



AQUIND Limited

PEIR CHAPTER 18

Ground Conditions

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18 GROUND CONDITIONS

18.1 SCOPE OF THE ASSESSMENT

18.1.1 INTRODUCTION

18.1.1.1 This chapter provides the preliminary ground conditions environmental impact assessment of the Proposed Development. The Proposed Development that forms the basis of this assessment is described in Chapter 3 - Description of the Proposed Development.

18.1.1.2 The ground conditions assessment will consider the potential impacts associated with the following activities:

- The potential for disturbance of existing contaminated land associated with the construction and operational 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 and operational stages of the Proposed Development.
- Effects on buried infrastructure (including buried services and foundations) associated with the Construction Stage of the Proposed Development.
- Effects on controlled waters (from the mobilisation of contaminants) associated with the construction and operational stages of the Proposed Development.
- Effects on sensitive geology or geological features associated with the construction and operational stages of the Proposed Development.

18.1.1.3 FOC infrastructure is anticipated to be located adjacent to the Converter Station (up to two Telecommunications buildings) and within approximately 1 km of Landfall (up to two Optical Regenerations Stations), and other associated equipment for auxiliary power supply, and security fencing, as described in Chapter 3. However, as the locations are not yet confirmed, the assessment of these elements of the Proposed Development will be considered in the ES when further details are available.

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 Onshore Cable Corridor;
- within 500 m of the Onshore Cable Corridor for Human Health Receptors; and
- within 1 km for Controlled Water Receptors.

18.1.2.2 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 as follows.

18.2.2 LEGISLATION

- The specific UK legislation on contaminated land is principally contained within Part 2A of the Environmental Protection Act 1990 ('EPA'). 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. (HMSO, 1990).
- The legacy of contaminated land in England is regulated by The Contaminated Land (England) (Amendment) Regulations 2012 (HMSO, 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.
- DEFRA Contaminated Land Statutory Guidance (2012) states that 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 (DEFRA, 2012). 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.
- The Water Framework Directive (2000/60/EC) (2003) ('WFD') is an over-arching framework which is designed to (HMSO, 2003):
 - ⌋ 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.

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

18.2.3 PLANNING POLICY

National Policy

18.2.3.1

The National Policy Statements ('NPSs') set out the need for, and Government's policy to deliver development of NSIPs. The Planning Act 2008 requires the Examining Authority and the SoS to use the NPS to make decisions on applications for development consent for NSIPs.

- National Policy Statement for Energy (EN-1) (HMSO, 2011) is the primary basis for decision making for this project. 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.
 - Where a proposed development has an impact upon a Mineral Safeguarding Area ('MSA'), the IPC should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.
- The National Planning Policy Framework (NPPF, 2018) indicates at paragraph 180 that to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.
 - In line with the requirements of paragraph 178 of the NPPF, remediation of contaminated land is required as a minimum, to be such that, 'Land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'.
 - The NPPF advises that both local planning policies and decisions should ensure that the ground conditions of a proposed development site are

suitable for the proposed new use of that site. The NPPF states (paragraph 183):

'Local planning authorities should focus on where the proposed development is an acceptable use of land, rather than the control of processes or emission (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.'

- The Planning Practice Guidance (PPG, 2017) Land Affected by Contamination, released in June 2014, 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 should be satisfied that a proposed development will be appropriate for its location and not pose an unacceptable risk.
 - 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, if one is required.

Local Policy

Portsmouth City Council

- The Portsmouth Plan (Portsmouth's Core Strategy) Policy PCS1 states that:
 - The council will need to be satisfied that an appropriate scheme for the remediation of the site is in place to deal with historic land contamination before development can take place. Such a scheme will need to consider the impact on existing and future occupiers as well as Portsmouth Harbour.
- The Portsmouth Plan (Portsmouth's Core Strategy) Policy PCS2 – Port Solent and Horsea Island has considerable contaminated land issues through the industrial use of the land, landfill and land reclamation. Therefore, before any development can take place the council will need to be satisfied that an appropriate scheme for the remediation of the site is in place to deal with historic land contamination. Such a 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 notes that:
 - 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 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.
 - Encourage market confidence in the redevelopment of brownfield sites in the City and thus promote the recycling of brownfield sites rather than greenfield sites.
 - 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 notes that:
 - 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.
 - § It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.
- i 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

- Following consideration by the South Downs National Park Authority and Winchester City Council both planning authorities adopted the Winchester District Local Plan Part 1 – Joint Core Strategy Development Plan in March 2013. 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 notes that the Local Planning Authority will support development which meets the following criteria:
 - i 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 notes that:
 - i 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.

- i Developments that do not accord with other policies of the plan may be permitted where the local Planning Authority 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 effectively with the 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 Local Planning Authority is satisfied that the remediation works proposed will achieve the long-term suitability for the site for its intended use.

East Hampshire District Council

- The East Hampshire District Council Joint Core Strategy was adopted by East Hampshire District Council on 8 May 2014 and by the South Downs National Park Authority on 26 June 2014.
 - i Policy CP27 – Pollution (EHDC, 2014) of the Strategy notes that:
 - § The risks posed to end users for proposed development on or adjacent to land suspected of being affected by contamination are required to be appropriately investigated and if necessary remediated to comply with current UK industry good practice;
 - § The standard of remediation must take full account of the development's intended use and be to a level which ensures the future safe use of the land with respect to human health, groundwater and the wider environment;
 - § For proposed developments on or adjacent to land suspected of being affected by contamination, risks posed to end user will be required to be appropriately investigated and if necessary remediated to comply with current UK industry good practice;
 - § The possibility of contamination will be assumed where there is no evidence and when concerning applications in relation to land on or adjacent to previous industrial use or where proposed users are considered sensitive e.g. housing, schools, allotments, hospitals and children's playing areas; and
 - § It is the responsibility of the developer to identify land affected by contamination and to ensure that such land is remediated to secure a safe development.
 - i Policy CP26 – Water Resources/Water Quality – requires new developments to protect the quality and quantity of water and make efficient

use of water. Development within Groundwater Source Protection Zones will only be permitted provided that it has no adverse impact on the quality of the groundwater source.

Hampshire County Council

- Hampshire County Council 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

- 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

18.2.4 GUIDANCE

18.2.4.1 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. (DEFRA, 2008); and
- Environment Agency Guiding Principles on Land Contamination (Environment Agency , 2010).

18.2.4.2 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:

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 07 December 2018, including formal responses from statutory consultees. The responses from PINS and the Local Planning Authorities in relation to Ground Conditions, and how those requirements should be addressed by the Applicant, are set out below in Table 18.1.
- 18.3.1.2 Appendix 5.3 provides a complete set of responses in the PEIR to the contents of the Scoping Opinion.

Table 18.1 – Scoping Opinion Response

Consultee	Scoping Opinion Ref	Summary of Comments Received	How this has been addressed by the Applicant
EHDC, WCC, HBC and PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	Environment Surveys and inspection must include consideration of soils, potential contamination, geology, superficial cover, bedrock, hydrogeology, solution features, source protection zones and nearby abstractions.	At the time of preparing their scoping opinion, the LPAs had not had sight of the baseline study and preliminary risk assessment that supports the PEIR. In particular, PCC has requested sight of this baseline information in advance of commenting further. The findings of the baseline study and preliminary risk assessment are included in the Ground Conditions chapter of the PEIR.
EHDC, WCC, HBC and PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	The proposed cable route has solution features present. These features contribute to karstic environment with rapid transit times therefore pollution prevention is key. Consideration of the solution features must form part of the scope of work particularly in key area i.e. close to the Lambeth Group and Chalk	LPAs have stated that the assessment of contamination must include an assessment of solution features and karst rock conditions and how this may affect pollution transit times. An initial assessment of the risk to Chalk aquifer resources and the influence karstic condition have on sensitivity is included in the both the Ground Conditions and Water Resources and Flood Risk chapters of the PEIR. Discussions to be had with relevant regulators and stakeholders to agree way forward. More

Consultee	Scoping Opinion Ref	Summary of Comments Received	How this has been addressed by the Applicant
		Boundaries and clay with flints and chalk boundaries.	detailed assessment of the associated risks will be covered in the ES.
EHDC, WCC, HBC and PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	Sites of geological interest should include solution features	LPAs have requested that sites of geological interest should include solution features. Sites of geological interest are included in the PEIR. However, it is unclear as to what is required in terms of geological interest in relation to solution features as these are not normally considered sites of geological interest. Clarification from relevant CLOs will be sought in support of the ES.
EHDC, WCC, HBC, PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	Where Secondary A Aquifers overlie Principal Aquifers, this should have a receptor assessment of High due to the potential connectivity of the aquifer and the presence of solution features Secondary A and B aquifers should lie in Moderate Risk and it is recommended that Unproductive Strata is present in Low Risk.	The Sensitivity Receptor table has been updated in the PEIR to include receptor assessment where Secondary A Aquifers over Principal Aquifers with a classification of High. This risk categorisation will be carried forward to the ES chapter.

Consultee	Scoping Opinion Ref	Summary of Comments Received	How this has been addressed by the Applicant
EHDC, WCC, HBC, PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	All imported soils material must be clean and inert and not pose a contaminant threat to underlying aquifers.	This issue will be dealt with in the Waste section. However, we would never advocate, nor would legislation permit, the importation of contaminated soils to the site.
EHDC, WCC, HBC and PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26 HBC Ground conditions/contamination page 5 PCC Water resources and flood risk/ground conditions page 8	The assessment must be designed to understand the potential for pathway creation through impacted soils /or long-term spill and incident management if preferential pathways are created.	Both the Ground Conditions and Water Resources chapters of the PEIR include a preliminary assessment of the potential for the creation of preferential pathways to sensitive receptors (human health/soils and groundwater resources, respectively). This will be assessed in further detail in the relevant ES chapters.
EHDC, WCC, HBC and PCC	EHDC Ground conditions/contamination page 13 WCC Ground conditions/contamination page 26	The conceptual Site Model ('CSM') should also look at the development phase as well as legacy contamination and how mitigation measures	The CSM within the PEIR addresses potential contamination risk during both the construction and operational stages of the Proposed Development as well as legacy.

Consultee	Scoping Opinion Ref	Summary of Comments Received	How this has been addressed by the Applicant
	<p>HBC Ground conditions/contamination page 5</p> <p>PCC Water resources and flood risk/ground conditions page 8</p>	<p>can be deployed to prevent pollution occurring during the pre-development and operational stages.</p>	<p>contamination. This will be assessed in further detail in the ES.</p>
PCC	<p>Water Resources and Flood Risk/Ground Contamination page 8</p>	<p>A review of PCC in house records.</p>	<p>A visit to PCC to review in house records is planned and the findings will be included in the ES.</p>

18.3.2 CONSULTATION

- 18.3.2.1 Consultation is a key part of the DCO application process. Further consultation will continue to be undertaken once the PEIR is made available, to support the assessment for the ES. A summary of the consultation undertaken for the Ground Conditions assessment to date is detailed in Table 18.2 Consultation Response.

Table 18.2 – Consultation Response

Consultee	Date (Method of Consultation)	Discussion	Summary of Outcome of Discussions
EA	29 September 2017 (email)	The Environment Agency were not aware of any ground storage tanks or gas meter, and suggested further enquires were made with the local authority. The Environment agency identified six waste management facilities within 500 m of the Onshore Cable Corridor.	Data has been incorporated into the baseline study (see Section 1.4 for details), the assessment of impacts, the constraints drawings (see Section 1.4 for details) and this PEIR chapter.
WCC	10 November 2017 (email)	Winchester County Council required a plan showing the extend of the site before any responses could be made.	Consultation will need to be undertaken with Winchester County Council and incorporated into the ES.
PCC	02 May 2018 (email) 09 May 2018 17 May 2018	The Preliminary Risk Assessment would need to be seen in order to consider if any works, takes place as the CSM drives locations and depths to sample. The draft PRA would be of use, but given the information sources used didn't include the local records, it will probably only be indicative. Portsmouth City Council CLO anticipated that either a reduced scope for the local records or maybe someone coming into the office and trace the cable run on GIS and decide what reports are of interest would be one way to proceed.	A proposed visit is required to PCC to review in house records for inclusion in the baseline study. Further consultation with PCC will be required and incorporated into the ES.

