# Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

## Preliminary Environmental Information Report

**Volume 1**

## Chapter 19 - Onshore Ground Conditions and Contamination

April 2021

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## Glossary of Acronyms

| | |
|---|---|
| BGS | British Geological Survey |
| BS | British Standard |
| BSI | British Standards Institution |
| CDM | Construction Design Management |
| CEMP | Construction Environmental Plan |
| CIA | Cumulative Impact Assessment |
| CoCP | Code of Construction Practice |
| COSHH | Control of Substances Hazardous to Health |
| DCO | Development Consent Order |
| DECC | Department for Energy and Climate Change |
| DEFRA | Department for the Environment, Food and Rural Affairs |
| DEP | Dudgeon Offshore Wind Farm Extension Project |
| EA | Environment Agency |
| EC | European Commission |
| EIA | Environmental Impact Assessment |
| EPP | Evidence Plan Process |
| EQS | Environmental Quality Standards |
| ES | Environmental Statement |
| ETG | Expert Topic Group |
| EU | European Union |
| GIS | Geographical Information System |
| HDD | Horizontal Directional Drilling |
| HVAC | High-Voltage Alternating Current |
| HVDC | High-Voltage Direct Current |
| km | Kilometre |
| LNR | Local Nature Reserve |
| MMP | Materials Management Plan |
| NPPF | National Planning Policy Framework |
| NPS | National Policy Statement |
| NSIP | Nationally Significant Infrastructure Project |
| NVZ | Nitrate Vulnerable Zone |
| OS | Ordnance Survey |

| | |
|---|---|
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| PCOC | Potential Contaminants of Concern |
| PEIR | Preliminary Environmental Information Report |
| PPE | Personal Protective Equipment |
| PPG | Planning Practice Guidance |
| PRA | Preliminary Risk Assessment |
| PRoW | Public Right of Way |
| SAC | Special Areas of Conservation |
| SEP | Sheringham Shoal Offshore Wind Farm Extension Project |
| SPA | Special Protection Area |
| SPZ | Source Protection Zone |
| SSSI | Site of Special Scientific Interest |
| SBCO | Statuary Nature Conservation Organisation |
| SVOC | Semi Volatile Organic Contaminants |
| WFD | Water Framework Directive |
| VOC | Volatile Organic Contaminants |

## Glossary of Terms

| | |
|---|---|
| The Applicant | Equinor New Energy Limited |
| DCO boundary | The area subject to the application for development consent, including all permanent and temporary works for DEP and SEP. The DCO boundary will be subject to updated impact assessment and further development of mitigation proposals to inform the ES. |
| The Dudgeon Offshore Wind Farm Extension Project (DEP) | The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |
| Dudgeon Offshore Wind Farm Extension site | The Dudgeon Offshore Wind Farm Extension lease area. |
| Horizontal directional drilling (HDD) zones | The areas within the onshore cable route which would house HDD entry or exit points. |
| Jointing bays | Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts. |
| Landfall | The point at the coastline at which the offshore export cables are brought onshore and connected to the onshore export cables. |
| Onshore cable corridor | The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction. |
| Onshore substation sites | Parcels of land within onshore substation zones A and B, identified as the most suitable location for development of the onshore substation. Two sites have been identified for further assessment within the PEIR. |
| Onshore substation zone | Parcels of land within the wider onshore substation search area identified as suitable for development of the onshore substation. Two substation zones (A and B) have been identified as having the greatest potential to accommodate the onshore substation. |
| PEIR boundary | The area subject to survey and preliminary impact assessment to inform the PEIR, including all permanent and temporary works for DEP and SEP. The PEIR boundary will be refined down to the final DCO boundary ahead of the application for development consent. |
| Study area | Area where potential impacts from the project could occur, as defined for each individual EIA topic. |

| | |
|---|---|
| Sheringham Shoal Offshore Wind Farm Extension site | Sheringham Shoal Offshore Wind Farm Extension lease area. |
| The Sheringham Shoal Offshore Wind Farm Extension Project (SEP) | The Sheringham Shoal Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |
| Transition joint bay | Connects offshore and onshore export cables at the landfall. The transition joint bay will be located above mean high water. |

# 19 GROUND CONDITIONS AND CONTAMINATION

## 19.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the potential impacts of the proposed Dudgeon Offshore Wind Farm Extension Project (DEP) and Sheringham Shoal Offshore Wind Farm Extension Project (SEP) on ground conditions and contamination and how this could affect human health, the natural and the built environment. The chapter provides an overview of the existing environment for the proposed onshore development area, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of DEP and SEP.
2. This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary source are the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) are presented in **Section 19.4**.
3. The assessment should be read in conjunction with following linked chapters:
   - **Chapter 20 Water Resources and Flood Risk**;
   - **Chapter 21 Land Use and Agriculture**;
   - **Chapter 22 Onshore Ecology and Ornithology**; and
   - **Chapter 30 Health**.
4. Additional information to support the ground conditions and contamination assessment includes:
   - **Appendix 19.1 Land Quality Desk Study and Preliminary Risk Assessment Report**; and
   - **Appendix 19.2 Waste Assessment**

## 19.2 Consultation

5. Consultation with regard to ground conditions and contamination has been undertaken in line with the general process described in Chapter 6 EIA Methodology. **Table 19.1** provides a summary of the consultation received that is relevant to this chapter and how the consultation responses received to date have influenced the approach that has been taken.
6. This chapter will be updated following the consultation on the PEIR in order to produce the final assessment that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report alongside the DCO application.

