel would be required to wear appropriate PPE and to only undertake work following a Health and Safety risk assessment and a Health and Safety Induction. Hygiene and welfare facilities would need to be provided for use by construction personnel during the works.
- A watching brief would be implemented during excavation to ensure that any unexpected contamination within the Made Ground (if present) is rapidly identified, risk assessed and dealt with appropriately.
- Regular monitoring visual inspections during the Construction and Decommissioning Stages.
- If remediation is deemed necessary, requirements will be assessed on a site-specific basis and the works carried out, supervised, validated and verified in accordance with current best practice.
- Good working practices and housekeeping during construction such as sealing or covering stockpiles of contaminated soils and treating water removed from excavations prior to discharge are considered likely to reduce identified impacts.
- Water/surfactant will be sprayed onto material being worked to damp down any potentially contaminated dust and prevent it from becoming airborne. Temporary surface water drainage and vehicle wheel washes will further reduce the risk of dust generation. Precautions should also be taken while transporting excavated materials off-site to ensure that any risk of fugitive dust emissions are prevented. Construction phase air monitoring may be used to check the effectiveness of damping down of the dust on site. Vehicle movements will be restricted to an agreed travel plan and construction activities on site will not exceed standard working hours, unless explicitly required to do so.

- Water removed from any excavations will be disposed of or discharged in accordance with EA requirements.
- The reuse of soil within the Order Limits should be governed by the production of a Materials Management Plan in which chemical criteria are specified for the import of soils/fill material from off-site and for the reuse of site won material. The stripping, storage and reuse of subsoil should be carried out in accordance with BS 8061:2013.
- Foundations for structures at the Converter Station (Section 1) will require piles that will extend down into the chalk groundwater aquifer. A Piling Works Risk Assessment has been prepared by WSP, following accepted, best practice Environment Agency Guidance. This Piling Works Risk Assessment will ensure that piling operations do not form a pathway for the migration of contamination at the surface (either existing contaminants, those that form part of the pilling process or those that might be introduced during the operation of the Converter Station) to the aquifer. Pilling for the launch pit of the Kings Pond HDD (Section 3) will not interact with the Chalk and therefore the aquifer is not at risk from these operations.

18.9.2.2. 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).

18.9.2.3. Additional mitigation measures will be required for Milton Common during the Construction Stage as listed below:

- the works will need to be carefully and sensitively managed with community engagement;
- the excavated waste will need to be carefully segregated and handled so as not to contaminated areas away from the works themselves;
- the trench will need to be excavated in short lengths to minimise odour risk;
- all waste will need to be exported from site to a suitably licensed landfill or treatment facility;
- the reinstatement of an engineered landfill cap; and
- clay stanks will be required at intervals along the trench to prevent migration of landfill gas along the route.

18.9.3. OPERATION

18.9.3.1. To prevent any adverse effects to below ground structures appropriate techniques and design solutions will be considered during the design of the Proposed Development, these will include:

- Appropriate concrete in accordance with BRE Digest 1. 3rd Edition (including February 2018 amendments), Concrete in aggressive ground.

18.9.3.2. Mitigation measures will be required during the operational stage of the Proposed Development including the following:

- any Joint Bays will need gas protection measures to prevent ingress of landfill gas; and
- a detailed management plan for future maintenance and entry to below ground access chambers will be required (e.g., personal gas alarms, emergency recovery hoists, etc.).

18.10. RESIDUAL EFFECTS

18.10.1.1. With the application of outlined mitigation, all magnitude of impacts are reduced to negligible and **not significant** during the Construction, Operational and Decommissioning Stages of the Proposed Development.

18.10.1.2. Table 18.8 details the residual effects on receptors once mitigation measures have been implemented during the Construction, Operational and Decommissioning Stages of the Proposed Development.