Portsmouth City Council CLO mentioned that they will be checking their records for the proposed boreholes however this work has/may be already completed by the Pollution team. They requested that this information be submitted. Rather than trying to find 'clean' locations for boreholes, their requirement was that the boreholes testing for pollution are located in the locations most likely to be polluted with some extra for 'coverage'. The Method Statements for the boreholes should detail assessment and waste disposal, and also how the boreholes will not create new pathways or compromise remediation (if present in each area).

Portsmouth City Council CLO requires a Method Statement for each of the sample locations for the GI. The land use summaries produced for the locations so far show historic records but nothing that would stop the process. For many of these locations such and the PRS indicates landfill but we also have reports showing greater information and the BGS borehole logs should also be looked at. BS10175 desk study and a rational for the sample locations will need to be submitted after the desk study has been created and existing reports checked.

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

18.4 METHODS OF ASSESSMENT

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

18.4.1.2 A Detailed Desk Study including a deviation addendum report and a ground investigation report have been prepared using information from historical Ordnance Survey maps, environmental data reports (Envirocheck), British Geological Survey maps ('BGS') and ground investigations together with published and internet based information and consultations with regulators and other stakeholders.

18.4.1.3 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 following sources of information:

- Envirocheck Report (Ref: 121347347_1_1 and 121347331_1_1);
- BGS Map Sheet 316 – Fareham (1:50,000, 1998) and Map 331 – Portsmouth (1: 50,000, 1994);
- BGS Geology of Britain Viewer (accessed October 2018);
- Natural England Multi-Agency Geographic Information for the Countryside (MAGIC) website (accessed October 2018);
- EA website (accessed October 2018);
- Consultation with the EA and local authorities;
- Aquind – UK Cable Route Detailed Desk Study Route 3D, prepared by WSP dated June 2017;
- Aquind – UK Cable Route Addendum Desk Study – Route 3D, Deviations, prepared by WSP dated June 2018;
- Environmental Review and Desk Study Report, reference 13578DS prepared by RSA Geotechnics Ltd dated June 2013; and
- Aquind – UK Cable Route Milton Common – Initial Ground Investigation Findings, prepared by WSP dated October 2018.

18.4.1.4 A series of constraints drawings have been prepared and can be found within Volume 2 of this PEIR, see Figures 18.1 to 18.5.

18.4.1.5 To inform the assessment, existing site use, soil, geological, hydrogeological, and hydrological conditions have been reviewed to derive a hydrogeological model and establish the environmental setting of the Site. The environmental setting establishes potential receptors of contamination.

18.4.1.6 Therefore, to assess the possibility for land to be currently contaminated, potential sources and receptors have been identified, along with an evaluation of the potential existence of pathways between them to form complete contaminant linkages. The likely significance of the risk for each plausible linkage has been assessed for the PEIR.

18.4.1.7 The risk to receptors has been determined both for the Construction Stage and the Operational Stage of the Proposed Development.

18.4.2 GROUND INVESTIGATION

18.4.2.1 Ground investigation at the Converter Station Area was completed in April 2018 and a ground investigation consisting of twelve window samples at Milton Common was completed in October 2018.

18.4.2.2 Information from these investigations relating to ground conditions and contamination has been included in the assessment carried out as part of the PEIR.

18.4.2.3 The Ground Conditions Impact Assessment will fulfil the following stages as necessary for the Proposed Development:

- Assess impacts potentially affecting receptors (human health, controlled waters, geological features and building structures);
- Characterise the impacts by describing their extent, magnitude, duration, reversibility, timing and frequency;
- Identify cumulative impacts;
- Identify significant effects of impacts in the absence of any mitigation;
- Incorporate measures to avoid and mitigate (reduce) these impacts;
- Assess the significance of any residual effects after mitigation; and
- Identify appropriate compensation measures to offset significant residual effects.

18.4.2.4 It should be noted that the ongoing ground investigation is preliminary in nature and will be supplemented with further, detailed ground investigation following the ES and in advance of the detailed design of the Proposed Development. In addition, it is likely that further, area-specific ground investigation will be carried out by the contractor for the project to better understand specific ground risks identified and to allow for a safe method of working to be established.

18.4.3 CONSTRUCTION

18.4.3.1 During the Construction Stage of the works the principal human health receptors will be construction workers and neighbouring site users. Controlled waters receptors, including underlying aquifers and on-site and nearby surface water features, will also be considered.

18.4.4 OPERATION

18.4.4.1 During the Operational Stage, the principal human health receptors will be users of the site and neighbouring land. Controlled waters receptors will be considered, as will building structures including buried concrete and potable water supply pipes. Construction and maintenance workers will be considered should groundworks be required for the maintenance or replacement of cables.

18.4.5 SIGNIFICANCE CRITERIA

18.4.5.1 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.

Table 18.3 – Sensitivity of Receptors

Sensitivity	High	Medium	Low	Negligible
Human Health Receptor	Residential properties with private gardens/schools/care homes /playing fields	Residential properties without plant uptake Retail and business parks (public and work places) Allotment and market gardens	Commercial /industrial properties	N/A
Controlled Waters Receptor	EA defined Principal Aquifers EA defined Secondary A Aquifers overlying Principal Aquifers EA groundwater Source Protection Zone 1 Surface water bodies of high quality	EA defined Secondary A and B Aquifers EA groundwater Source Protection Zone 2 and 3 Surface water bodies of moderate quality	EA defined Unproductive Strata and Secondary Undifferentiated Aquifers Minor local drainage network	N/A
Ecological	Ramsar sites SPAs	Local nature reserves or LGS	N/A	N/A

Sensitivity	High	Medium	Low	Negligible
	SACs SSSIs NNRs MNRs			
Geological	SSSIs Major strategic mineral resource areas Strategic underground storage space Solution features Regionally Important Geological Sites ('RIGS') (This will be done as part of the ES)	Local geological sites and important mineral resource areas or Mineral Safeguarding Areas ('MSA')	Mineral Areas of Search/Consultation Areas ('MCA')	N/A
Built environment	N/A	Potable water supply pipes Buried concrete	N/A	N/A

18.4.5.2 Construction and/or maintenance workers are not included in the list of receptors, as it will be a fundamental requirement that any construction/maintenance workers on the project are adequately protected from the effects of any contamination via project-specific health and safety plans and procedures which will be put in place prior to the Construction Stage.

18.4.5.3 The magnitude of the impacts of the Proposed Development on ground conditions and contamination is assessed by comparing the difference in risk of each contaminant linkage at baseline to those at construction and at operational stages (see Table 18.4 Magnitude of Change Criteria). This provides a way of assessing both the adverse and beneficial effects during construction and the operational period.

18.4.5.4 The overall significance will be assessed using the matrix shown in Chapter 4 EIA Methodology. This uses the sensitivity of the receptor and magnitude of change to determine significance.

Table 18.4 – Magnitude of Change Criteria

Magnitude of Change	Criteria	Example
High	Results in loss of attribute and/or likely to cause exceedance of statutory objectives and/or breach of legislation.	Likely significant human health impact. Contamination of a Principal aquifer or loss or isolation of strategic mineral resource.
Medium	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	Results in minor effects on attribute.	Measurable change in attribute, but of limited size/proportion.
Negligible	Results in no change or effect on attribute.	No significant loss in quality of feature/attribute.

18.4.6 ASSUMPTIONS AND LIMITATIONS

- 18.4.6.1 This chapter of the PEIR provides preliminary information as it relates to the Proposed Development to date and to data currently available and gathered at this point of the assessment process.
- 18.4.6.2 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the Proposed Development on identified sensitive receptors will be undertaken at subsequent stages to inform the ES.
- 18.4.6.3 The semi quantitative assessment within this topic area considers land quality from the perspective of land contamination. It excludes soils quality from an agricultural or forestry perspective. Such an assessment can be found in Chapter 17 - Soils and Agricultural Land Use of this PEIR.
- 18.4.6.4 Land contamination has the potential to affect groundwater resources. Wider issues of groundwater and surface water resources are contained within Chapter 19 - Water Resources and Flood Risk of this PEIR.
- 18.4.6.5 Land contamination has the potential to affect ecological resources. Potential impacts on ecological receptors are addressed in Chapter 16 - Onshore Ecology of this PEIR.

18.4.6.6 Whilst the Project is designed to provide permanent electrical infrastructure there may come a time where it may be appropriate to decommission the equipment. In this scenario: potential impacts on geology, site users and adjacent site users; water environment and on-site infrastructure are expected to be similar or identical to those detailed for the Construction Stage.

18.4.6.7 Gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessment for the ES.

18.5 BASELINE ENVIRONMENT

18.5.1.1 The Site Boundary is illustrated in Figure 3.2. Study Areas extend to 500 m of the Site Boundary. The baseline features, identified sources and sensitive receptors are shown on the constraints drawings included in Volume 2, Figures 18.1 to 18.5.

18.5.2 SECTION 1 – LOVEDEAN (CONVERTER STATION AREA)

Designated Sites

18.5.2.1 Two areas of Ancient Woodland (Crabdens Copse and Stoneacre Copse) are located adjacent to the Converter Station Area.

Hydrogeology and Hydrology

18.5.2.2 There are no surface water features within the Converter Station Area.

18.5.2.3 The area is located within an Environment Agency Source Protection Zone 1 associated with Lovedean Pumping Station potable water supply (further details provided in Chapter 19 - Water Resources and Flood Risk).

18.5.2.4 A covered reservoir is located approximately 500 m west of Lovedean substation.

18.5.2.5 The Tarrant Chalk Member which underlays this area is designated as a Principal Aquifer and the Head Deposits are designated as a Secondary Undifferentiated Aquifer.

Bedrock Geology

18.5.2.6 As indicated on the BGS online viewer and BGS map sheet 316, the bedrock geology across the area comprises the Tarrant Chalk Member and is indicated to be close to or at the surface. This geology is a soft white chalk with relative widely spaced large sized flint.

Superficial Geology

18.5.2.7 The BGS online viewer and BGS map sheet 316 indicates the potential for localised Head Deposits to be present overlying the Tarrant Chalk Member towards the centre of the area. This deposit comprises gravel, sand and clay.

Radon

- 18.5.2.8 The area is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.2.9 The baseline study included a review of information from the Envirocheck Report. This recorded fourteen historical mineral extraction sites within 500 m of Section 1. Four of these are located on-site (Crabdens Copse, Hinton Daubney Chalk Pit, Stonemere Copse Chalk Pit and Denmead Farm Chalk Pit). Crabdens Row Chalk Pit is located adjacent east of the Lovedean substation. These pits are all recorded as chalk pits and opencast; these have the potential to be infilled with Made Ground. Earliest available mapping of the area (1869) indicated that the area comprised of agricultural fields with frequent former chalk pits. Denmead Farm Chalk Pit was present from 1868 to 1932.
- 18.5.2.10 Lovedean Substation was identified on the historical maps from 1980. There was one Category 3 – Minor Pollution Incident to controlled waters recorded on-site at the Lovedean Substation. This incident occurred in 1998 and was caused by an oil leak. There was a significant loss of cable insulation oil due to poor operational practice.
- 18.5.2.11 During a site walkover fly tipping and an old farming plant was noted in the woodland in close proximity to the indicative Converter Station location.

18.5.3 SECTION 2 - ANMORE

Designated Sites

- 18.5.3.1 James Copse (Ancient Semi-Natural Woodland) is located within 500 m of the Site Boundary in Section 2. Yoells Copse (SINC) is located approximately 967m east of the Site Boundary in Section 2. Yoells Copse is also designated as a statutory Local Nature Reserve.

Hydrogeology and Hydrology

- 18.5.3.2 There are no surface water features within Section 2.
- 18.5.3.3 The area is located within an Environment Agency Source Protection Zone 1.
- 18.5.3.4 The underlying Tarrant Chalk Member is designated as a Principal Aquifer and the Head Deposits are designated as a Secondary Undifferentiated Aquifer.