*Table 19.1: Consultation responses.*

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| PINS | Scoping Opinion, 2020 | Table 3-2 of the Scoping Report has scoped out all operational impacts on ground conditions and contamination, although the potential for operational impacts is identified in terms of resource extraction and Mineral Safeguarding Areas. Despite the limited justification provided, given the operational nature of the Proposed Development, the Inspectorate does not consider that significant effects to human health are likely during the operational stage and therefore agrees these matters can be scoped out of the ES. | Operational impacts on Mineral Safeguarding Areas has been discussed in **Section 19.6.2**. |
| PINS | Scoping Opinion, 2020 | With regard to operational impacts to controlled waters, the Water Resources and Flood Risk chapter to the Scoping Report acknowledges the potential for supply of contaminants during the operational phase (paragraph 604). Accordingly, the Inspectorate does not agree that operational impacts to controlled waters from the alterations to exposure pathways and the introduction of new contaminant sources can be scoped out of this aspect chapter.<br>The Inspectorate does, however, agree that impacts to controlled waters due to the disturbance and mobilisation of contaminants from existing sources are unlikely to result in significant effects and can be scoped out of the ES. | Existing environment is discussed in **Section 19.5**. Impacts are set out in **Section 19.6** and **19.7**. **Chapter 20 Water Resources and Flood Risk** also discusses impacts to controlled waters. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| PINS | Scoping Opinion, 2020 | Paragraph 578 identifies geological Sites of Special Scientific Interest (SSSIs) at both landfall search areas and at the edge of the substation search area. No justification has been provided to demonstrate that there would be no significant effects to these sites during operation. As such, the Inspectorate is unable to agree that this matter can be scoped out at this stage. For the same reason, the Inspectorate also does not agree that cumulative impacts during operation can be scoped out. | Existing environment is discussed in **Section 19.5**. Potential impacts on geological SSSIs are considered in **Sections 19.6** and **19.7**. |
| PINS | Scoping Opinion, 2020 | Paragraph 587 states that the decommissioning impacts would be similar in nature to those for construction, although the magnitude of effect is likely to be lower. There is no specific justification for not including impacts to human health or controlled waters during decommissioning within the scope of the assessment.<br>As such, the Planning Inspectorate cannot agree to removing these matters from the scope of the assessment. | Impacts associated with decommissioning and the potential impacts to human health and controlled waters are discussed in **Section 19.6.3**. Additional assessments in relation to human health and controlled waters can be found in **Chapter 20 Water Resources and Flood Risk** and **Chapter 30 Health**. |
| PINS | Scoping Opinion, 2020 | Table 3-2 proposes to scope out transboundary impacts to ground conditions and contamination, although no justification is provided within the aspect chapter. Nevertheless, given the nature of the Proposed Development in this regard the | Transboundary effects to ground conditions and contamination are not anticipated as a result of DEP and SEP, therefore they |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| | | Inspectorate agrees that significant transboundary effects are unlikely and therefore this matter can be scoped out of the ES. | have been scoped out of this chapter. |
| PINS | Scoping Opinion, 2020 | Paragraph 574 of the Scoping Report explains that the onshore ground conditions and contamination study area is the same as the onshore scoping area described in section 1.4 of the Scoping Report. The ES should justify the extent of the study areas used in the assessment in relation to the general 500m and 3km buffer zones around the cable corridor and onshore substation respectively used to define the onshore scoping area. | Justification of the ground conditions and contamination study area is given in **Appendix 19.1**. |
| PINS | Scoping Opinion, 2020 | Paragraphs 582 and 586 of the Scoping Report identify potential construction and operational impacts on Mineral Safeguarding Areas; these areas are not identified in Section 3.1.1 'Existing Environment'. The Inspectorate expects these to be identified and mapped in the ES.<br>Table 3-2 does not present any impacts to these receptors. For the avoidance of doubt, the Inspectorate considers that any likely significant effects occurring as a result of resource extraction including in Mineral Safeguarding Areas should be assessed within the ES. | Mineral safeguarding data has been reviewed and is considered within the assessment. Details of baseline conditions can be found in **Section 19.5.5**. An assessment relating to the impacts to safeguarded areas during construction and operation can be found in **Sections 19.6.1** and **19.6.2**. |
| Environment Agency | Scoping Opinion, 2020 | We are pleased that impacts detailed in Table 3.2 are scoped into the Assessment. If an area of land contamination is identified within the cable | Existing environment is discussed in **Section 19.5**. Impacts are set out |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| | | corridor which may affect principal and secondary aquifers a Preliminary Risk Assessment will need to be undertaken. Sufficient information should be provided the EIA to provide assurance that the risks to the water environment are fully understood and can be addressed through appropriate measures including the need for site investigation, risk assessment and remediation. If significant contamination is found within the Application area, any proposals to undertake piling on site should be accompanied by a piling risk assessment.<br>We recommend that the cable corridor does not pass through areas designated as Source Protection Zone 1. | in **Sections 19.6** and **19.7**. |
| Natural England | Scoping Opinion, 2020 | Soils: Impacts from the development should be considered in light of the Government's policy for the protection of the best and most versatile (BMV) agricultural land as set out in paragraph 170 of the NPPF. We also recommend that soils should be considered in the context of the sustainable use of land and the ecosystem services they provide as a natural resource, as also highlighted in paragraph 170 of the NPPF. | An assessment of impacts to soils and agricultural land use is included within **Chapter 21 Land Use and Agriculture**. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| Norfolk County Council | Scoping Opinion, 2020 | The adopted Norfolk Minerals and Waste Core Strategy and Development Management Policies DPD and the Minerals and Waste Site Specific Allocations DPDs are relevant local planning policies and should be taken into account throughout the project. | Mineral safeguarding data has been reviewed and is considered within the assessment. Details of baseline conditions can be found in **Section 19.5.5**. An assessment relating to the impacts to safeguarded areas during construction and operation can be found in **Sections 19.6.1** and **19.6.2**. |
| Norfolk County Council | Scoping Opinion, 2020 | The inclusion of the NPS requirements EN-1-5.10.9 and EN-5.14.6 regarding mineral safeguarding and waste are welcomed.<br><br>To ensure mineral safeguarding is appropriately taken into account, the ES should consider how a methodology can be put in place for the reuse of suitable materials extracted as part of the cable construction phases. | An assessment relating to the impacts to safeguarded areas during construction and operation can be found in **Sections 19.6.1** and **19.6.2**.<br>A waste assessment is included as **Appendix 19.2** of this PEIR report. |
| Public Health England | Scoping Opinion, 2020 | We would expect the applicant to provide details of any hazardous contamination present on site (including ground gas) as part of a site condition report. | Potentially hazardous contamination is discussed in **Section 19.5**. Impacts, as well as mitigation measures, are set out in **Sections 19.6** and **19.7**. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| Public Health England | Scoping Opinion, 2020 | Emissions to and from the ground should be considered in terms of the previous history of the site and the potential of the site, once operational, to give rise to issues. Public health impacts associated with ground contamination and/or the migration of material off-site should be assessed and the potential impact on nearby receptors and control and mitigation measures should be outlined. | Existing environment is discussed in **Section 19.5**. Impacts, as well as mitigation measures, are set out in **Sections 19.6** and **19.7**. |
| Public Health England | Scoping Opinion, 2020 | Relevant areas outlined in the Government's Good Practice Guide for EIA include:<br>• effects associated with ground contamination that may already exist<br>• effects associated with the potential for polluting substances that are used (during construction / operation) to cause new ground contamination issues on a site, for example introducing / changing the source of contamination<br>• impacts associated with re-use of soils and waste soils, for example, re-use of site-sourced materials on-site or offsite, disposal of site-sourced materials offsite, importation of materials to the site, etc. | Existing environment is discussed in **Section 19.5**. Impacts, as well as mitigation measures, are set out in **Sections 19.6** and **19.7**.<br><br>A waste assessment is included as **Appendix 19.2** of this PEIR report. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| Public Health England | Scoping Opinion, 2020 | The applicant should demonstrate compliance with the waste hierarchy (e.g. with respect to re-use, recycling or recovery and disposal).<br>For wastes arising from the development the ES should assess:<br>• the implications and wider environmental and public health impacts of different waste disposal options<br>• disposal route(s) and transport method(s) and how potential impacts on public health will be mitigated<br>• If the development includes wastes delivered to the installation:<br>• Consider issues associated with waste delivery and acceptance procedures (including delivery of prohibited wastes) and should assess potential off-site impacts and describe their mitigation | A waste assessment is included as **Appendix 19.2** of this PEIR report. |

## 19.3 Scope

### 19.3.1 Study Area

7. The study area for ground conditions and contamination has been defined on the basis of the distance over which impacts may occur and by the location of any receptors that may be affected by those potential impacts. This has been established using professional judgement and is supported by **Appendix 19.1 Land Quality Desk Study and Preliminary Risk Assessment Report**. The study area is based on the PEIR boundary plus a 250m buffer for potential sources of contamination and receptors. A 250m buffer has been chosen as the potential risks associated with contamination sources at distances within 250m are likely to have greatest impact on on-site conditions with potential risks diminishing with distance.

8. A full description of the infrastructure within the PEIR boundary is provided in **Chapter 5 Project Description**.

### 19.3.2 Realistic Worst-Case Scenario

#### 19.3.2.1 General Approach

9. The final design of DEP and SEP will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 6 EIA Methodology**.

10. The realistic worst-case scenarios for the ground conditions and contamination assessment are summarised in **Table 19.2**. These are based on the parameters of DEP and SEP described in **Chapter 5 Project Description**, which provides further details regarding specific activities and their durations.

11. In addition to the design parameters set out in **Table 19.2** Realistic worst-case scenarios. Consideration is also given to how DEP and SEP will be built out as described in **Section 19.3.2.2** to **Section 19.3.2.4** below. This accounts for the fact that whilst DEP and SEP are the subject of one DCO application, it is possible that either one or both of DEP and SEP will be developed, and if both are developed, that construction may be undertaken either concurrently or sequentially.