Table 18.8 - Summary of Effects Table for Ground Conditions

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
Construction and Decommissioning (Removal Option) Stages				
Exposure of contaminated soils and groundwater and removal of contaminated soils.	Geology (MSAs)	Section 1, 3 and 8 Minor to Moderate (Not Significant) - / P / D / LT Section 2, 4, 5, 6, 7, 9 and 10 Minor (Not Significant) - / P / D / LT	CEMP, Additional Mitigation, Additional mitigation measures at Milton Common	Negligible (Not Significant) N/A
	Human Health (construction and maintenance workers and adjacent land users)	Section 1, 2, 3, 4, 5, 6, 7 and 10 Minor (Not Significant) - / P / D / LT Section 8 Moderate (Significant) - / P / D / LT Section 9	CEMP, Additional Mitigation, Additional mitigation measures at Milton Common	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
		Moderate (Significant) - / P / D / LT		
	Controlled Waters (Principal, Secondary A and Secondary Undifferentiated Aquifers)	Section 1 (Principal Aquifers) Moderate (Significant) - / P / D / LT Minor (Secondary Undifferentiated) (Not Significant) - / P / D / LT Section 2, 3,4, 5, 6, 7 (Principal and Secondary (A) Aquifers over Principal) Major to Moderate (Significant) - / P / D / LT Section 8, 9 (Secondary (A) Aquifers) Moderate (Significant) - / P / D / LT	Additional Mitigation, CEMP	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
	Below Ground Services (potable water supply pipes and buried services)	Section 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Minor to Moderate (Not Significant) - / P / D / LT	Additional Mitigation, CEMP, Additional Mitigation, Additional mitigation measures at Milton Common	Negligible (Not Significant) N/A
Spills associated with construction works	Controlled Waters (Principal Aquifer) Controlled Waters (Secondary Undifferentiated)	Section 1 (Principal Aquifers) Moderate (Significant) - / T / I / ST Section 1 and 10 Minor (Secondary Undifferentiated) (Not Significant) - / T / I / ST Section 2, 3, 4, 5, 6, 7 (Principal and Secondary (A) Aquifers over Principal) Major to Moderate (Significant)	Additional Mitigation, CEMP	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
		- / T / I / ST Section 8, 9 and 10 (Secondary (A) Aquifers) Moderate (Significant) - / T / I / ST		
Operational and Decommissioning (Leave In-Situ) Stages				
Exposure to potentially contaminated soil or groundwater	Geology (MSAs)	Section 1, 2, 4, 5, 6, 7, 9 and 10 Minor (Not Significant) - / P / D / LT Section 3 and 8 Minor to Moderate (Not Significant) - / P / D / LT	Additional Mitigation	Negligible (Not Significant) N/A
	Human Health (and maintenance workers and adjacent land	Section 1 Minor (Not Significant) - / T / D / ST	Additional Mitigation,	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
	users)	Section 2, 3, 4, 5, 6, 7 and 10 Minor (Not Significant) - / T / D / MT Section 8 Moderate (Significant) - / T / D / MT Section 9 Minor to Moderate (Not Significant) - / T / D / MT		
	Controlled Waters (Principal, Secondary A and Secondary Undifferentiated Aquifers)	Section 1 (Principal Aquifers) Moderate (Significant) - / T/ D / ST Minor (Secondary Undifferentiated) (Not Significant) - / T / D / ST	Additional Mitigation	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
		Section 2, 3, 4, 5, 6, 7 (Principal and Secondary (A) Aquifers over Principal) Major to Moderate (Significant) - / T / D / ST Section 8, 9 (Secondary (A) Aquifers) Moderate (Significant) - / T / D / ST		
	Below Ground Services (potable water supply pipes and buried services)	Section 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Minor (Not Significant) - / P / D / LT	Additional Mitigation,	Negligible (Not Significant) N/A
Deterioration of concrete due to aggressive ground	Site Structures	Section 1 Minor (Not Significant) - / P / D/ LT	Incorporated in the design of the development	Negligible (Not Significant) N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to mitigation	Summary of Mitigation/Enhancement	Significance and Nature of Residual Effects following Mitigation / Enhancement
conditions				

Key to table:

+ / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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