Bedrock Geology

- 18.5.3.5 As indicated on the BGS online viewer and BGS map sheet 316 the bedrock geology across the area comprises the Tarrant Chalk Member and is indicated to be close to or at the surface. This geology is a soft white chalk with relative widely spaced large sized flint.

Superficial Geology

- 18.5.3.6 The BGS online viewer and BGS Map sheet 316 indicates the potential for some localised Head Deposits to be present overlying the Tarrant Chalk Member towards the centre of the area. This deposit comprises gravel, sand and clay.

Radon

- 18.5.3.7 The area is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.3.8 The baseline study included a review of information from the Envirocheck Report. This recorded four historical mineral extraction sites within 500 m of the area (two at Denmead Chalk Pit, Merits Farm Chalk Pit and Anmore Dell Chalk Pit. These pits were all recorded as opencast, ceased; these have the potential to be infilled with Made Ground. Earliest available mapping of the area (1869) indicates that the area comprised of agricultural fields with frequent former chalk pits.

18.5.4 SECTION 3 - DENMEAD/KINGS POND MEADOW

- 18.5.4.1 This section contains information relating to option 3a) Kings Pond Meadow, 3b) Anmore Road, and 3c) Highways Route.

Designated Sites

- 18.5.4.2 The Onshore Cable Route options 3a) Kings Pond Meadow and 3b) Anmore Road run through Kings Pond Meadow which is designated as a SINC and also a SSSI.

Hydrogeology and Hydrology

- 18.5.4.3 Kings Pond is located on-site within Kings Pond Meadow and is located towards the north of the options 3a) and 3b) area. A drain runs along the western boundary of options 3a) and 3b).
- 18.5.4.4 Section 3 is located within an Environment Agency Source Protection Zone 1 and Inner Zone 1c relating to subsurface activity only.
- 18.5.4.5 The underlying Tarrant Chalk Member is designated as a Principal Aquifer, the Lambeth Group as a Secondary A Aquifer, the Head Deposits as Secondary Undifferentiated Aquifer and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.4.6 As indicated on the BGS online viewer and BGS Map sheet 316 the bedrock geology across the area comprises the London Clay Formation overlying the Lambeth Group overlying the Tarrant Chalk Member. The London Clay Formation generally comprises bioturbated or poorly laminated blue grey or grey-brown slightly calcareous silty clay with some layers of sandy clay. The Lambeth Group generally comprises clay with some silty or sandy sand and some sands and gravels with minor

limestones and lignite's. The Tarrant Chalk Member generally comprises a soft white chalk with relative widely spaced large sized flint.

Superficial Geology

- 18.5.4.7 The BGS online viewer and BGS Map sheet 316 indicates the potential for Head Deposits to be present overlying the London Clay Formation, the Lambeth Group and the Tarrant Chalk Member in sequence. This deposit comprises gravel, sand and clay.

Radon

- 18.5.4.8 Section 3 is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.4.9 The baseline study included a review of information from the Envirocheck Report. This recorded:

- Three mineral extraction sites were recorded within 500 m of the Site Boundary in Section 3. Anmore Gravel pit is located adjacent to Mill Road West (Option 3c) Highways). Anmore Dell Chalk Pit is located approximately 250 m east from the eastern boundary of options 3a) and 3b). Soak Sand Pit is located 300m east from the eastern boundary of options 3a) and 3b). All the mineral extraction sites are recorded as opencast and ceased;
- An historical landfill (Anmore Dell Landfill) is located approximately 250m east of the eastern boundary of options 3a) and 3b); deposited waste includes inert waste;
- One Local Authority Pollution Prevention and Control has been recorded approximately 260 m west of the Martin Avenue (Route 3c) associated with Denmead Filling Station;
- There are eight Category 3 – Minor Incidents to controlled waters recorded within 500 m of the Site Boundary. These incidents occurred between 1992 and 1996 and were caused by crude sewage, other oil, rubble/litter or soils and storm sewage; and
- Two Category 2 – Significant Incidents for agricultural slurry and crude sewage and have been recorded within 500m of the Site Boundary. These incidents occurred in 1992.

- 18.5.4.10 Earliest available mapping (1869) indicates that the site comprised agricultural fields with an area of forestry. Kings Pond was recorded from 1870. A Chalk Pit is mapped east of Mill Road from 1897 to 1898. Soak Copse is mapped from 1909 to 1910. By 1938 the town of Denmead was developed, with further development in 1980 to 1983 (to the current layout). Anmore was developed prior to 1980.

18.5.5 SECTION 4 - HAMBLEDON ROAD TO BURNHAM ROAD

Designated Sites

- 18.5.5.1 Portsdown SSSI is located approximately 423 m west of the Site Boundary in Section 4. Four ancient woodlands (Marrelsmoor Coppice, Alsfordmoor Coppice, Piper Hulls Wood and an unnamed wood west of Park Wood) are located within 250 m west and east of the Site Boundary.

Hydrogeology and Hydrology

- 18.5.5.2 A number of drainage ditches are located in Section 4.
- 18.5.5.3 The majority of Section 4 is located within an Environment Agency Source Protection Zone Inner Zone 1c relating to subsurface activity only.
- 18.5.5.4 Portsdown Hill Reservoir (covered reservoir) has been noted approximately 150 m east of Site Boundary in Section 4.
- 18.5.5.5 The underlying Wittering Formation, Bognor Sand Member, Portsmouth Sand Member, Whitecliff Sand Member and the Lambeth Group are designated as a Secondary A Aquifer and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.5.6 As indicated on the BGS online viewer and BGS Map sheet 316 the bedrock geology across Section 4 comprises the Wittering Formation overlying the Thames Group (London Clay Formation, Bognor Sand Member, Portsmouth Sand Member and Whitecliff Sand Member) overlying the Lambeth Group.

Superficial Geology

- 18.5.5.7 The BGS online viewer and BGS Map sheet 316 indicates the potential for Head Deposits to be present particularly around Waterlooville and Soake. Around Purbrook there are localised areas of Head Deposits associated with existing/ relic water courses. This deposit comprises gravel, sand and clay.

Radon

- 18.5.5.8 The area is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.5.9 The baseline study included a review of information from the Envirocheck Report. This recorded:
- Seven chalk pits (Wymering, Purbrook Park, unnamed chalk pit, Belle Isle, Dell Garden, the Park Gravel Pit and Collegers Pit) have been identified within 250 m of the Site Boundary. Soak Sand Pit is located approximately 350 m east of the Site Boundary and Hart Plain House Sand Pit approximately 500 m east of the

Site Boundary. All the mineral extraction sites are recorded as opencast and ceased;

- A historical Landfill (Fielders Park) is recorded approximately 50 m east of the Site Boundary and deposited waste included household waste;
- Two Local Authority Pollution Prevention and Controls are recorded at 19 m north and 32 m west of the Site Boundary for PG1/14 Petrol filling stations. Five other Local Authority Pollution Prevention and Controls are located within 100 m of the Site Boundary three for petrol filling stations, one for Part B process specific reference now surrendered) and one for dry cleaning;
- There are four recorded Category 3 – Minor Incidents to controlled waters recorded within 50 m of the area and are due to waste oil, crude sewage and gas oil. These occurred between 1996 and 1998; and
- One Category 2 – Significant Incident occurred in 1992 for crude sewage approximately 50 m west of the Site Boundary.

18.5.5.10 Earliest available mapping (1869) indicates that the area comprised of agricultural fields until the residential development occurred in 1930s and 1960s. The northern portion of Section 4 remains as undeveloped agricultural fields. A garage/petrol filling station was present adjacent east of Section 4 from 1961. Havant and Waterlooville Sewage works was recorded approximately 200 m north of the Site Boundary from 1909 to 1953 when it was replaced by a builder's yard to 1977 and then an industrial estate from 1993.

The London Road (A3) was present prior to the production of the earliest map. Fort Purbrook was recorded on the maps from 1933 approximately 220 m north-east of the Site Boundary. Portsdown and Horndean Light Railway was recorded adjacent to the west of the Site Boundary from 1909 to 1932; it was no longer operational from 1963 to 1983 and now forms part of the London Road.

18.5.6 SECTION 5 - FARLINGTON

18.5.6.1 This section contains information relating to the following Onshore Cable Corridor options: 5a) Farlington Avenue; 5b) Pump Station Route; and 5c) Portsdown Hill Road.

Designated Sites

18.5.6.2 Farlington Avenue SINC and a Field to West of Gillman Road SINC are located on route. Land to the north and south of Portsdown Hill road SINC are located on route. Meadow west of Farlington Avenue SINC is located on-route. There is a proposed LWS at the covered reservoir to the north/east of the option 5b), which is located within option 5c).

18.5.6.3 Fort Purbrook including covered-way to east is located approximately 50 m north of Portsdown Hill Road and is a Scheduled Monument (Two Grade II listed forts). The covered way to the east is also Scheduled.

Hydrogeology and Hydrology

- 18.5.6.4 There are a number of drainage ditches and streams, located in Section 5.
- 18.5.6.5 Section 5 is not located within an Environment Agency Source Protection Zone.
- 18.5.6.6 Drayton covered reservoir is located adjacent east of Ainsdale Road (Options 5b) and 5c).
- 18.5.6.7 There is also notable buried water utility infrastructure within this area.
- 18.5.6.8 The underlying Portsdown Chalk Formation, Spetisbury Chalk Member, Tarrant Chalk Member, Newhaven Chalk Member, Seaford Chalk Formation and the Lewes Nodular Chalk Formation are designated as Principal Aquifers. The underlying Lambeth Group and the River Terrace Deposits (undifferentiated) are designated as Secondary A Aquifers. The underlying Head Deposits and the Raised Marine Deposits are designated as Secondary Undifferentiated Aquifers.

Bedrock Geology

- 18.5.6.9 As indicated on the BGS online viewer and BGS Map sheet 316 the bedrock geology across Section 5 comprises the Lambeth Group towards the north of the Section 5. Section 5 is predominately the Lewes Nodular Chalk Formation, which generally comprises hard nodular chalk with flints. Towards the north of Section 5 the geology changes to thick bands of the Portsdown Chalk Formation (white chalk with marl seams and flint bands) overlying the Spetisbury Chalk Member (firm white chalk with regular large flint seams) overlying the Tarrant Chalk Member overlying the Newhaven Chalk Member (soft to medium hard, smooth white chalk with numerous marl seams and flint bands) overlying the Seaford Chalk Formation (firm white chalk with nodular and tabular flint seams) overlying the Lewes Nodular Chalk Formation in sequence. All these Chalk members and formations are within the White Chalk Subgroup.

Superficial Geology

- 18.5.6.10 The BGS online viewer and BGS Map sheet 316 indicates the potential for Head Deposits to be present towards the north of Section 5 and generally comprises gravel, sand and clay. The River Terrace Deposits (undifferentiated) are located underlying the Head Deposits across most of Section 5 particularly towards the south. The River Terrace Deposits are associated with existing and relic watercourses across Section 5 and generally comprise sand, silt and clay. Raised Marine Deposits potentially outcrop towards the south of the area and generally comprise, sand, gravel silt and clay commonly charged with organic debris.

Radon

- 18.5.6.11 Section 5 is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.6.12 The baseline study included a review of information from the Envirocheck Report. This recorded:
- One historical sand/chalk pit located adjacent to Ainsdale road and within the vicinity of the Drayton Covered Reservoir;
 - An historical landfill (Pumping Station) was located adjacent east of the Site Boundary, at options 5b and 5c (land north of Eveleigh Road and west of grassed strip owned by Portsmouth Water) and deposited waste included inert waste;
 - A registered landfill (Pumping Station) was formerly located within the same area as the historical landfill; the licence was lapsed/ cancelled/ defunct/ surrendered on 1 May 1984 and was authorised to accept excavated natural materials and road making materials;
 - A discharge consent located approximately 41m east of the Site Boundary and associated with Southern Water Services Ltd discharging public sewage; storm overflow was revoked on 14 May 1993; and
 - Two waste management facilities (metal recycling sites and a scrapyards) operated by James Huntley and Sons Ltd have been identified approximately 500 m south east of the Site Boundary.