*Table 19.2: Realistic worst-case scenarios.*

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| **Construction** | | | | |
| Impacts relating to the landfall | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$<br>• Transition joint bay size = 10 x 15m.<br>• Total construction space required = 30,000m$^2$ | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$<br>• Transition joint bay size = 15 x 15m.<br>• Total construction space required = 30,000m$^2$ | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$ for each project (overlapping)<br>• Transition joint bay size = 10 x 15m for each project<br>• Total construction space required for each project = 30,000m$^2$ (overlapping) | The HDD works should not require any prolonged periods of restrictions or closures to the beach for public access, although it is possible that some work activities will be required to be performed on the beach that may require short periods of restricted access. |
| | Temporary access<br>• Route from the existing road system | Temporary access<br>• Route from the existing road system | Temporary access<br>• Route from the existing road system | |
| Impacts relating to the onshore cable corridor | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | The onshore cable duct will be installed in sections of up to 1km at a time, with a typical construction presence of up to four weeks along each 1km section. |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| | Duration<br>• 24 months in total | Duration<br>• 24 months in total | Duration<br>• 24 months in total | |
| | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 180,000m$^3$ of which 36,000m$^3$ to be disposed of | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 360,000m$^3$ of which 72,000m$^3$ to be disposed of | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 360,000m$^3$ of which 72,000m$^3$ to be disposed of | |
| | Construction corridor<br>• Total width = 45m<br>• Jointing bays = 120 (approximately every 500m) buried below ground<br>• Jointing bay dimensions = 12m long by 4m wide by 2m deep within the working corridor<br>• One trench, 1m wide by 1.75m deep.<br>• Minimum cable burial depth at 1.2m | Construction corridor<br>• Total width = 60m<br>• Approximately 120 jointing bays (one every 500m) buried below ground<br>• Jointing bay dimensions = 12m long by 4m wide by 2m deep within the working corridor.<br>• Two trenches, each 1m wide by 1.75m deep.<br>• Minimum cable burial depth at 1.2m | Construction corridor<br>• Total width = 60m<br>• Approximately 240 jointing bays (one every 500m) buried below ground along each cable trench<br>• Jointing bay dimensions of 12m long by 4m wide by 2m deep within the working corridor.<br>• Two trenches, each 1m wide by 1.75m deep.<br>• Minimum cable burial depth at 1.2m | |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| | Construction compounds<br>• Up to 2 main compounds of 60,000m$^2$ each<br>• 8 secondary compounds of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | Construction compounds<br>• Up to 2 main compounds of 60,000m$^2$ each<br>• 8 secondary compounds of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | Construction compounds<br>• Up to 2 main compounds for each project of 60,000m$^2$ each<br>• 8 secondary compounds for each project of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | |
| Impacts relating to the onshore substation | Substation footprint<br>• Permanent area = 3.25ha.<br>• Temporary construction area = 1ha<br>• Total construction area = 4.25ha | Substation footprint<br>• Permanent area = 6.0ha<br>• Additional construction area = 1ha<br>• Total construction area = 7.0ha. | Substation footprint<br>• Permanent area = 6.25ha<br>• Additional construction area = 1ha<br>• Total construction area = 7.25ha. | |
| **Operation** | | | | |
| Impacts relating to the onshore cable route | Link boxes<br>• Below ground = 120 (up to 2m x 2m x 1.5m) plus an above ground marker post at each location<br>• Above ground = 120 (up to 1.5m x 1m x 1.5m) | Link boxes<br>• Below ground = 120 (up to 2m x 2m x 1.5m) plus an above ground marker post at each location<br>• Above ground = 120 (up to 1.5m x 1m x 1.5m) | Link boxes<br>• Below ground = 120 for each project (up to 2m x 2m x 1.5m) plus an above ground marker post at each location | Link boxes are expected to be below ground. Alternatively link boxes may be above ground in cabinets. |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| | | | • Above ground = 120 for each project (up to 1.5m x 1m x 1.5m) | |
| Impacts relating to the onshore substation | <u>Substation footprint</u><br>• Operational area = 3.25ha | <u>Substation footprint</u><br>• Operational area = 6.0ha | <u>Substation footprint</u><br>• Operational area = 6.25ha | |
| | <u>Substation buildings</u><br>• Max building height = 15m<br>• Oily water sump to provide secondary containment to oil from transformers in the event of a spillage. | <u>Substation buildings</u><br>• Max building height = 15m<br>• Oily water sump to provide secondary containment to oil from transformers in the event of a spillage. | <u>Substation buildings</u><br>• Max building height = 15m<br>• Oily water sump to provide secondary containment to oil from transformers in the event of a spillage. | |
| | <u>Duration</u><br>• 36 months in total | <u>Duration</u><br>• 36 months in total | <u>Duration</u><br>• 36 months in total for each project | |
| **Decommissioning** | | | | |
| No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst case scenario, the impacts will be no greater than those identified for the construction phase. | | | | |

#### 19.3.2.2 Construction Scenarios

12. The following principles set out the framework for how DEP and SEP may be constructed:
    - DEP and SEP may be constructed at the same time, or at different times;
    - If built at the same time both Projects could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times the first Project would require a four-year period of construction including a three year onshore construction period. The second Project would require a three-year period of construction;
    - If built at different times, the duration of the gap between end of onshore construction of the first Project, and the start of onshore construction of the second Project may vary from 0 to 1 year;
    - Assuming maximum construction periods, and taking the above into account, the maximum period over which the construction of both Projects could take place is 7 years; and
    - The earliest construction start date is 2024 and the latest is 2028
13. In order to determine which construction scenario presents the realistic worst case for each receptor and impact, the assessment considers both maximum duration effects and maximum peak effects, in addition to each Project being developed in isolation, drawing out any differences between each of DEP and SEP.
14. The three construction scenarios considered by the ground conditions and contamination assessment are therefore:
    - Build DEP or build SEP in isolation;
    - Build DEP and SEP concurrently – reflecting the maximum peak effects; and
    - Build one project followed by the other with a gap of up to one year (sequential) – reflecting the maximum duration of effects.
15. Any differences between DEP and SEP, or differences that could result from the manner in which the first and the second Project are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in the impact assessment section of this chapter (**Section 19.6**). For each potential impact only the worst-case construction scenario for two Projects is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in **Section 19.6**.

#### 19.3.2.3 Operation Scenarios

16. Operation scenarios are described in detail in **Chapter 5 Project Description**. The assessment considers the following three scenarios:
    - Only DEP in operation;
    - Only SEP in operation; and
    - DEP and SEP operating at the same time, with a gap of up to two years between each project commencing operation.

17. The operational lifetime of each project is expected to be 35 years.

#### 19.3.2.4 Decommissioning Scenarios

18. Decommissioning scenarios are described in detail in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a decommissioning plan prior to construction, however for the purpose of this assessment it is assumed that decommissioning of DEP and SEP could be conducted separately, or at the same time.

### 19.3.3 Summary of Mitigation Embedded in the Design

19. This section outlines the embedded mitigation relevant to the ground conditions and contamination assessment, which has been incorporated into the design of DEP and SEP (**Table 19.3**). Where other mitigation measures are proposed, these are detailed in the impact assessment (**Section 19.6**).

*Table 19.3: Embedded mitigation measures.*

| Parameter | Mitigation Measures Embedded into the Design of DEP and SEP |
|---|---|
| **Contaminated land** | |
| Cable routing | Whilst the PEIR boundary overlaps with a number of sources of potential contamination, the final cable routing will avoid the following: areas of licensed landfill (Bodham Pit, Morbays Tip, Central Depot and land south of Roseacre Estate) and sewage works – which will minimise the potential for impacts to human health and controlled waters from these sources.<br>The final cable routing will avoid Weybourne Town Pit, Weybourne Cliffs and Kelling Heath which are designated as a geological SSSI.<br>Trenchless crossing techniques (e.g. HDD) have been committed to where the cable corridor crosses Main Rivers which will minimise the potential for contamination (if present) from excavation works by limiting the potential for contaminated material to enter surface waters via surface run off. |
| **Groundwater quality and abstractions for public water supply** | |
| Cable routing | The PEIR boundary has been developed to avoid interaction with Groundwater Source Protection Zone 1, and therefore minimise the potential for impact on abstractions for public water supply. |

## 19.4 Impact Assessment Methodology

### 19.4.1 Policy, Legislation and Guidance

#### 19.4.1.1 National Policy Statements

20. The assessment of potential impacts upon ground conditions and contamination has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to DEP and SEP are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC 2011c).

21. The specific assessment requirements for ground conditions and contamination, as detailed in the NPS, are summarised in **Table 19.4** together with an indication of the section of the PEIR chapter where each is addressed.

*Table 19.4: NPS assessment requirements.*

| NPS Requirement | NPS Reference | Project Response |
|---|---|---|
| En-1 NPS for Energy (EN-1) | | |
| Where the development is subject to EIA [Environmental Impact Assessment] the applicant should ensure that the ES [Environmental Statement] clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project. | Paragraph 5.3.3 | The geological designated sites are listed in **Section 19.5.4**. Impacts on geological SSSIs are set out in **Sections 19.6** and **19.7**. Impacts on ecological SSSIs are discussed in **Chapter 22 Onshore Ecology and Ornithology**. |
| The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests. | Paragraph 5.3.4 | Existing environment is discussed in **Section 19.5**. Impacts are set out in **19.6** and **19.7**. Impacts to ecological receptors are discussed in **Chapter 22 Onshore Ecology and Ornithology**. |
| In having regard to the aim of the Government's biodiversity strategy the IPC should take account of the context of the challenge of climate change: failure to address this challenge will result in significant adverse impacts to biodiversity. The policy set out in the following sections recognizes the need to protect the most important biodiversity and | Paragraph 5.3.6 | The geological designated sites and impacts relating to climate change are discussed in **Sections 19.5.4** and **19.5.8** respectively. Impacts on geological SSSIs are set |

| NPS Requirement | NPS Reference | Project Response |
|---|---|---|
| geological conservation interests. The benefits to nationally significant low carbon energy infrastructure development may include benefits may outweigh harm to these interests. The IPC may take account of any such net benefit in cases where it can be demonstrated. | | out in **Sections 19.6** and **19.7**. Impacts to ecological receptors are discussed in **Chapter 22 Onshore Ecology and Ornithology**. |
| [The] development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives; where significant harm cannot be avoided, then appropriate compensation measures should be sought. | Paragraph 5.3.7 | Geological designated sites are discussed in **Section 19.5.4**. Impacts on geological SSSIs are set out in **Section 19.6** and **19.7**. Impacts to ecological receptors are discussed in **Chapter 22 Onshore Ecology and Ornithology**. |
| In taking decisions, the IPC should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment. | Paragraph 5.3.8 | The geological designated sites are listed in **Section 19.5.4**. Impacts on geological SSSIs are set out in **Sections 19.6** and **19.7**. Impacts on ecological receptors are discussed in **Chapter 22 Onshore Ecology and Ornithology**. |
| 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. | Paragraph 5.10.9 | Mineral Safeguarding Areas are discussed in **Section 19.5.5**. Impacts relating to Mineral Safeguarding Areas are set out in **Sections 19.6** and **19.7**. |

#### 19.4.1.2 Other

22. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of ground conditions and contamination. These include:

- The National Planning Policy Framework Guidance (NPPF) (Ministry of Housing, Communities and Local Government, updated 2019) (see **Table 19.5** below).