- 18.5.6.13 Earliest available mapping (1869) indicates that the area comprised agricultural fields until residential development occurred from 1910. Portsdown Hill Reservoirs were present adjacent to Ainsdale road from 1898. Drayton Reservoir was present from 1869 and is currently mapped as an active covered reservoir. A pumping station was noted from 1932 to 1938, and a school was present from 2000.

18.5.7 SECTION 6 - ZETLAND FIELD AND SAINSBURY'S CAR PARK

- 18.5.7.1 This section contains information relating to Onshore Cable Corridor option 6a) A2030 and Fitzherbert Road and option 6b) Zetland Field and Fitzherbert Road.

Designated Sites

- 18.5.7.2 Farlington Marshes LNR is located approximately 500 m east of the Onshore Cable Corridor. Chichester and Langstone Harbours SPA/Ramsar sites are located approximately 500 m south-east of the Onshore Cable Corridor. Langstone Harbour SSSI is located approximately 500 m south-east of the Onshore Cable Corridor. Solent Maritime SAC is located approximately 500 m south of the Onshore Cable Corridor.

Hydrogeology and Hydrology

- 18.5.7.3 A number of drainage ditches and streams are located in Section 6.

- 18.5.7.4 Section 6 is not located within an Environment Agency Source Protection Zone.

18.5.7.5 The White Chalk Subgroup is designated as Principal Aquifer, the River Terrace Deposits are designated as Secondary A Aquifer and the Raised Marine Deposits are designated as Secondary Undifferentiated Aquifers.

Bedrock Geology

18.5.7.6 As indicated on the BGS online viewer and BGS Map sheet 316 the bedrock geology across the area comprises the White Chalk Subgroup particularly the Lewes Nodular Chalk Formation.

Superficial Geology

18.5.7.7 The BGS online viewer and BGS Map sheet 316 indicates the potential for River Terrace Deposits (undifferentiated) to present across the entire area overlying the Raised Marine Deposits towards the east and south of the area.

RADON

18.5.7.8 Section 6 is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

18.5.7.9 The baseline study included a review of information from the Envirocheck Report and reported:

- One registered waste treatment or disposal site located 238 m north-east of the Site Boundary, Tilbury Metals Ltd operated a Scrapyard within a very small (less than 10,000 tonnes per year) max input rate, operational on 20 June 1997;
- One registered waste transfer site located 223 m east of the Site Boundary, Graham Tatford and Co Ltd operated a transfer site. The transfer site licence is exempt and was dated 1 Sept 1992, authorised waste included pharmaceutical liquid waste and waste prescription medicines;
- Two Local Authority Pollution Prevention and Controls are recorded at 38 m north and adjacent to the Site Boundary, both for PG14/14 petrol filling stations. Six other Local Authority Pollution Prevention and Controls are located within 500 m of the Site Boundary, one for PG1/1 waste oil burners less than 0.4 mw net rated thermal input (109 m north) three for PG6/34 respraying of road vehicles (145 m north, 290 m north-east and 360 m north-east), and one for PG6/33 wood coating 234 m north-east);
- There are two Category 3 – Minor Incidents to Controlled waters recorded within 500 m of the Site Boundary (250 m east and 400 m north-east) and were due to other industrial pollutants. These occurred between 1996 and 1997;
- A discharge consent is recorded approximately 23 m east of the Site Boundary and was associated with Dunham-Bush (Mfg) Ltd discharging of trade discharge – process water which was revoked on 4 November 1992 and 31 March 1997; and

- A discharge consent located approximately 162 m west associated with Southern Water Services Ltd; discharging storm sewage overflow which was revoked on 11 February 2008.

18.5.7.10 Earliest available mapping (1869) indicates that Section 6 comprised agricultural fields and Farlington Water Works/Sewage Works from 1869 to 1955. A works/factory was present on-site from 1963 to 1993 when the current Sainsbury Superstore and petrol station was present. An electrical substation was present 10 m east from 1955 to 1979 then part of Sainsburys petrol station in 1993. A factory/works was present 150 m east from 1962 to present. A Railway was present adjacent south of the area from 1870 to present.

18.5.8 SECTION 7 - FARLINGTON JUNCTION TO AIRPORT SERVICE ROAD

Designated Sites

18.5.8.1 The Onshore Cable Corridor runs through Farlington Marshes LNR. Chichester and Langstone Harbours SPA/Ramsar sites are located adjacent to Eastern Road. Langstone Harbour SSSI is located adjacent to Eastern Road. Solent and Isle of Wight Lagoons SAC is located 50 m east of the Site Boundary in Section 7. Langstone Harbour Royal Society for the Protection of Birds Reserve is located approximately 500 m east of the Site Boundary.

Hydrogeology and Hydrology

18.5.8.2 The Broom Channel runs through the Onshore Cable Corridor. A number of lakes are located within 500 m of the Site Boundary, including Shut Lake and Sluice Lake. The lakes are associated with Langstone Harbour and Farlington Marshes. A number of drainage ditches and streams are located in Section 7.

18.5.8.3 Section 7 is not located within an Environment Agency Source Protection Zone.

18.5.8.4 The White Chalk Subgroup is designated as Principal Aquifer, the River Terrace Deposits are designated as Secondary A Aquifer and the Raised Marine Deposits, and Beach and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers.

Bedrock Geology

18.5.8.5 As indicated on the BGS online viewer and BGS Map sheet 316 the bedrock geology across the area comprises the White Chalk Subgroup particularly the Lewes Nodular Chalk Formation.

Made Ground

18.5.8.6 As indicated on the BGS online viewer and BGS Map Sheet 316 Made Ground is present west and south of Eastern Road (A2030). This is associated with a number of historical infilled land between 1890s and 1960s. An area of backfilled ground is present associated with Kendall's Quay historical landfill, which deposited unknown

waste. The area is an active mineral site for marine sand and gravel extraction. An area of infilled ground is present extending beneath the road bridge and to the northern side of Langstone-Chichester Harbour SPA. The backfilled ground extends along the route of the A27 including the roundabout with Eastern Road. The area was progressively backfilled between 1870s and 1980s; the backfill type is unknown.

Superficial Geology

- 18.5.8.7 The BGS online viewer and BGS Map sheet 316 indicates the potential for River Terrace Deposits (undifferentiated) to present across the entire area overlying the Raised Marine Deposits and the Beach and Tidal Flat Deposits (undifferentiated). The Beach and Tidal Flat Deposits are likely to be present in close proximity to the Broom Channel and across Farlington Marshes. The Beach and Tidal Flat deposits generally comprise, 'Beach deposits' shingle, sand, silt and clay and 'Tidal Flat Deposits' commonly silt and clay with sand and gravel layers.

Radon

- 18.5.8.8 Section 7 is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.8.9 The baseline study included a review of information from the Envirocheck Report and reported:
- Two historical landfills (Kendall's Quay and Sports Field East of Eastern Road) are recorded adjacent east of Eastern Road (A2030). For both landfills the deposited waste included unknown material;
 - Kendall's Wharf mineral extraction is located approximately 200 m east of the Site Boundary, the Wharf is active and extracts Marine Deposits;
 - Two Local Authority Pollution Prevention and Controls are located adjacent to Eastern Road, one for PG14/14 petrol filling station and one for PG3/1 blending, packing, loading and use of bulk cement. A further eight local authority pollution prevention and controls are located between 100 m to 500 m west of the Site Boundary;
 - There are three Category 2 – Significant incidents to controlled waters recorded within 500 m of the Site Boundary (approximately 165 m east, 253 m west and 300 m west), the incidents were related to the release of chemicals – other organic and gas oils and occurred between 1995 and 1996; and
 - There are seven Category 3 – Minor Incidents to controlled water recorded within 500 m of the Site Boundary, the incidents relate to the release of paints and dyes, organic wastes, oils, diesel (including agricultural), inert suspended solids, unknown pollutants and fire water/foam. The incidents occurred between 1992 to 1997. Five discharge consents are located from adjacent east of Eastern Road to 150 m west, these are associated with trade effluent

discharge, trade discharges – cooling water and store sewage overflow and were all revoked from 1999 to 2006.

- 18.5.8.10 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. Development has taken place to the west of Section 7 including works and business parks. The former Portsmouth City Airport (adjacent to the Site Boundary) is now a residential development. A factory/works is noted adjacent to the Site Boundary from 1963 and is now Anchorage Park. A works is noted 120 m east of the Site Boundary from 1990. Portsmouth City Airport is recorded 25 m west of Section 7 from 1953 to 1983, residential housing is noted from 1983. East Demi Bastion is noted adjacent to Section 7, as well as Anchorages Lodges from 1897 to 1932, then part of airfield 1953 to 1983 and a community centre/playing fields from 1990. A rifle range is noted adjacent to the Site Boundary from 1987 to 1932, then open fields from 1963 to 1990 and then residential housing from 2000. A racecourse is noted on the route and adjacent to route near Kendall's Wharf from 1898 to 1910 and is then noted as a factory/works and playing fields from 1963.

18.5.9 SECTION 8 - GREAT SALTERNS GOLF COURSE TO VELDER AVENUE/ MOORINGS WAY

OPTION 8A) EASTERN ROAD

Designated Sites

- 18.5.9.1 Chichester and Langstone Harbours SPA and Ramsar sites are located within a 500 m area to the east of the Site Boundary in Section 8a). Solent Maritime SAC and Langstone Harbour SSSI are located within 500 m and to the east of the Site Boundary. Great Salterns Lake is located adjacent west of the Site Boundary and the golf driving range. Great Salterns Gold Course is located adjacent east of the Site Boundary and north of Burrfields Road.

Hydrogeology and Hydrology

- 18.5.9.2 Great Salterns Lake is present adjacent west of Eastern Road. The Broom Channel is present adjacent east of Eastern Road. A number of lakes are located within 500 m of the Site Boundary, including Mallard Lake and Sluice Lake. The lakes are associated with Langstone Harbour and Farlington Marshes. A number of drainage ditches and streams were located surrounding the area. Drains are also present, associated with the Golf Courses.
- 18.5.9.3 Section 8a) is not located within an Environment Agency Source Protection Zone.
- 18.5.9.4 The River Terrace Deposits, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member are designated as Secondary A Aquifer, the Raised Marine Deposits, and Beach and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.9.5 As indicated on the BGS online viewer and BGS Map sheet 316 and 331 the bedrock geology across the area comprises the Thames Group (London Clay Formation, Bognor Sand Member towards the north, Portsmouth Sand Member and Whitecliff Sand Member towards the south) overlying the Lambeth Group towards the north.

Superficial Geology

- 18.5.9.6 The BGS online viewer and BGS Map sheet 316 and 331 indicates the potential for River Terrace Deposits (undifferentiated) to present towards the south of Section 8a overlying the Raised Marine Deposits towards the north of Section 8a. The Beach and Tidal Flat Deposits are likely to be present towards the east of Section 8a.

Radon

- 18.5.9.7 Section 8a is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.9.8 The baseline study included a review of information from the Envirocheck Report and reported:
- Six historical landfills are recorded within 500 m of the Site Boundary. Sports Field east of Eastern Road Landfill is located adjacent east of Eastern Road and deposited waste included household waste, noted on historical maps during the 1960s. Land south of Burrfields Road Land is located adjacent west of Eastern Road and extends approximately 500 m west of the Site Boundary, deposited waste included household waste. Land east of Baffins Pond is located adjacent west of Eastern Road and east of Baffins pond and extends approximately 800 m west of Eastern Road, deposited waste included household waste. Great Salterns Quay Landfill located adjacent east of Eastern Road extends approximately 20 m east, deposited waste included household waste. Moneyfield and Longmeadow Allotments landfills are recorded approximately 500 m west of Eastern Road at the closest point, deposited waste included household waste. Hilsea Gasworks Refuse Disposal Area landfill is located 500 m west of Eastern Road at the closest point, deposited waste included industrial waste;
 - Six waste management facilities are located approximately 500 m west of Eastern Road within the historical Hilsea Gasworks Refuse Disposal Area landfill which is now labelled as factories/works. These range from physical treatment facilities, special waste transfer stations, metal recycling sites, waste transfer sites, waste treatment facilities and scrapyards;
 - Portsmouth Brickworks (BGS Record Mineral Extraction Site) located approximately 500 m east of Eastern Road is recorded as opencast and ceased. An old clay pit and brick works is recorded in this location on historical

maps from 1898 to 1963, when it was replaced by a factory/depot. An old sand/chalk pit is recorded on historical maps approximately 300 m west of Eastern Road and east of Baffins Pond from 1931 to 1942; and

- There is one Local Authority Pollution Prevention and Controls located 29 m east Eastern Road, associated with PG1/14 Petrol Filling Station, authorised 21 Jan 1999. One Category 3 – Minor Incident to controlled waters occurred 272 m west of Eastern Road associated with the discharge of waste oil, this occurred in 1996. One discharge consent is recorded 290 m west of Eastern Road associated with Southern Water Services Ltd discharging public sewage: storm sewage overflow into the Great Salterns Lake, this was revoked on 30 March 2013.

18.5.9.9 Earliest available mapping (1869) indicates that the area comprised undeveloped agricultural fields and marshland. Eastern Road first appears on mapping in the 1930s. Allotment gardens and golf courses are noted on the maps from 1931 to present. A sewage lifting station is noted on the map approximately 500 m west of Eastern Road (east of Baffins Pond) from 1910 to 1932, then marked as allotment gardens until 1932 and then undeveloped land and a car park to the present day. A refuse destructor is noted on the map 400 m west of Eastern Road (east of Baffins Pond) from 1931 to 1932, then allotment gardens to 1963 and then undeveloped land and a car park to the present day.

OPTION 8B) – MINOR ROADS AND MOORINGS WAY

Designated Sites

18.5.9.10 Chichester and Langstone Harbours SPA and Ramsar sites are located within a 500 m area east of the Site Boundary in Section 8c. Solent Maritime SAC and Langstone Harbour SSSI are located within 500 m to the east of the Site Boundary. The Onshore Cable Corridor runs along the seawall east of Milton Common.

Hydrogeology and Hydrology

18.5.9.11 Frog Lake, Duck Lake and Swan Lake are located within Milton Common towards the east of the residential estate.

18.5.9.12 Section 8b) is not located within an Environment Agency Source Protection Zone.

18.5.9.13 The River Terrace Deposits (undifferentiated and second), the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member are designated as Secondary A Aquifers, the Raised Marine Deposits, and Beach and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.9.14 As indicated on the BGS online viewer and BGS Map 331 the bedrock geology across the area comprises the London Clay Formation. The Bognor Sand Member may be present towards the north of the area and the Portsmouth Sand Member and Whitecliff Sand Member may be present towards the south of Section 8b).

Superficial Geology

- 18.5.9.15 The BGS online viewer and BGS Map sheet 331 indicates the potential for River Terrace Deposits (undifferentiated and second) to present across the majority of Section 8b), overlying the Raised Marine Deposits towards the east of Section 8b). The Beach and Tidal Flat Deposits may be present towards the east of Section 8b), associated with Langstone Harbour.

Radon

- 18.5.9.16 Section 8b) is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.9.17 The baseline study included a review of information from the Envirocheck Report and reports:

- Milton Common Historical Landfill is located adjacent to the north of the Moorings Way;
- Warren Lane Gravel Pit (BGS Recorded Mineral Extraction Site) noted from 1898 to 1909, it was formerly recorded as opencast and now ceased and is noted to have extracted River Terrace Deposits 2;
- A sand pit is noted on historical maps from 1898 to 1909 approximately 20 m south of Moorings Way with a residential development present from 1932; and
- Amey Business Services operated a waste management facilities 65 m west of Eastern Road which was surrendered on 11 July 2008. Amey Facilities Management operate a transfer site 65 m west of Eastern Road, authorised waste includes metals, paper, plastics, street sweeping debris, trees, bushes, weeds, grass wood and wood products.

- 18.5.9.18 Earliest available mapping (1869) indicates that Section 8b) comprised undeveloped agricultural land and marshland until 1973. Milton Common was formed during 1973 with landlocked lakes though the centre in an east-west orientation. Landlocked lakes are noted on the eastern side in a north-south orientation in 1988. A residential development is noted adjacent west and south of Milton Common from 1931 to 1932 and increasing development is noted on the 1963 map. Increasing development is noted south of Milton Common from 1990.

- 18.5.9.19 Milton Common Cemetery is noted approximately 100 m west of Eastern Avenue from 1931 to present. A residential development including Eastern Avenue, Salterns Avenue and Shore Avenue was noted from 1931 and this development expanded west across Eastern Road from 1938. A residential development is noted adjacent south of Moorings Way from 1931 and expanded between 1990 and the present day. An isolation hospital (now St Mary's Hospital) is noted approximately 400 m west of Eastern Avenue. A depot is noted adjacent west of Eastern Road from 1945 to present and an ambulance station is noted adjacent west of Eastern Road from 1968.

OPTION 8C) MILTON COMMON

Designated Sites

- 18.5.9.20 Chichester and Langstone Harbours SPA and Ramsar sites are located within a 500m area to the east of the Site Boundary in Section 8c). Solent Maritime SAC and Langstone Harbour SSSI are located within a 500m area east of the Site Boundary. The Onshore Cable Corridor crosses through Milton Common.

Hydrogeology and Hydrology

- 18.5.9.21 Frog Lake, Duck Lake and Swan Lake are located within Milton Common and are adjacent east to the Site Boundary. Milton Lake associated with Langstone Harbour is located approximately 200 m east.

- 18.5.9.22 Section 8c) is not located within an Environment Agency Source Protection Zone.

- 18.5.9.23 The River Terrace Deposits, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member are designated as Secondary A Aquifer, the Raised Marine Deposits, and Beach and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.9.24 As indicated on the BGS) online viewer and BGS Map 331 the bedrock geology across the area comprises the London Clay Formation. The Bognor Sand Member may be present towards the north of Section 8c) and the Portsmouth Sand Member and Whitecliff Sand Member may be present towards the south of Section 8b.

Made Ground

- 18.5.9.25 As indicated on the BGS online viewer, BGS Map Sheet 316 and WSP Ground investigation works undertaken at Milton Common dated October 2018, Made Ground/Acritical Ground is present across the entire area. The twelve window samples undertaken at Milton Common found that the thickness of Made Ground varied across Milton Common, with thinner deposits encountered to the west between 1.20 m and 1.60 m depth. Thicker Made Ground deposits >4 m depth were encountered towards the centre and east of Section 8c). Many of the window samples holes had multiple attempts or stopped short of target depth due to obstructions, possible asbestos or encountering metal objects. Historical photographs show

construction waste (e.g. rebar, radiators, pipe work, support beams, roof sheeting and vehicles (cars, military vehicles also possible military marine vehicles parts).

18.5.9.26 Made Ground is likely to be associated with historical landfills.

18.5.9.27 The report concludes that a former route option that cut across the middle of Milton Common is likely to encounter the thickest deposits of Made Ground and is therefore considered a higher risk from a contamination and construction view point.

Superficial Geology

18.5.9.28 The BGS online viewer and BGS Map sheet 331 indicates the potential for River Terrace Deposits (undifferentiated) to present towards the south of option 8c) overlying the Raised Marine Deposits towards the north of option 8c). The Beach and Tidal Flat Deposits may be present towards the east of option 8c), associated with Langstone Harbour.

Radon

18.5.9.29 Section 8c) is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

18.5.9.30 The baseline study included a review of information from the Envirocheck Report. The Onshore Cable Corridor goes through the historical Milton Common Lake landfill, deposited waste included industrial and household waste. During WSP's investigation in October 2018, evidence of landfill waste was noted in the majority of the exploratory holes.

18.5.9.31 Earliest available mapping (1869) indicated that Section 8c) comprised of Milton Lake and marshlands until 1973. Milton Common was formed during 1973 with landlocked lakes through the centre in an east-west orientation. Landlocked lakes are noted on the eastern side in a north-south orientation in 1988. A residential development was noted adjacent west and south of Milton Common from 1931 to 1932 and increasing development was noted on the 1963 map. Increasing development was noted south of Milton Common from 1990.

18.5.10 SECTION 9 - VELDER AVENUE/MOORINGS WAY TO BRANSBURY ROAD OPTION 9A) – HIGHWAYS ROUTE

Designated Sites

18.5.10.1 Langstone Harbour LNR and SSSI is located within 500 m east of this option. Chichester and Langstone Harbours SPA and Ramsar sites are located within 500 m to the east.

Hydrogeology and Hydrology

- 18.5.10.2 A number of drainage ditches and streams are located within the vicinity of this option).
- 18.5.10.3 The area is not located within an Environment Agency Source Protection Zone.
- 18.5.10.4 The River Terrace Deposits, the Bognor Sand Member, Portsmouth Sand Member, the Whitecliff Sand Member and the Wittering Formation are designated as Secondary A Aquifer, the Raised Marine Deposits, are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.10.5 As indicated on the BGS online viewer and BGS Map 331 the bedrock geology across the area comprises the London Clay Formation. The Bognor Sand Member may be present towards the north of the area and the Portsmouth Sand Member and Whitecliff Sand Member may be present towards the south underlying the Wittering Formation.

Superficial Geology

- 18.5.10.6 The BGS online viewer and BGS Map sheet 331 indicates the potential for River Terrace Deposits (undifferentiated and second) to be present across the majority of the area overlying the Raised Marine Deposits.

Radon

- 18.5.10.7 Section 9a) is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.10.8 The baseline study included a review of information from the Envirocheck Report and reported:
- Warren Lane Gravel Pit (BGS Recorded mineral extraction site was located 364 m east of Milton Road from 1898 to 1909 and is recorded as opencast and ceased; and
 - A sand pit is noted on historical maps from 1898 to 1909 approximately 364 m east of Milton Road.
 - There are two Local Authority Pollution Prevention and Controls located adjacent west of Milton Road; Acorn Garage, PG1/1 waste oil burners, less than 0.4 MW net rated thermal input application, revoked March 2001 and Rontec, PG1/14 petrol filling station authorised January 1998.
- 18.5.10.9 Earliest available mapping (1869) indicated that the area comprises undeveloped agricultural land. A smithy is noted adjacent west of Milton Road from 1881 then an outbuilding of a public house from 1898 to 1909 followed by a car park 1909 to 1999 and then residential housing to present. An Old Canal is noted adjacent west of

Milton Road from 1881 to 1898 and then Kingsley Road to present. A smithy is noted 20 m west of Milton Road from 1881 to 1909 then residential housing from 1932 to present. A brick works and associated kilns are noted 419 m east of Milton Road from 1898 to 1931, following which they are noted as residential housing to present.

OPTIONS 9B) ALLOTMENTS AND 9C) IRONBRIDGE LANE

Designated Sites

- 18.5.10.10 Chichester and Langstone Harbours SPA and Ramsar sites are located adjacent east of option 9b) with option 9c) in a similar location. Langstone Harbour SSSI and Solent Maritime SAC are located adjacent east of the area. Milton Common is located north of options 9b) and 9c).

Hydrogeology and Hydrology

- 18.5.10.11 Langstone Harbour and associated Eastney Lake, Lock Lake and Langstone Channel are located adjacent to the east of Sections 9b and 9c.
- 18.5.10.12 Sections 9b and 9c are not located within an Environment Agency Source Protection Zone.
- 18.5.10.13 The River Terrace Deposits, the Wittering Formation, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member are designated as Secondary A Aquifer, the Raised Marine Deposits, Beach and Tidal Flat Deposits and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

- 18.5.10.14 As indicated on the BGS online viewer and BGS Map 331 the bedrock geology across Sections 9b and 9b comprises the London Clay Formation. The Bognor Sand Member may be present towards the north of the area and the Portsmouth Sand Member and Whitecliff Sand Member may be present towards the south. The Wittering Formation is likely to be present across the south of Sections 9b and 9c overlying the London Clay Formation.