- Environmental Protection Act 1990 (Part 2A): Contaminated Land Statutory Guidance. The Environmental Protection Act 1990 makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Act provides the statutory definition of contaminated land: "Contaminated Land is any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reasons of substances in, on or under the land that:
  - Significant harm is being caused or there is a significant possibility of such harm being caused; or
  - Significant pollution of controlled waters is being or is likely to be caused."
- The guidance also provided the regulatory basis for the identification, designation and remediation of contaminated land. DEP and SEP could have an effect on land potentially affected by contamination. This requires assessment to ensure that the land is suitable for use following the construction of DEP and SEP, and that the land cannot be determined as contaminated land under Part 2A of the Act.
- Land Contamination Risk Management Framework 2020. The Environment Agency guidance provides an update to the former Environment Agency Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11). The guidance aims to help those assessing potentially contaminated site to identify and assess the risks posed to sensitive receptors from potentially contaminated sites, make appropriate decisions in relation to the outcome of the assessment and identify the required actions necessary e.g. implement remediation if deemed necessary.
- Environmental Permitting (England and Wales) Regulations 2016. The 2016 Regulations (as amended) set out an environmental permitting and compliance regime that applies to various activities and industries. The environmental permitting regime is a common framework for applying for, receiving, varying or transferring and surrendering permits, along with compliance, enforcement and appeals arrangements. It rationalises the previous permitting and compliance regimes into a common framework that is easier to understand and simpler to use. The framework introduces different levels of control, based on risk:
  - exclusions (lower risk activities which may be undertaken without any permit), standard rules permits (standard requirements and conditions for the relevant activities are set out so applicants can determine in advance whether the permit is applicable to their proposals) and bespoke permits (permits written specifically for activities which are unique or higher risk).

- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The aim of the directive is for all waterbodies to achieve Good Status by 2027 (which is comprised of scoring of both Ecological and Chemical Status) and to ensure no deterioration from current status. This legislation is relevant to ground conditions and contamination as it will assist in determining the sensitivity of water bodies within the DEP and SEP study area. Water quality is assessed within **Chapter 20 Water Resources and Flood Risk**.
- Groundwater (Water Framework Directive) (England) Direction 2016. The aim of the directive is to set out instructions and obligations for the Environment Agency to protect groundwater, including monitoring and setting threshold values for both existing and new pollutants in groundwater. This legislation is relevant to ground conditions and contamination as it will assist in determining the sensitivity of groundwater resources within the DEP and SEP study area.
- Water Resources Act. The Water Resources Act (1991) as amended by the Water Act (2003) provides the definition of and regulatory controls for the protection of water resources including the quality standards expected for controlled waters. This legislation is relevant to ground conditions and contamination as it will assist in determining the sensitivity of controlled waters within the DEP and SEP study area, particularly when assessing the effects during construction and operational activities.
- Environment Act 1995. The act established the Environment Agency and gave it responsibility for environmental protection of controlled waters. This legislation is relevant to ground conditions and contamination as it will help assess the sensitivity and potential effects of the construction and operational phases of DEP and SEP. It will also aid in the identification of suitable mitigation measures to provide protection of the controlled waters present.
- Environmental Damage (Prevention and Remediation) (England Regulations (2015) transposes into domestic law the EU Directive 2004/35/EC on environmental liability with regards to the prevention and remedying of environmental damage. This legislation is relevant to ground conditions and contamination as it will aid in the identification of suitable preventative measures and mitigation techniques for the construction and operational phases of DEP and SEP.
- Construction (Design and Management) Regulations 2015. These regulations are the main set of regulations used to manage the health, safety and welfare of construction projects. The legislation is relevant to ground conditions and contamination as it ensures the safety of human receptors involved in the construction phase.

- Guiding Principles for Contaminated Land. The Guiding Principles for Contaminated Land comprise three documents produced by the Environment Agency. The documents include GPCL 1 –Guiding principles for land contamination introduction, GPCL 2 –FAQs, technical information, detailed advice and references, and GPCL 3 –reporting checklist. The aims of these documents are to provide guidance to those who are involved with contaminated land, encourage good practice, promote compliance with regulatory requirements and to provide reference to applicable guidance.
- The Environment Agency's Approach to Groundwater Protection Position Statements 2018, provides information relating to the Environment Agency's approach to managing and protecting groundwater. They detail how the Environment Agency delivers government policy for groundwater and adopts a risk-based approach where legislation allows. The primary aim of all of the position statements is the prevention of pollution of groundwater and protection of it as a resource.
- Minerals Policy Statement 1: Planning and Minerals (MPS1) aims to secure adequate and steady supplies of the minerals needed by society and the economy. This publication has been withdrawn; however, it is still deemed relevant in the context of this assessment.
- North Norfolk Local Plan: Policy EN13 Pollution and Hazard Prevention and Minimisation. The policy states that 'all development proposals should minimise, and where possible reduce, all emissions and other forms of pollution, including light and noise pollution, and ensure no deterioration in water quality. Proposals will only be permitted where, individually or cumulatively, there are no unacceptable impacts on:
    - the natural environment and general amenity;
    - health and safety of the public;
    - air quality;
    - surface and groundwater quality;
    - land quality and condition; and
    - the need for compliance with statutory environmental quality standards.'

    It also states that 'developments on contaminated land (or where there is reason to suspect contamination) must include an assessment of the extent of contamination and any possible risks'.
- The Broadland District Council and South Norfolk District Council Contaminated Land Strategy is designed to complement the Environmental Protection Act 1990 (Part 2A): Contaminated Land Statutory Guidance. The aim of the approach adopted by both councils is to:
    - protect human health
    - protect controlled waters
    - protect designated ecosystems
    - prevent damage to property

- prevent further contamination of land
- ensure contaminated land is returned to beneficial use
- encourage voluntary remediation
- support re-use of brownfield land ensuring that contaminated land is given due consideration in all land development acquisition decisions.

- Norfolk County Council Guidance Note on the Mineral Safeguarding Process for aggregates – Sand & Gravel and Carstone. The guidance note states that if a proposed development is located on an MSA (mineral safeguarding area) then there are two main issues to be addressed in formulating a safeguarding response:
  - the applicant should carry out investigations to identify whether the resource is viable for mineral extraction, and
  - if the mineral resource is viable, the applicant considers whether it could be extracted economically prior to development taking place.

  The guidance note states that the Environmental Statement (ES) should address relevant mineral safeguarding issues for the proposed development and that the potential for prior extraction be recognised and built into the master planning process.

*Table 19.5: National Planning Policy Framework guidance relevant to ground conditions and contamination.*

| NPPF Requirement | NPPF Reference | Section Reference |
|---|---|---|
| The planning system should contribute to and enhance the natural and local environment by:<br>• Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan;<br>• Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability; and | NPPF15-170 | Existing environment in relation to sensitive sites is discussed in **Section 19.5.4**. Impacts and mitigation measures aimed at minimising the potential impacts to the receptors identified, including remediation, are set out in **Sections 19.6** and **19.7**. |

| NPPF Requirement | NPPF Reference | Section Reference |
|---|---|---|
| • Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. | | |
| Planning policies and decisions should ensure that:<br>• A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);<br>• After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and<br>• Adequate site investigation information, prepared by a competent person, is available to inform these assessments. | NPPF15-178 | Existing ground conditions and potential sources of contamination are discussed within **Section 19.5**. The impacts of DEP & SEP, and mitigation measures (including site investigation works), are set out in **Sections 19.6** and **19.7**. |

| NPPF Requirement | NPPF Reference | Section Reference |
|---|---|---|
| Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and / or landowner.<br><br>Planning policies and decisions should also 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. | NPPF15-179 and NPPF15-180 | Existing ground conditions and potential sources of contamination are discussed within **Section 19.5**. The impacts of DEP & SEP, and mitigation measures (including site investigation works), are set out in **Sections 19.6** and **19.7**. |
| The focus of planning policies and decisions should be whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these 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. | NPPF15-183 | Existing environment is discussed in **Section 19.5**. Impacts are set out in **Sections 19.6** and **19.7**. |
| It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation. | NPPF17-203 and 204 | Mineral Safeguarding Areas are discussed in **Section 19.5.5**. Impacts relating to Mineral Safeguarding Areas are set out in **Sections 19.6** and **19.7**. |

| NPPF Requirement | NPPF Reference | Section Reference |
|---|---|---|
| Planning policies should:<br>• safeguard mineral resources by defining Mineral Safeguarding Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked);<br>• set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place. | | |

23. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

### 19.4.2 Data and Information Sources

#### 19.4.2.1 Site specific surveys

24. In order to provide site specific and up to date information on which to base the impact assessment, a site characterisation survey was conducted, which consisted on reviewing available desk-based information related to ground conditions and contamination. The assessment is provided in the Land Quality Desk Study and Preliminary Risk Assessment report (**Appendix 19.1**). The Preliminary Risk Assessment (PRA) provides an assessment of ground conditions for DEP and SEP and follows a risk-based approach including consideration of potential sources, pathways and receptors to identify potential pollutant linkages that may result in unacceptable risks to receptors from ground contamination.