Superficial Geology

- 18.5.10.15 The BGS online viewer and BGS Map sheet 331 indicates the potential for River Terrace Deposits (undifferentiated and second) to be present across the majority of Sections 9b and 9c overlying the Raised Marine Deposits north of the area, Beach and Tidal Flat Deposits east of the area and the tidal flat deposits south of the area particularly in the vicinity of Bransbury Park. The Tidal Flat Deposits comprise consolidated soft silty clay with layers of sand, gravel and peat.

Radon

- 18.5.10.16 Sections 9b and 9c are within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

- 18.5.10.17 The baseline study included a review of information from the Envirocheck Report and reported:
- Eastney Lake historical landfill is noted adjacent east of Bransbury Park, deposited waste includes industrial, commercial and household waste; and
 - Three discharge consents are located within 500 m of both options. Southern Water Services Ltd had a discharge consent for sewage discharges – as a pumping station water company, adjacent east of the allotments, which was revoked 5 March 2008. 4delivery Limited has a discharge consent for trade effluent discharge – site drainage 163 m east of Bransbury Park and was revoked 31 December 2009. Daniel Homes Ltd had a discharge consent for discharge of other matter surface water 272 m south-east of the allotments and was revoked 28 March 1996.
- 18.5.10.18 Earliest available mapping (1869) indicates that Sections 9b and 9c comprised undeveloped agricultural land. Eastney Lake is noted to be located within Bransbury Park from 1870 to 1871. Milton Lake is noted as being present on Milton Common from 1870 to 1871. St James Hospital is noted from 1870 to present and developed land to the south in 1898. The allotment gardens are noted from 1931 to present. Land reclaimed south of the allotments, which used to be part of Lock Lake is noted in 1973. Langstone Campus (Portsmouth University) formed and expanded from the once Port Royale College in 1938 to 1942. Increasing development (residential and roads) west of Portsmouth University is noted in the 1950s, 1990s, 2000s, 2006 and 2017.

18.5.11 SECTION 10 - EASTNEY (LANDFALL)

Designated Sites

- 18.5.11.1 Chichester and Langstone Harbours SPA and Ramsar sites are located adjacent east and north of the Landfall area. Langstone Harbour SSSI and Solent Maritime SPC are located adjacent east and north of the Landfall area. Fort Cumberland SAM and SINC is located adjacent east and north-east of the Landfall area.

Hydrogeology and Hydrology

- 18.5.11.2 Langstone Harbour and Eastney Lake are located adjacent north of the Landfall area. Langstone Channel is located adjacent south and east of the Landfall area.
- 18.5.11.3 The Landfall area is not located within an Environment Agency Source Protection Zone.

18.5.11.4 The River Terrace Deposits, the Wittering Formation, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member are designated as Secondary A Aquifer, the Raised Marine Deposits, Beach and Tidal Flat Deposits and Tidal Flat Deposits are designated as Secondary Undifferentiated Aquifers and the London Clay Formation as Unproductive Stratum.

Bedrock Geology

18.5.11.5 As indicated on the BGS online viewer and BGS Map 331 the bedrock geology across the area comprises the London Clay Formation. The Bognor Sand Member may be present towards the north of the area and the Portsmouth Sand Member and Whitecliff Sand Member may be present towards the south. The Wittering Formation is likely to be present across of the area overlying the London Clay Formation.

Superficial Geology

18.5.11.6 The BGS online viewer and BGS Map sheet 331 indicates the potential for River Terrace Deposits (undifferentiated and second) to present across the majority of the Landfall area. Beach and Tidal Flat Deposits are likely to be present towards the east of the Landfall area. Tidal Flat Deposits are likely to be present towards the west of the Landfall area particularly in the vicinity of Bransbury Park. Storm Beach Deposits are likely to be present towards the south-east of the Landfall area particularly in the vicinity of Fort Cumberland. The Storm Beach Deposits generally comprise gravel and rarely sand.

Radon

18.5.11.7 The Landfall area is within the lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).

Potentially Contaminated Sites

18.5.11.8 The baseline study included a review of information from the Envirocheck Report and reported:

- Four historical Landfills are listed within 500 m of the Landfall area. The Glory Hole historical landfill was located adjacent north of Fort Cumberland Road and deposited waste, included industrial, commercial and household waste. Henderson Road Caravan Park historical landfill was located adjacent north of Fort Cumberland Road, deposited waste included industrial, commercial and household waste. Eastney Lake historical landfill was located adjacent north-west of Fort Cumberland Road, deposited waste included industrial, commercial and household waste. Landfill Site B South of Ferry Road historical landfill was located 349 m north of Fort Cumberland Road, deposited waste included commercial and household waste;
- Eastney Farm Gravel Pit (BGS Recorded Mineral Extraction Site) is recorded adjacent south of Melville Road and 100 m south of Fort Cumberland Road. This

is recorded as opencast and ceased and is recorded as a swimming baths from 1909; and

- A Category 3 – Minor pollution incident to controlled waters is recorded approximately 500 m north-east of Fort Cumberland Road associated with gas oil dated 18 April 1996.

18.5.11.9 Historical mapping indicates that the route from the Landfall to the junction with Eastern Road passes along existing tracks and roads that have been present prior to the earliest available mapping (1870). The Landfall area has a military history that pre-dates the earliest available maps. Fort Cumberland has been present since the 1740s and is located 100 m east of the proposed Landfall area. The Landfall area is labelled as Fraser Range on current mapping and was used as a firing range out towards sea until 2006. The area is now reportedly abandoned. A Gas chamber, which later formed part of Fraser Range has been noted 20 m west of Fort Cumberland Road. The Rifle Range and Fraser Range are located on the route. A sea service battery and central gunnery school eastern barracks is noted from 1933 to 1992 75 m south of Fort Cumberland Road and was residential housing from 1992. A Musketry Hut was located 100 m north of Fort Cumberland Road from 1909 to 1942 and then a caravan park until present. A sewage pumping station, later noted as a refuse destructor was located adjacent north of Fort Cumberland Road from 1881.

18.5.12 FUTURE BASELINE

18.5.12.1 Assuming no future development of the Site is undertaken, there are unlikely to be any significant changes in relation to baseline ground conditions.

18.6 PREDICTED IMPACTS

18.6.1.1 This section assesses the potential effects of the Proposed Development on Ground Conditions. The assessment uses the information that is available at the PEIR stage, of the Construction Stage on the receptors identified in the baseline study and on the underlying and surrounding geology. 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.

18.6.2 SECTION 1 – LOVEDEAN (CONVERTER STATION AREA)

Construction

18.6.2.1 It is noted that FOC infrastructure within this section is anticipated to comprise infrastructure (including buildings) within the Converter Station Area, immediately adjoining (but outside) the Converter Station perimeter fence. It is considered that there are unlikely to be any ground related impact to potential receptors associated with these structures. However, this will be assessed in more detail in the ES Chapter once details of the size, nature and location of the FOC infrastructure have been established.

Geology

- 18.6.2.2 Contamination is anticipated to be localised and associated with historic 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 Low and the magnitude of change is considered to be Low resulting in a **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Site Users and Adjacent Site Users

- 18.6.2.3 Site users and adjacent site users could be impacted during construction through direct contact, ingestion and inhalation of contaminated soils and possibly also contaminated ground water. The sensitivity of Site users and adjacent site users is Low, and the magnitude of change, prior to mitigation, is considered to be Low, resulting in a **Minor** effect on human health workers prior to the implementation of mitigation measures.

Water Environment

- 18.6.2.4 Exposure of contaminated soils 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. The sensitivity of controlled waters receptors (The Tarrant Chalk Member Principal Aquifer and the Head Deposits Secondary Undifferentiated Aquifer) is High and the magnitude of change, prior to mitigation is considered to be Medium, resulting in a Major to Moderate effect on controlled waters prior to the implementation of mitigation measures.
- 18.6.2.5 Spillages could affect groundwater by a vertical migration mechanism. The sensitivity of the controlled waters (Principal and Secondary (Undifferentiated) Aquifers) receptors is High, and the magnitude of change, prior to mitigation, considered to be Medium, resulting in a Major to Moderate effect on controlled waters prior to the implementation of mitigation measures.
- 18.6.2.6 As part of the construction process potentially contaminated material may be removed off-site. Removal of these materials would result in betterment of groundwaters at the Site.
- 18.6.2.7 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.

On Site Infrastructure

- 18.6.2.8 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. The sensitivity of buried services

is Medium and the magnitude of change is Low resulting in a **Minor to Moderate** effect on potable water supply pipes and buried services prior to the implementation of mitigation measures.

Operation

Geology and Soils

18.6.2.9 Once the Proposed Development has been constructed, all necessary remediation 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 **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Sites User and Adjacent Site Users

18.6.2.10 It is unlikely that humans will come into contact with geology or soils however this occurs in areas such as landscaping. It may be possible for maintenance workers to come into contact with soil or groundwater if cables need to be replaced. 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 **Minor** effect on human health prior to the implementation of mitigation measures.

Water Environment

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

- Leaching of contaminants from soils;
- Introduction of preferential pathways, e.g. piles, through low permeability layers;
- Migration of contaminated groundwater from upgradient sources; and
- Mobilisation via overground/surface water runoff following earthworks including cable replacement.

18.6.2.12 The sensitivity of the controlled waters receptors (The Tarrant Chalk Member Principal Aquifer and the Head Deposits Secondary Undifferentiated Aquifer) is High, and the magnitude of change is considered to be Low, resulting in **Moderate** effect on controlled water receptors prior to the implementation of mitigation measures.

18.6.2.13 Once the proposed mitigation measures have been undertaken (see Section 18.7) it is anticipated that magnitude of the change to controlled waters Principal, and Secondary (A) Aquifers) receptors will reduce to **Negligible** and the sensitivity will be Low. There will be a Negligible and not significant effect on controlled waters receptors following the implementation of mitigation measures.

On Site Infrastructure

- 18.6.2.14 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.
- 18.6.2.15 The sensitivity of buried concrete is Medium, the magnitude of change, prior to mitigation is considered to be Low, resulting in a Minor to Moderate effect on buried concrete prior to the implementation of mitigation measures.
- 18.6.2.16 There is the potential for ground based contamination to detrimentally affect potable water supply pipes. The sensitivity of potable water supply pipes is Medium, the magnitude of change prior to mitigation is Low, resulting in a **Minor to Moderate** effect on potable water supply pipes prior to the implementation of mitigation measures.

Decommissioning

- 18.6.2.17 Whilst the Project is designed to provide permanent electrical infrastructure, there may come a time where it may be appropriate to decommission the equipment. When it is considered suitable, the decommissioning of the station will involve each item of equipment being removed for recycling or disposal, as appropriate. In this scenario, potential impacts on geology, site users and adjacent site users, water environment and on-site infrastructure are expected to be similar or identical to those detailed for the construction period.

18.6.3 SECTIONS 2-9 - ONSHORE CABLE CORRIDOR

Construction

Geology

- 18.6.3.1 Contamination is anticipated to be localised associated with historic 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 Low and the magnitude of change is considered to be Low resulting in a **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Site Users and Adjacent Site Users

- 18.6.3.2 Sites users and adjacent site users could be impacted during construction through direct contact, ingestion and inhalation of contaminated soils and possibly also contaminated ground water. The sensitivity of site users and adjacent site users is Low, and the magnitude of change, prior to mitigation, is considered to be Low, resulting in a **Minor** effect on human health workers prior to the implementation of mitigation measures.

Water Environment

18.6.3.3 Exposure of contaminated soils 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 by a vertical migration mechanism.

18.6.3.4 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 18.5.

18.6.3.5 The controlled water receptors are as follows:

Principal Aquifers:

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

Secondary A Aquifers:

- The Lambeth Group (Cable section 3, 4, 5);
- The River Terrace Deposits (Cable Section 5, 6, 7, 8, 9);
- The Wittering Formation (Cable Section 4, 9);
- Bognor Sand Member (Cable Section 4, 8, 9);
- Portsmouth Sand Member (Cable Section 4, 8, 9); and
- Whitecliff Sand Member (Cable Section 4, 8, 9).

Secondary Undifferentiated Aquifers:

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

18.6.3.6 As part of the construction process potentially contaminated material may be removed off-site. Removal of these materials would result in betterment of groundwaters at the Site.

18.6.3.7 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.

18.6.3.8 Construction activities such as HDD and/or trenching could affect groundwater by creating preferential pathways for contaminants. Presently 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. This will reduce/remove hydraulic linkages between the HDD works and the Principal Aquifer. However, HDD could affect groundwater by creating preferential pathways for contaminants within Section 9, Section 7 and Section 6, without the implementation of mitigation measures.

On Site Infrastructure

18.6.3.9 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. The sensitivity of buried services is Medium and the magnitude of change is Low resulting in a **Minor to Moderate** effect on potable water supply pipes and buried services prior to the implementation of mitigation measures.

18.6.3.10 Table 18.5 lists the predicated impacts during the Construction Stage for each section of the Onshore Cable Route.

Table 18.5 – Predicted Impacts during Construction Stage

Predicated Impacts	Section	Sensitivity	Magnitude of change	Effect
Geology and Soils	2, 3, 4, 5,6,7,8,9	Low	Low	Minor
Site User and Adjacent Site Users	2,3,4,5,6,7,8,9	Low	Low	Minor
Water Environment	2,3, 5, 6, 7	High	Medium	Major to Moderate
	4, 8, 9	Medium	Medium	Moderate
On Site Infrastructure	2,3,4,5,6,7,8,9	Medium	Low	Minor to Moderate

Operation

Geology and Soils

- 18.6.3.11 Once the Proposed Development has been constructed, all necessary remediation will have been undertaken, however there may be some impact to the geology and soils in rural areas. The sensitivity to geology receptors is Low and the magnitude of change is considered to be Low, resulting in a **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Sites User and Adjacent Site Users

- 18.6.3.12 It is unlikely that humans will come into contact with geology or soils however this occurs in areas such as landscaping. It may be possible for maintenance workers to come into contact with soil or groundwater. 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 **Minor** effect on human health prior to the implementation of mitigation measures.

Water Environment

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

- Leaching of contaminants from soils;
- Introduction of preferential pathways, e.g. piles, through low permeability layers;
- Migration of contaminated groundwater from upgradient sources; and
- Mobilisation via overground/surface water runoff following earthworks.

- 18.6.3.14 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 Route are shown in Chapter 19 Water Resources and Flood Risk.

- 18.6.3.15 The controlled water receptors are as follows:

Principal Aquifers:

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

Secondary A Aquifers:

- The Lambeth Group (Cable section 3, 4, 5);
- The River Terrace Deposits (Cable Section 5, 6, 7, 8, 9);
- The Wittering Formation (Cable Section 4, 9);
- Bognor Sand Member (Cable Section 4, 8, 9);
- Portsmouth Sand Member (Cable Section 4, 8, 9); and
- Whitecliff Sand Member (Cable Section 4, 8, 9).

Secondary Undifferentiated Aquifers:

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

On Site Infrastructure

- 18.6.3.16 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.
- 18.6.3.17 The sensitivity of buried concrete is Medium, the magnitude of change, prior to mitigation is considered to be Low, resulting in a **Minor to Moderate** effect on buried concrete prior to the implementation of mitigation measures.
- 18.6.3.18 There is the potential for ground based contamination to detrimentally affect potable water supply pipes. The sensitivity of potable water supply pipes is Medium, the magnitude of change prior to mitigation is Low, resulting in a **Minor to Moderate** effect on potable water supply pipes prior to the implementation of mitigation measures.
- 18.6.3.19 Table 18.6 – Predicted Impact During Operational Stage lists the predicated impacts during the Operational Stage for each section of the Onshore Cable Route.

Table 18.6 - Predicted Impacts during Operational Stage

Predicated Impacts	Section	Sensitivity	Magnitude of change	Significance
Geology and Soils	2,3,4,5,6,7,8,9	Low	Low	Minor
Site User and Adjacent Site Users	2,3,4,5,6,7,8,9	Low	Low	Minor

Water Environment	2,3,5,6,7	High	Low	Moderate
	4,8,9	Medium	Low	Minor to Moderate
On Site Infrastructure	2,3,4,5,6,7,8,9	Medium	Low	Minor to Moderate

Decommissioning

18.6.3.20 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. When it is considered suitable, the decommissioning of the station will involve each item of equipment being removed for recycling or disposal, as appropriate. In this scenario, potential impacts on geology, site users and adjacent site users, water environment and on-site infrastructure are expected to be similar or identical to those detailed for the construction period.

18.6.4 SECTION 10 – EASTNEY (LANDFALL)

Construction

18.6.4.1 It is noted that the anticipated FOC infrastructure, i.e. up to two Optical Regeneration Stations, will be located within approximately 1 km of the Landfall. It is considered that there are unlikely to be any ground related impact to potential receptors associated with these structures. However, this will be assessed in more detail in the ES Chapter once details of the size, nature and location of the FOC infrastructure have been established.

Geology

18.6.4.2 Contamination is anticipated to be localised associated with historic 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 Low and the magnitude of change is considered to be Low resulting in a **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Site Users and Adjacent Site Users

18.6.4.3 Sites users and adjacent site users could be impacted during construction through direct contact, ingestion and inhalation of contaminated soils and possibly also contaminated ground water. The sensitivity of Site users and adjacent site users is Low, and the magnitude of change, prior to mitigation, is considered to be Low, resulting in a **Minor** effect on human health workers prior to the implementation of mitigation measures.

Water Environment

- 18.6.4.4 Exposure of contaminated soils may increase the leachability of contaminants to groundwater specifically Secondary (A) and Secondary (Undifferentiated) Aquifers, if contaminants or groundwater is present. This leachate could affect controlled waters by vertical and lateral migration. The sensitivity of controlled waters receptors (The River Terrace Deposits, the Wittering Formation, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member Secondary A Aquifers and the Raised Marine Deposits (Secondary Undifferentiated Aquifer) is Medium and the magnitude of change, prior to mitigation is considered to be Medium, resulting in a **Moderate** effect on controlled waters prior to the implementation of mitigation measures.
- 18.6.4.5 Spillages could affect groundwater by a vertical migration mechanism. The sensitivity of the controlled waters (Secondary A and Secondary Undifferentiated Aquifers) receptors is Medium, and the magnitude of change, prior to mitigation, considered to be Medium, resulting in a **Moderate** effect on controlled waters prior to the implementation of mitigation measures.
- 18.6.4.6 As part of the construction process potentially contaminated material may be removed off-site. Removal of these materials would result in betterment of groundwaters at the Site.
- 18.6.4.7 Construction activities such as HDD and/or trenching could affect groundwater by creating preferential pathways for contaminants. The sensitivity of the controlled waters (Secondary A and Secondary Undifferentiated Aquifers) receptors is Medium, and the magnitude of change prior to mitigation, considered to be Medium, resulting in a **Moderate** effect on controlled waters prior to the implementation of mitigation measures.
- 18.6.4.8 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.

On Site Infrastructure

- 18.6.4.9 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. The sensitivity of buried services is Medium and the magnitude of change is Low resulting in a **Minor to Moderate** effect on potable water supply pipes and buried services prior to the implementation of mitigation measures.

Operation

Geology and Soils

- 18.6.4.10 Once the Proposed Development has been constructed, all necessary remediation will have been undertaken, however there may be some impact to the geology and soils in rural areas. The sensitivity to geology receptors is Low and the magnitude of change is considered to be Low, resulting in a **Minor** effect on geology receptors prior to the implementation of mitigation measures.

Sites User and Adjacent Site Users

- 18.6.4.11 It is unlikely that humans will come into contact with geology or soils however this occurs in areas such as landscaping. It may be possible for maintenance workers to come into contact with soil or groundwater. 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 **Minor** effect on human health prior to the implementation of mitigation measures.

Water Environment

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

- Leaching of contaminants from soils;
- Introduction of preferential pathways, e.g. piles, through low permeability layers;
- Migration of contaminated groundwater from upgradient sources; and
- Mobilisation via overground/surface water runoff following earthworks.

- 18.6.4.13 The sensitivity of the controlled waters receptors (The River Terrace Deposits, the Wittering Formation, the Bognor Sand Member, Portsmouth Sand Member and the Whitecliff Sand Member Secondary A Aquifers and the Raised Marine Deposits Secondary Undifferentiated Aquifer) is Medium, and the magnitude of change is considered to be Low, resulting in **Minor to Moderate** effect on controlled water receptors prior to the implementation of mitigation measures.

On Site Infrastructure

- 18.6.4.14 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.

18.6.4.15 The sensitivity of buried concrete is Medium, the magnitude of change, prior to mitigation is considered to be Low, resulting in a **Minor to Moderate** effect on buried concrete prior to the implementation of mitigation measures.

18.6.4.16 There is the potential for ground based contamination to detrimentally affect potable water supply pipes. The sensitivity of potable water supply pipes is Medium, the magnitude of change prior to mitigation is Low, resulting in a **Minor to Moderate** effect on potable water supply pipes prior to the implementation of mitigation measures.

Cumulative Impact Assessment

18.6.4.17 The potential for cumulative impacts has been considered for the construction and operation stages of the Proposed Development.

18.6.4.18 The zone of influence for the assessment of cumulative effects is the same as the study area for the assessment as follows:

- within the Onshore Cable Corridor;
- within 500 m of the Onshore Cable Corridor for Human Health Receptors; and
- within 1 km for Controlled Water Receptors.

18.6.4.19 The implementation of the mitigation measures set out within Section 18.7 below will ensure that potential for soil and water pollution during construction and operation is minimised to an acceptable level.

18.6.4.20 The Proposed Development would remove (where necessary) and remediate (where required) sources of contamination, so any unacceptable contamination in the soil and groundwater would be mitigated.

18.6.4.21 Therefore, providing all necessary remediation/ mitigation measures are implemented, it is considered likely that the Proposed Development will have a negligible cumulative effect in conjunction with other committed developments on the adjacent environment with regard to contamination and ground conditions, where existing ground contamination is removed/remediated.

18.6.4.22 However, during the Construction Stage, it is considered that cumulative effects may arise through the Onshore Cable Route options particularly where the route goes through historical landfills. Significant effects can be mitigated through the implementation of appropriate management measures resulting in a negligible cumulative effect.

Decommissioning

18.6.4.23 Whilst the Project is designed to provide permanent electrical infrastructure, there may come a time where it may be appropriate to decommission the equipment. When it is considered suitable, the decommissioning of the station will involve each item of equipment being removed for recycling or disposal, as appropriate. In this scenario, potential impacts on geology, site users and adjacent site users, water environment

and on-site infrastructure are expected to be similar or identical to those detailed for the construction period.

18.7 PROPOSED MITIGATION

18.7.1 SECTION 1 – LOVEDEAN (CONVERTER STATION AREA)

Construction

18.7.1.1 Detailed mitigation measures will be determined once ground investigations have been completed and will be fully considered within the ES. The ground investigation will determine whether further works, for example, remediation and validation, are required prior to the commencement of construction works.

Geology and soils

18.7.1.2 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.

18.7.1.3 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.

Controlled Waters

18.7.1.4 Where contaminated soils/waters are identified as posing unacceptable risks to controlled waters consideration will be given to remediation in those area to minimise the risks.

18.7.1.5 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 the risks.

18.7.1.6 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.

18.7.1.7 Water removed from any excavations will be disposed of or discharged in accordance with Environment Agency requirements.

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

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

Site Users and Adjacent Site users

- 18.7.1.9 Throughout all site works undertaken a Construction Phase Plan ('CPP') should be completed to ensure the protection of workers and the general public during the Construction Stage, which will specify appropriate safe working practices. These measures are likely to include provision of appropriate Personal Protective Equipment ('PPE') and Respiratory Protective Equipment ('RPE') for the proposed tasks and identified contamination.
- 18.7.1.10 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).
- 18.7.1.11 The reuse of soil on Site 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.