25. The local authorities and Environment Agency whose area the DEP and SEP study area crosses have also been contacted in order to obtain information relating to groundwater and surface water abstractions.

#### 19.4.2.2 Other available sources

26. Other sources that have been used to inform the assessment are listed in **Table 19.6**.

*Table 19.6: Other available data and information sources.*

| Data set | Spatial coverage | Year | Notes |
|---|---|---|---|
| British Geological Survey (BGS) | Full | 2020 | BGS onshore Geoindex map (http://mapapps2bgs.ac.uk/geoindex/home.html) |
| Department for Environment, Food and Rural Affairs (DEFRA) | Full | 2020 | MAGIC map (www.magic.defra.gov.uk) |
| Coal Authority | Full | 2020 | Interactive online viewer (http://mapapps2.bgs.ac.uk/coalauthority/home.html) |
| Public Health England | Full | 2020 | UK Radon Website (https://www.ukradon.org/information/ukmaps) |
| Google Earth | Full | 2020 | Publicly available aerial imagery |
| Envirocheck GIS data | Full | 2020 | Historical maps, environmental sensitivity data and permitting records |
| Zetica | Full | 2020 | Unexploded ordnance (UXO) risk (https://zeticauxo.com/) |
| Norfolk County Council | Full | 2020 | Mineral safeguarding areas (https://norfolk.opus4.co.uk/planning/localplan/maps/norfolk-minerals#/x:599916/y:312764/z:2/b:15/o:1157,o:1165,o:1252) |

### 19.4.3 Impact Assessment Methodology

27. **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied to DEP and SEP. The following sections confirm the methodology used to assess the potential impacts on ground conditions and contamination.

#### 19.4.3.1 Definitions

28. For each effect, the assessment identifies receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions of sensitivity, value and magnitude for the purpose of the ground conditions and contamination assessment are provided in **Table 19.7** and **Table 19.8**:.

#### 19.4.3.1.1 *Sensitivity*

29. Receptor sensitivity has been defined with reference to the adaptability, tolerance, recoverability and value of individual receptors. **Table 19.7** provides an example of the likely criteria for appraisal of sensitivity for identified ground conditions and contamination receptors based on professional judgement.

30. Receptor sensitivity considers, for example, whether the receptor:

- Is rare;
- Has protected or threatened status;
- Has importance at a local, regional or national scale; or
- Has a key role in ecosystem function (in the case of biological receptors).

31. Generic receptor sensitivity examples based on the above criteria are presented below in **Table 19.7**.

*Table 19.7: Receptor sensitivity criteria.*

| Sensitivity | Examples |
|---|---|
| **High** - has very limited or no capacity to accommodate physical or chemical changes. | **General**<br>• Receptor is internationally or nationally important / rare with limited potential for offsetting / compensation. |
| | **Land quality – human health**<br>• Construction workers involved in below ground construction works;<br>• Public and local residents / school aged children (off-site within 50m); and<br>• Future end users (residential or allotment end use). |
| | **Land quality – controlled waters and ecology**<br>• Groundwater source protection zones (SPZ) 1;<br>• Public water supplies/ licensed surface water and groundwater abstractions for potable use;<br>• Private water supplies for potable use (off-site within 50m);<br>• Supports habitats or species that are highly sensitive to change in surface hydrology or water quality; and<br>• Surface and groundwaters supporting internationally designated sites (e.g. Special Areas of Conservation (SAC), Special Protection Area (SPA), Ramsar sites). |
| | **Land quality – geological sites and mineral resources**<br>• Mineral Safeguarding Area – nationally important resource |

| Sensitivity | Examples |
|---|---|
| | • Designated geological sites of international importance |
| | **Built environment**<br>• Sites of international importance, World Heritage Sites and Scheduled Monuments. |
| **Medium** - has limited capacity to accommodate physical or chemical changes. | **General**<br>• Receptor is regionally important / rare with limited potential for offsetting / compensation. |
| | **Land quality – human health**<br>• Future end users (commercial / industrial end use/open space/ farmers and workers on agricultural land);<br>• Public and local residents / school aged children (off-site at distances >50m but <250m);<br>• Commercial workers (off-site within 50m); and<br>• Construction workers (above ground). |
| | **Land quality – controlled waters and ecology**<br>• Groundwater SPZ 2 and SPZ 3;<br>• Principal Aquifers;<br>• Secondary A and B Aquifers with private potable groundwater abstractions;<br>• Private water supplies for potable groundwater abstraction (off site within 250m) and<br>• Surface and groundwaters supporting nationally designated sites (SSSI). |
| | **Land quality – geological sites and mineral resources**<br>• Mineral Safeguarding Areas – regionally important resource<br>• Designated geological site of national importance e.g. SSSIs |
| | **Built environment**<br>• Commercial or residential buildings |
| **Low** - has moderate capacity to accommodate | **General**<br>• Receptor is locally important / rare |
| | **Land quality – human health** |

| Sensitivity | Examples |
|---|---|
| physical or chemical changes. | • Future end users (transport end use such as car parks or highways);<br>• Public and local residents / school aged children (off-site >250m); and<br>• Commercial workers (off-site at distances >50m but <250m). |
| | **Land quality – controlled waters and ecology**<br>• Secondary A and B Aquifers without groundwater abstractions; and<br>• Groundwater or surface waters supporting regionally important sites (e.g. Local Nature Reserve LNR)). |
| | **Land quality – geological sites and mineral resources**<br>• Adjacent to a Mineral Safeguarding Area;<br>• Low economically viable mineral resource |
| | **Built environment**<br>• Car parks, highways, transport infrastructure and utilities. |
| **Negligible** - is generally tolerant of physical or chemical changes. | **General**<br>• Receptor is not considered to be particularly important / rare. |
| | **Land Quality – Human Health**<br>• Commercial workers (off-site >250m). |
| | **Land Quality – Controlled Waters**<br>• Unproductive strata; and<br>• Supports or contributes to habitats that are not sensitive to changes in surface hydrology or water quality. |
| | **Land quality – geological sites and mineral resources**<br>• No economically viable minerals |
| | **Built environment**<br>• Locally important roads and footpaths; |

19.4.3.1.2 *Magnitude of change/ effect*

32. Potential effects may be adverse, beneficial or neutral. The magnitude of an effect is assessed qualitatively, according to the criteria set out in **Table 19.8**:. the following definitions apply to the time periods used in the magnitude assessment:
    - Long-term: >5 years;

- Medium-term: 1 to 5 years; and
- Short-term: <1 year.

33. For effects related to human health, magnitude reflects the likely increase or decrease in exposure risk for a receptor. For controlled waters, magnitude represents the likely effect that an activity would have on resource availability or value, at the receptor. Magnitude is therefore affected by the distance and connectivity between an impact source and the receptor.

*Table 19.8: Definition of magnitude levels for ground conditions and contamination.*

| Magnitude | Definition |
|---|---|
| **High** - permanent or large-scale change affecting usability, risk or, value over a wide area, or certain to affect regulatory compliance. | **Land quality – human health**<br>• Permanent or major change to existing risk exposure (adverse / beneficial);<br>• Unacceptable risks/ severe harm to one of more receptors over the long-term or permanently (adverse); or<br>• Remediation and complete source removal (beneficial). |
| | **Land quality – controlled waters**<br>• Permanent, long-term or wide scale effects on water quality or availability (adverse / beneficial);<br>• Permanent loss or long-term derogation of a water supply source resulting in prosecution (adverse);<br>• Change in WFD water body status / potential or its ability to achieve WFD objectives in the future (adverse / beneficial);<br>• Permanent habitat creation or complete loss (adverse / beneficial); or<br>• Measurable habitat change that is sustainable / recoverable over the long-term (adverse / beneficial). |
| | **Land quality - geological sites and mineral resources**<br>• Complete loss of designated sites<br>• Complete sterilisation of mineral resource |
| | **Built environment**<br>• Catastrophic damage to buildings or structures |
| **Medium** - Reversible change affecting | **Land quality – human health**<br>• Medium-term or moderate change to existing risk of exposure (adverse / beneficial); |

| Magnitude | Definition |
|---|---|
| usability, value, or risk, over the medium-term or local area: possibly affecting regulatory compliance. | • Unacceptable risks to one or more of the receptors over the medium-term (adverse); or<br>• Serious concerns or opposition from Statutory Consultees (adverse). |
| | **Land quality – controlled waters**<br>• Medium-term or local scale effects on water quality or availability (adverse / beneficial);<br>• Medium-term derogation of a water supply source, possibly resulting in prosecution (adverse);<br>• Observable habitat change that is sustainable / recoverable over the medium-term (adverse / beneficial); or<br>• Temporary change in status / potential of a WFD water body or its ability to meet objectives (adverse / beneficial). |
| | **Land quality - geological sites and mineral resources**<br>• Partial loss of the designated geological sites<br>• Medium-term or local scale loss of mineral resources |
| | **Built environment**<br>• Damage to buildings or structures |
| **Low** - temporary change affecting usability, risk or value over the short-term or within the study area; measurable permanent change with minimal effect, usability, risk or value; no effect on regulatory compliance. | **Land quality – human health**<br>• Short-term temporary or minor change to existing risk exposure (adverse / beneficial); or<br>• Unacceptable risks to one or more receptors over the short-term (adverse). |
| | **Land quality – controlled waters**<br>• Short-term or very localised effects on water quality or availability (adverse / beneficial);<br>• Short-term derogation of a water supply source (adverse);<br>• Measurable permanent effects on a water supply source that do not impact on its operations (adverse);<br>• Observable habitat change that is sustainable / recoverable over the short-term (adverse / beneficial); or<br>• No change in status / potential of a WFD water body or its ability to meet objectives (neutral). |

| Magnitude | Definition |
|---|---|
| | **Land quality - geological sites and mineral resources**<br>• Temporary change in status of designated geological sites<br>• Short-term or very localised effects on mineral resources |
| | **Built environment**<br>• Easily repairable damage to buildings or structures. |
| **Negligible** - minor permanent or temporary change, indiscernible over the medium to long-term. Short-term, with no effect on usability. | **Land quality – human health**<br>• Negligible change to existing risk of exposure; or<br>• Activity is unlikely to result in unacceptable risks to receptors (neutral). |
| | **Land quality – controlled waters**<br>• Very minor or intermittent impact on local water quality or availability (adverse / beneficial);<br>• Usability of a water supply source will be unaffected (neutral);<br>• Very slight local changes that have no observable impact on dependent receptors (neutral); or<br>• No change in status / potential of a WFD water body or its ability to meet objectives (neutral). |
| | **Land quality - geological sites and mineral resources**<br>• No change in status of designated geological site<br>• Very minor impact on mineral resources |
| | **Built environment**<br>• Very slight non-structural damage or cosmetic harm to buildings or structures. |

#### 19.4.3.2 Impact Significance

34. In basic terms, the potential significance of an impact is a function of the sensitivity of the receptor and the magnitude of the effect (see **Chapter 6 EIA Methodology** for further details). The determination of significance is guided by the use of an impact significance matrix, as shown in **Table 19.9**. Definitions of each level of significance are provided in **Table 19.10**.

35. Potential impacts identified within the assessment as major or moderate are regarded as significant in terms of the EIA regulations. Appropriate mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall impact in order to determine a residual impact upon a given receptor.

*Table 19.9: Impact significance matrix.*

| | | Negative Magnitude | | | | Beneficial Magnitude | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **High** | **Medium** | **Low** | **Negligible** | **Negligible** | **Low** | **Medium** | **High** |
| **Sensitivity** | **High** | *Major* | *Major* | *Moderate* | *Minor* | *Minor* | *Moderate* | *Major* | *Major* |
| | **Medium** | *Major* | *Moderate* | *Minor* | *Minor* | *Minor* | *Minor* | *Moderate* | *Major* |
| | **Low** | *Moderate* | *Minor* | *Minor* | *Negligible* | *Negligible* | *Minor* | *Minor* | *Moderate* |
| | **Negligible** | *Minor* | *Negligible* | *Negligible* | *Negligible* | *Negligible* | *Negligible* | *Negligible* | *Minor* |

*Table 19.10: Definition of impact significance.*

| Significance | Definition |
|---|---|
| **Major** | Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation. |
| **Moderate** | Intermediate change in receptor condition, which are likely to be important considerations at a local level. |
| **Minor** | Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process. |
| **Negligible** | No discernible change in receptor condition. |
| **No change** | No impact, therefore, no change in receptor condition. |

### 19.4.4 Cumulative Impact Assessment Methodology

36. The CIA considers other plans, projects and activities that may impact cumulatively with DEP and SEP. As part of this process, the assessment considers which of the residual impacts assessed for DEP and/or SEP on their own have the potential to contribute to a cumulative impact, the data and information available to inform the cumulative assessment and the resulting confidence in any assessment that is undertaken. **Chapter 6 EIA Methodology** provides further details of the general framework and approach to the CIA.

37. For ground conditions and contamination, these activities include the onshore elements of other offshore windfarm projects, construction projects (commercial, residential and transport developments) and remediation projects.

### 19.4.5 Assumptions and Limitations

38. The desk-based Land Quality PRA (**Appendix 19.1**) is based on a range of publicly available information. No ground investigation data from within the study area has been used to inform the Land Quality PRA or the impact assessment presented in this chapter. The assessments therefore adopt a precautionary approach i.e. if a potential pollutant linkage has been identified it is assumed to be present until further site-specific information is available to clarify whether the linkage exists. The impact assessment presented in this chapter is therefore limited by the finite data on which it is based. There is a level of uncertainty associated with extrapolation of site-specific data or non-site data to other locations within the study area.

## 19.5 Existing Environment

### 19.5.1 Geology

39. Information on the geological conditions within the study area has been collated from BGS datasets, including 1:50,000 scale geological mapping. The anticipated geological sequence within the study area, as shown on the BGS online viewer, is outlined in **Table 19.11** below and illustrated in **Figures 19.1.6 – 19.1.9** of the PRA (**Appendix 19.1**).

*Table 19.11: Geological sequence for the ground conditions and contamination study area.*

| Stratum | Unit | Description |
|---|---|---|
| Topsoil | - | Very soft to soft organic clay and peat. |
| Made Ground | - | Manmade or re-worked ground of variable description. |
| Superficial Deposits | Marine Beach Deposits | Shingle, sand, silt and clay; may bedded or chaotic; beach deposits may be in the form of dunes, sheets or banks; in association with the marine environment. |
| | River Terrace Deposits | Sand and Gravel, locally with lenses of silt, clay or peat. |
| | Head Deposits | Poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, |

| Stratum | Unit | Description |
|---|---|---|
| | | mantling a hillslope and deposited by solifluction and gelifluction processes. Gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material. |
| | Alluvium | Clay, silt, sand and gravel. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. |
| | Sheringham Cliffs Formation | Consists of a thick glacial sequence that contains several distinctive subdivisions varying from stratified fine-grained sands, matrix-supported diamictons, clay and sand. |
| | Briton's Lane Sand and Gravel Member | Horizontal, massive and low angle planar cross-bedded gravels and cobble gravels with thin seams of horizontal and rippled sand. The lithology has a distinctive high flint content (c.85-89%) of which the majority is of non-chatter marked variety (c.78-85%). The gravels also contain a wide range of far-travelled crystalline erratics including rocks of British and Scandinavian provenance. |
| | Weybourne Town Till Member | A highly calcareous silt and chalk-rich matrix supported diamicton. |
| | Lowestoft Formation | Chalky till, together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. |
| | Happisburgh Glacial Formation | A range of diamictons, sands and gravels, sands and laminated silts and clays. |
| | Bacton Green Till Member | An extensive diamicton complex that consists of a stratified assemblage of stony diamicton with beds/laminae of sorted material including sand, silt and clay. |
| Bedrock | Wroxham Crag Formation | Interbedded gravels, sands, silts and clays. The gravels are dominated by flint (up to c.80%) and by quartz and quartzite (up to c.60%). |
| | White Chalk Subgroup (Lewes Nodular Chalk, | Chalk with flints. With discrete marl seams, nodular chalk, sponge-rich and flint seams throughout. |

| Stratum | Unit | Description |
|---|---|---|
| | Seaford Formation, Newhaven Chalk Formation, Culver Chalk Formation, Portsdown Chalk Formation) | |

### 19.5.2 Hydrogeology

40. The baseline presented in the PRA (**Appendix 19.1**) indicates that the superficial Marine Beach Deposits, River Terrace Deposits, Alluvium and Briton's Lane Sand and Gravel Member are classified by the Environment Agency as Secondary A Aquifers (**Figures 19.1.6 – 19.1.9, Appendix 19.1**).

41. Secondary A Aquifers are defined as permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.

42. The Happisburgh Glacial Formation and Bacton Green Till are classified by the Environment Agency as Secondary B Aquifers / Unproductive Strata. A Secondary B Aquifer comprises predominantly lower permeability strata which may in part have the ability to store and yield limited amounts of groundwater by virtue of localised features such as fissures, thin permeable horizons and weathering.