On Site Infrastructure

- 18.7.1.12 Assessment of the ground conditions during the ground investigation and at detailed design stage together with the implementation of appropriate remediation measures and design specifications such as clean inert trench fill and sulphate resistant concrete are likely to minimise the risk to onsite infrastructure.

Residual Effects

- 18.7.1.13 Given the proposed mitigation measures, any remaining impacts posed by any potentially contaminated soils/groundwaters to site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** effect on human health receptors following the implementation of mitigation measures.
- 18.7.1.14 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters (Principal, and Secondary (A) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on controlled waters receptors following the implementation of mitigation measures.
- 18.7.1.15 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to geology receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on geology receptors following the implementation of mitigation measures.

18.7.1.16 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on site infrastructure receptors following the implementation of mitigation measures.

Operation

Sites Users and Adjacent Site Users including Controlled Waters

18.7.1.17 Appropriate remedial measures, informed by the results of the ground investigation, will be undertaken where required in areas such as landscaping where humans could interact with the geology and soils. The remedial measures will be designed to break the contaminant linkage by treating or removing the contamination source or pathway thereby reducing the potential risks to receptors to appropriate levels.

On Site Infrastructure

18.7.1.18 To prevent any negative 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 (BRE, 2017).

18.7.1.19 Findings of the ground investigation will inform detailed design such as the best option for the Onshore Cable Route, to ensure that they do not impact the geology and soils such as introducing new contamination pathways.

Residual Effects

18.7.1.20 Given the proposed mitigation measures, any remaining impact posed by any potentially contaminated soils/groundwaters to construction site personnel and site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** and not significant effect on human health receptors following the implementation of mitigation measures.

18.7.1.21 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters Principal, and Secondary (A) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** and not significant effect on controlled waters receptors following the implementation of mitigation measures.

18.7.1.22 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** and not significant effect on site infrastructure receptors following the implementation of mitigation measures.

18.7.2 SECTIONS 2-10 - ONSHORE CABLE CORRIDOR AND EASTNEY (LANDFALL)

Construction

- 18.7.2.1 Detailed mitigation measures will be determined once ground investigations have been completed and will be fully considered within the ES. The ground investigation will determine whether further works, for example, remediation and validation, are required prior to the commencement of construction works.

Geology and soils

- 18.7.2.2 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.
- 18.7.2.3 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.

Controlled Waters

- 18.7.2.4 Where contaminated soils/waters are identified as posing unacceptable risks to controlled waters consideration will be given to remediation in those area to minimise the risks.
- 18.7.2.5 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 the risks.
- 18.7.2.6 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.
- 18.7.2.7 Water removed from any excavations will be disposed of or discharged in accordance with Environment Agency requirements.
- 18.7.2.8 Construction activities should also be undertaken in accordance with appropriate CIRIA guidance. Specifically, this should include:
- CIRIA C741. Environmental Good Practice on site (4th Edition) (CIRIA C741, 2015) and
 - CIRIA C532. Control of Water Pollution from Construction Sites (CIRIA C532, 2001).

Site Users and Adjacent Site users

- 18.7.2.9 Throughout all site works undertaken a CPP should be completed to ensure the protection of workers and the general public during the Construction Stage, which will specify appropriate safe working practices. These measures are likely to include provision of appropriate PPE and RPE for the proposed tasks and identified contamination.

- 18.7.2.10 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).

18.7.2.11 The reuse of soil on the Site 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.

On Site Infrastructure

18.7.2.12 Assessment of the ground conditions during the ground investigation and at detailed design stage together with the implementation of appropriate remediation measures and design specifications such as clean inert trench fill and sulphate resistant concrete are likely to minimise the risk to onsite infrastructure.

Residual Effects

18.7.2.13 Given the proposed mitigation measures, any remaining impacts posed by any potentially contaminated soils/groundwaters to site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** effect on human health receptors following the implementation of mitigation measures.

18.7.2.14 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters (Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on controlled waters receptors following the implementation of mitigation measures.

18.7.2.15 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to geology receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on geology receptors following the implementation of mitigation measures.

18.7.2.16 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on site infrastructure receptors following the implementation of mitigation measures.

Operation

Sites Users and Adjacent Site including Controlled Waters

- 18.7.2.17 Appropriate remedial measures, informed by the results of the ground investigation, will be undertaken where required in areas such as landscaping where humans could interact with the geology and soils. The mitigation measures for the Construction Stage will be applied if cable replacement is needed during the Operational Stage. The remedial measures will be designed to break the contaminant linkage by treating or removing the contamination source or pathway thereby reducing the potential risks to receptors to appropriate levels.

On Site Infrastructure

- 18.7.2.18 To prevent any negative 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 (BRE, 2017).

- 18.7.2.19 Findings of the ground investigation will inform detailed design such as the best option for the Onshore Cable Route, to ensure that they do not impact the geology and soils such as introducing new contamination pathways.

Residual Effects

- 18.7.2.20 Given the proposed mitigation measures, any remaining impact posed by any potentially contaminated soils/groundwaters to construction site personnel and site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** effect on human health receptors following the implementation of mitigation measures.
- 18.7.2.21 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters Principal, Secondary (A) and Secondary (Undifferentiated) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on controlled waters receptors following the implementation of mitigation measures.
- 18.7.2.22 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect at the Landfall.

Construction

- 18.7.2.23 Detailed mitigation measures will be determined once ground investigations have been completed and will be fully considered within the ES. The ground investigation will determine whether further works, for example, remediation and validation, are required prior to the commencement of construction works.

Geology and soils

- 18.7.2.24 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.
- 18.7.2.25 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the CEMP.

Controlled Waters

- 18.7.2.26 Where contaminated soils/waters are identified as posing unacceptable risks to controlled waters consideration will be given to remediation in those area to minimise the risks.
- 18.7.2.27 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 the risks.
- 18.7.2.28 The Proposed Development will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the full CEMP.
- 18.7.2.29 Water removed from any excavations will be disposed of or discharged in accordance with Environment Agency requirements.
- 18.7.2.30 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).

Site Users and Adjacent Site users

- 18.7.2.31 Throughout all site works undertaken a CPP should be completed to ensure the protection of workers and the general public during the Construction Stage, which will specify appropriate safe working practices. These measures are likely to include provision of appropriate PPE and RPE for the proposed tasks and identified contamination.

- 18.7.2.32 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).

18.7.2.33 The reuse of soil on the Site 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.

On Site Infrastructure

18.7.2.34 Assessment of the ground conditions during the ground investigation and at detailed design stage together with the implementation of appropriate remediation measures and design specifications such as clean inert trench fill and sulphate resistant concrete are likely to minimise the risk to onsite infrastructure.

Residual Effects

18.7.2.35 Given the proposed mitigation measures, any remaining impacts posed by any potentially contaminated soils/groundwaters to site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** effect on human health receptors following the implementation of mitigation measures.

18.7.2.36 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters (Secondary (A) and Secondary (Undifferentiated) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on controlled waters receptors following the implementation of mitigation measures.

18.7.2.37 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to geology receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on geology receptors following the implementation of mitigation measures.

18.7.2.38 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on site infrastructure receptors following the implementation of mitigation measures.

Operation

Sites Users and Adjacent Site Users including Construction Workers and Controlled Waters

- 18.7.2.39 Appropriate remedial measures, informed by the results of the ground investigation, will be undertaken where required in areas such as landscaping where humans could interact with the geology and soils. The remedial measures will be designed to break the contaminant linkage by treating or removing the contamination source or pathway thereby reducing the potential risks to receptors to appropriate levels.

On Site Infrastructure

- 18.7.2.40 To prevent any negative 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 (BRE, 2017).
- 18.7.2.41 Findings of the ground investigation will inform detailed design such as the best option for the Onshore Cable Route, to ensure that they do not impact the geology and soils such as introducing new contamination pathways.

Residual Effects

- 18.7.2.42 Given the proposed mitigation measures, any remaining impact posed by any potentially contaminated soils/groundwaters to construction site personnel and site users and neighbouring site users is anticipated to be negligible due to the magnitude of change reducing to Low and the sensitivity reducing to Negligible. There will be a **Negligible** effect on human health receptors following the implementation of mitigation measures.
- 18.7.2.43 Once the proposed mitigation measures have been undertaken it is anticipated that magnitude of the change to controlled waters, (Secondary (A) and Secondary (Undifferentiated) Aquifers) receptors will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on controlled waters receptors following the implementation of mitigation measures.
- 18.7.2.44 Once the proposed mitigation measures have been undertaken it is anticipated that the magnitude of change to onsite infrastructure will reduce to Negligible and the sensitivity will be Low. There will be a **Negligible** effect on site infrastructure receptors following the implementation of mitigation measures.

18.8 SUMMARY AND CONCLUSIONS

- 18.8.1.1 A preliminary assessment has been undertaken of the impact of the Proposed Development from potential contamination and subsequent impacts on human health, controlled waters and the environment. An assessment of potential impact on sensitive geological receptors and mineral reserves has also been presented.

18.8.2 BASELINE

18.8.2.1 A review of the baseline environment has been provided for the Converter Station Area, the Landfall area, and each of the sections of the route in between including alternate route options where required. For each section, the baseline review includes details of designated sites, hydrogeology and hydrology, bedrock geology, superficial geology, radon, and potentially contaminated sites within a 500 m buffer from the Site Boundary. Identified potential sources and sensitive receptors are shown on a series of constraints drawings provided in Volume 2 of this PEIR, Figures 18.1 to 18.5.

18.8.3 ASSESSMENT AND MITIGATION

18.8.3.1 Impacts upon human receptors are considered likely during the Construction Stage without appropriate remediation and management of potential risks through the CDM Regulations, the development of Method Statements and Risk Assessments and the use of good construction practices.

18.8.3.2 Impacts upon controlled water receptors (Principal, Secondary A and Secondary Undifferentiated Aquifers) are considered likely during the Construction Stage without appropriate remediation and management of potential risks through the CDM Regulations, the development of Method Statements and Risk Assessments and the use of good construction practices.

18.8.4 CONCLUSION

18.8.4.1 On completion of the ground investigation works and subsequent assessment of the potential contamination sources, the potential construction and operational impacts will be further assessed and appropriate mitigation developed to minimise the potential impacts. However, in view of the information currently available and following the implementation of the mitigation measures outlined above, it is considered that residual significant effects upon geology and land quality will be **Negligible**.

18.8.4.2 With the application of the mitigation measures outlined in Section 18.7 all the effects assessed are reduced to **Negligible** and not significant.

18.8.4.3 Details of required further work are outlined in Section 18.9.

18.9 ASSESSMENTS AND SURVEYS STILL TO BE UNDERTAKEN

18.9.1.1 A ground investigation at the Converter Station Area commenced in April 2018 and ground investigation along the Onshore Cable Corridor commenced in July 2018 with the purpose of further informing the Onshore Cable Route options and to provide further information that has help to inform, this geology, soils and contamination assessment.

- 18.9.1.2 The ground investigation works included chemical testing of soil and groundwater samples however the results from these are yet to be presented in full. A subsequent interpretative report will be issued and will include human health and controlled waters risk assessments and an assessment of the potential contaminant linkages that can be discounted and those that are considered to pose an unacceptable risk.
- 18.9.1.3 The ES will summarise the assessments within the Land Contamination Interpretative Report including the areas where remediation is necessary to minimise potential risks.
- 18.9.1.4 Further ground investigations along the Onshore Cable Corridor may be undertaken in 2019, if required, as well as an assessment of solution features and further consultations with HBC, PCC, EHDC, WCC.
- 18.9.1.5 As the design is defined and more design information emerges the assessment will be refined and outlined in the ES.

REFERENCES

- BS 8061:2013 . (2013). Specification for Subsoil.
- Building Research Establishment (BRE). (2017). Special Digest 1. 3rd Edition (including February 2018 amendments), Concrete in aggressive ground.
- CIRA C741. (2015). Environmental Good Practice on site (4th Edition).
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