43. The Head Deposits, Sheringham Cliffs Formation, Weybourne Town Till Member and Lowestoft Formation are classified as Secondary Undifferentiated Aquifers. Secondary Undifferentiated Aquifers are defined by the Environment Agency as being assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

44. The underlying bedrock comprising the Wroxham Crag Formation and White Chalk Supergroup which are classified by the Environment Agency as Principal Aquifers. Aquifers. This geology exhibits high permeability and / or provide a high level of water storage. They may support water supply and / or river base flow on a strategic scale.

45. The PRA (**Appendix 19.1**) indicates that the study area has been assigned, by the Environment Agency, a medium to high groundwater vulnerability risk. A high groundwater vulnerability designation indicates that the soil is easily able to transmit pollution to groundwater, which is characterised by high leaching potential in soils and the absence of low permeability superficial deposits.

46. Information received from the local authority indicates that there are seven private groundwater abstractions (for domestic purposes) located within the onshore cable corridor. An additional 38 domestic groundwater abstractions, seven licensed abstractions and 17 deregulated abstractions are located within 250m of the onshore cable corridor and onshore substation zone.

47. Source Protection Zones (SPZs) are defined around abstraction boreholes used for potable water supply, to delineate the area where release of a contaminant into the aquifer could impact on the abstraction.

48. A large proportion of PEIR boundary is located within a total catchment (SPZ 3), with the exception of the area between Landfall and north of the village of Weybourne and area between the villages of Matlaske and Oulton. It is likely that the SPZ is protecting groundwater within the Principal Bedrock Aquifers that underly the study area. The study area does not lie within a SPZ 1. To the east of the onshore substation zone (approximately 260 m at its closest point) is an area classified as a SPZ 2.

49. Due to the presence of domestic and licensed groundwater abstraction points, alterations in SPZ classifications need to be considered, for example the area (50m) surrounding a domestic abstraction for potable water would be considered to be located in a SPZ 1 due to its sensitivity and potential impacts to human health if it were to become contaminated.

### 19.5.3 Hydrology and Surface Drainage

50. Information provided within the PRA (**Appendix 19.1**) indicates that there are seven Environment Agency main rivers that cross the PEIR boundary, these are Spring Beck, River Bure, River Wensum, River Yare, River Tiffey and the River Tud.

51. In addition to the larger named rivers mentioned above, there are a number of unnamed watercourses, agricultural drains and drainage channels as well as lakes and ponds too numerous to be listed individually that are located either wholly or partially within the study area.

52. Information within the PRA indicates that there are four licensed surface water abstraction points located within the onshore cable corridor. The use of the abstracted water is not indicated in the information received, however the surface waters from which the abstractions are permitted include the River Yare and River Bure.

53. Further information with regards to hydrology is located within **Chapter 20 Water Resources and Flood Risk**.

### 19.5.4 Sensitive Land Use

54. Sensitive land use sites are considered, by statutory agencies, to be of special importance due to their intrinsic qualities which are unique to those areas. The following designated sites are located within the PEIR boundary:

- the onshore cable corridor crosses the River Wensum, which is designated as a SAC and SSSI, for its status as an enriched, calcareous lowland river.

55. The following designated sites are located within the 250m buffer zone of the PEIR boundary:

- Alderford Common (located adjacent to an access road of the onshore cable corridor at NGR: 613196, 318348 at its closest point), designated as a SSSI due to wide range of habitats that have developed there in response to variations in soils and topography;
- North Norfolk Coast (located approximately 140m west of landfall at NGR: 609532, 343949 at its closest point), designated as a SSSI due to the range of coastal habitats that are present within the area representing the largest expanse of undeveloped coastal habitat in Europe;

- Swannington Upgate Common (located approximately 200 m east of the onshore cable corridor at NGR: 614220, 318235 at its closest point, designated as a SSSI due to supporting a wide variety of habitat types within a small area.
- Kelling Heath (located approximately 220 m west of the onshore cable corridor at NGR: 610431, 342549 at its closest point) designated as a SSSI due to the area containing the best example of a glacial outwash plain in England; and
- Weybourne Cliffs (located immediately adjacent to the eastern edge of the 250m buffer at landfall, NGR: 611102, 343686), designated as a geological SSSI categorised as an historic site with outstanding Pleistocene section of national importance.

56. Parts of the study area are located within the following Nitrate Vulnerable Zones (NVZ):

#### 19.5.4.1 Landfall

- Anglia Chalk (groundwater).

#### 19.5.4.2 Onshore Cable Corridor

- Anglia Chalk (groundwater);
- Glaven NVZ (surface water);
- Saxthorpe (groundwater);
- Bure Broads Eutrophic Lake (eutrophic water);
- Norwich Crag and Gravels (groundwater) OCC; and
- Tud NVZ (surface water).

#### 19.5.4.3 Onshore Cable Corridor and Onshore Substation Area

- Yare NVZ (surface water).

57. There are no direct overlaps between the landfall location and onshore cable corridor and the geological SSSI sites. As such, no impacts to designated geological sites are anticipated as a result of DEP and SEP and can therefore be scoped out of the impact assessment.

58. Further information regarding ecological designated sites can be found in **Chapter 22 Onshore Ecology**.

### 19.5.5 Mineral Safeguarding Area

59. The land within the study area is underlain by clay, sand and gravel resources associated with the glacial deposits and chalk. The survey area crosses several Mineral Safeguarding Areas. These are areas of known deposits of minerals designated by a Mineral Planning Authority for safeguarding against unnecessary sterilisation by non-mineral development. An area of 7.35 square kilometres is designated as a Mineral Safeguarding Area within the onshore cable corridor, within the substation zone an area of 0.29 square kilometres is designated as a Mineral Safeguarding Area.

60. The substation zone is also located in the same area as two sites identified for strategic mineral extraction in the Norfolk County Council Minerals and Waste Local Plan review in October 2019: 'land north of Hickling Lane, Swardeston' and 'land south of Mangreen Hall Farm, Swardeston'. It is understood from Norfolk County Council that these two sites have now been withdrawn from the plan for proposed mineral abstraction.

61. An assessment of BGS recorded mineral sites conducted during the production of the PRA (**Appendix 19.1**) identified 18 records of ceased mineral extraction sites within the study area (11 sand and gravel and seven clay and shale extraction sites). A review of active extraction sites recorded on the Norfolk County Council website indicates that there are two active mineral extraction sites within the study area. Mangreen Quarry is located within the PEIR boundary surrounding the onshore substation zone, adjacent to the A140. Ketteringham Quarry is located 215m west of an access road to the onshore cable corridor (NGR: 617289, 302567 at its closest point).

### 19.5.6 Human Health

62. The required onshore infrastructure comprises landfall works, onshore cable corridor, onshore substation as set out in **Chapter 5 Project Description**. Haul and access roads will also be required during the construction period as will construction compounds.

63. During the installation of the onshore infrastructure, the critical human health receptors would be those involved with construction activities, adjacent off-site residents, nearby workers (e.g. agricultural workers) and visitors (e.g. where Public Rights of Way (PRoW) might be in use). During the operational phase of DEP and SEP, the human health receptors will be site users and workers at the substation.

### 19.5.7 Historical Setting

64. The research undertaken to inform the PRA (**Appendix 19.1**) indicates that the majority of the study area comprised agricultural land and woodland from the earliest available Ordnance Survey (OS) maps (1883-1887) and has the same use to date.

65. The study area has been used for mineral extraction with multiple marl, sand and gravel pits dispersed throughout the area in the earliest available OS maps (1893 - 1897). Some of the pits are no longer shown on recent OS maps suggesting they may have been infilled. Bodham Street Gravel Pit is shown to have been used as a refuse tip from the 1970s.

66. The Midland and Great Northern Railway, Eastern and Midlands Railway and East Norfolk Railway lines are shown to cross the study area from the late 1800s to date, with some of the lines shown as being dismantled on recent maps. A camp, potentially used by the military, is shown on maps from the 1950s to the 1990s to the north west of Weybourne. A sewage works is recorded from 1972 to date adjacent to a former camp in the Landfall area. A second sewage works is recorded south of Colton from the 1970s to 1990s. The 1957 OS map records a disused airfield bisecting the onshore cable corridor at Brandiston. A second disused airfield is shown to the north of Bluestone station during the same period. A small airstrip (approximately 550 m in length) is recorded on Google Earth Imagery dated 1999 onwards (images prior to this date were not available) within the onshore cable corridor near Weybourne (NGR: 609895, 343545).

67. A summary of the historical features that may give rise to potential sources of contamination is provided in **Table 19.12**.

*Table 19.12: Potential sources of contamination.*

| Potential Source | Potential Contaminants of Concern |
|---|---|
| **On-site** | |
| Railway land | Railway land (both current and historical) is a potential source of contamination and Made Ground may be encountered. Contaminants associated with railway land include herbicides, metals, fuel hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and sulphates. Asbestos can also be associated with the materials used within the track bedding material and fill used in the formation of embankments. |
| Potentially infilled land (former pits), brick works and landfill | Many former pits are located throughout the survey area, some of which have been infilled through unregulated waste disposal activity or as a licensed landfill. Contaminants of concern associated with the infilling of land are dependent on the age of emplacement of materials and the nature of materials used. Potential contaminants include ground gas, semi-volatile and volatile organic contaminants (SVOCs and VOCs), metals, asbestos, sulphates, fuel hydrocarbons, polycyclic aromatic hydrocarbons, phenols, cyanides, PCBs and dioxins, furans and asbestos. |
| Sewage Works | The processing of sewage could release contaminants into the environment depending on the site's full operational history and usage. Potential contaminants could include metals, cyanides, nitrates, sulphates, asbestos, fuel hydrocarbons, SVOCs, VOCs and PCBs. |
| Airfields and Military Camps. | Potential contaminants may include metals, asbestos, VOCs and SVOCs, glycols, fuel hydrocarbons, and PCBs. |

| Potential Source | Potential Contaminants of Concern |
|---|---|
| **On-site** | |
| | If aircraft dismantling occurred within the historical airfield there is the potential for radiological contamination (radium226) to be present within the onshore cable corridor. |
| **Off-site** | |
| Railway land | Asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, herbicides, PCBs. Ground gas. |
| Brick works | |
| Potentially infilled land / refuse sites | |
| Airfield and military camp | |
| Electricity substation | |

### 19.5.8 Climate Change and Natural Trends

#### 19.5.8.1 Geology

68. No major changes to the geology underlying the study area in relation to climate change and natural trends are anticipated to occur over the lifetime of the projects.

#### 19.5.8.2 Hydrogeology

69. There is increased regulation of agricultural chemicals and catchment wide initiatives to reduce pressures on groundwater to achieve compliance with the WFD. Therefore, baseline groundwater quality is likely to improve over time through the natural breakdown of chemicals that may currently be present in groundwater bodies.

#### 19.5.8.3 Hydrology and Surface Drainage

70. Climate change is expected to result in wetter winters, drier summers and a greater number of convectional rain storms. This means that the hydrology of the surface drainage network could change, with higher winter flows, lower summer flows and a greater number of storm-related flood flows. The risk of flooding will also be amplified as a result of the predicted increase in rainfall associated with climate change, with an increase in peak river flows and an increase in the magnitude of surface water flooding. Detailed information on the anticipated trends associated with surface water is provided in **Chapter 20 Water Resources and Flood Risk**.

#### 19.5.8.4 Possible Sources of Contamination

71. Climate change is expected to result in wetter winters and drier summers, which has the potential to mobilise pre-existing sources of contamination either through increased rates of infiltration due to heavier rainfalls or dust generation through drier summers. These changes have the potential to increase the exposure risks of receptors to pre-existing sources. Natural degradation of contaminants over time may result in a general improvement in ground conditions.

#### 19.5.8.5 Mineral Safeguarding Areas

72. Climate change and natural trends are not anticipated to impact Mineral Safeguarding Areas present within the study area.

## 19.6 Potential Impacts

73. The following section describes the potential impacts upon the receptors that have the potential to arise as a result of the construction, operational and decommissioning phases of DEP and SEP. The assessment is based upon the worst case scenario with regards to receptor sensitivity and value (with embedded mitigation), and the magnitude of the potential impact (as detailed in **Section 19.4**). Any mitigation measures discussed in this section are considered to be additional to those embedded within the design of DEP and SEP.

### 19.6.1 Potential Impacts during Construction

#### 19.6.1.1 Impact 1: Exposure of workforce, land owners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts

74. The excavation of cable trenches, earthworks and piling (if required) and the movement and stockpiling of soils have the potential to mobilise existing ground contamination (where present). This could result in impacts to human health through dermal contact, inhalation and ingestion of contaminants.

75. A PRA (**Appendix 19.1**) has been undertaken for the study area to identify plausible contaminant linkages as a result of the potential presence of contaminants within the soils and groundwater. The PRA identified that the majority of land within the study area has an agricultural use where unacceptable risks from contamination are not anticipated.

76. The PRA also identified localised areas within the study area with a history of potential contaminative uses. This includes former mineral extraction sites which may have been infilled, licenced landfill sites, former airfields, military land, railway land and sewage works.

77. The PRA identified potential contaminants of concern (PCOC) that could be present in the study area and could represent a risk to construction workers, land owners, land users and neighbouring land users if exposed during construction activities. Construction activities, particularly earthworks could disturb and expose construction workers and other site users to localised Made Ground soils and potential soil and / or groundwater contamination associated with historical and current land uses within the study area. Construction activities could create pollutant linkages through ingestion, inhalation and direct dermal contact pathways.

78. In the event of exposing soils and stockpiling construction waste (including excavated soils), dust could be generated during dry and windy conditions. Under these conditions, construction workers and land owners, land users and neighbouring land users could temporarily be exposed to contamination via the inhalation of potentially contaminated dusts.

79. Additionally, the risk associated with soil contamination sources to human health could be altered by a change in the migration pathways by construction activities. A specific risk of concern is ground gases. The ground gas risk for the proposed onshore development area is unknown and no ground gas information is known. Consideration of the potential risk from ground gas, including the potential of ground gas accumulation in confined spaces could represent a risk to human health through asphyxiation and explosion.

80. Construction workers are considered to be the most sensitive receptors as the activities they are engaged in constitute more direct exposure routes over longer periods of time.

#### 19.6.1.1.1 *Receptor Sensitivity*

81. The sensitivity of construction workers and land owners, land users and neighbouring land users is considered to be high.

#### 19.6.1.1.2 *Magnitude of effect - DEP or SEP in Isolation*

82. If DEP or SEP were to be constructed in isolation, the realistic worst-case scenario would involve the excavation of up to 180,000m$^3$ of material within the onshore cable corridor over a distance of 60km and a width of 45m (increasing to 100m at trenchless crossings). Additional earthworks will also be required at landfall and at the onshore substation during the construction phase. A maximum construction period of DEP or SEP in isolation is reported as four years within the realistic worst-case scenario section of this chapter (**Section 19.3.2**), however, earthworks would not be operating continuously and in the same location during the whole construction phase. It is anticipated that the cable corridor construction rate will be on average 400m per day and that the open trench will be typically 50 to 100m in length at any one time.

83. The impacts are predicted to be of local spatial extent (localised to the work areas and areas where contamination may be present), of short-term duration, of intermittent occurrence and high reversibility (occurring only during the works). The magnitude is therefore, considered to be low for DEP or SEP in isolation.

#### 19.6.1.1.3 *Magnitude of effect - DEP and SEP Together*

84. DEP and SEP constructed sequentially is considered as the worst-case scenario due to the longer period of time to which human health receptors could be exposed to potential contamination.

85. If DEP and SEP were constructed sequentially, the realistic worst-case scenario would involve the excavation of up to 360,000m$^3$ of material within the onshore cable corridor trenches (a total of two trenches) over a distance of 60km for each trench and a width of 60m (increasing to 100m at trenchless crossings). Additional earthworks will also be required at landfall and the onshore substation during the construction phase. It is assumed that the maximum period of construction for either DEP or SEP would be four years followed by up to a two-year gap prior to the commencement of the second phase of construction of either DEP or SEP which would last a maximum of three years (**Section 19.3.2**).

86. Although stretching over a period of three to four years for each construction phase, earthworks through areas of potential contamination are not anticipated to be continuously ongoing throughout the construction period. It is anticipated that the cable corridor construction rate will be on average 400m per day per crew and that the open trench will be typically 50 to 100m in length at any one time. As such, the impacts to human health are predicted to be of short-term duration, of local spatial extent (localised to the work areas and areas of contamination) of intermittent occurrence and high reversibility (occurring only during the works). The magnitude is therefore, considered to be low.

#### 19.6.1.1.4 *Impact Significance*

87. For both DEP and SEP in isolation and DEP and SEP together, without mitigation, the potential impact on human health associated with the construction of DEP and SEP is low magnitude on a high sensitivity receptor, representing an impact of moderate adverse significance.

#### 19.6.1.1.5 *Mitigation*

88. Where areas of potential contamination cannot be avoided, such as the areas that cross the entire width of the onshore cable corridor (e.g. the disused airfield and railways lines (both historical and active)), targeted ground investigations would be undertaken. This is in order to characterise the site conditions, identify unacceptable risks and determine whether remediation is required. If areas of potential concern are identified, then a remediation strategy would be developed and agreed with the relevant bodies prior to the commencement of remedial works and construction activity. The ground investigation, risk assessment and remediation would follow guidance provided within the 2020 Environment Agency Land Contamination Risk Management Framework.

89. The development of, and adherence to, a Code of Construction Practice (CoCP) would also be undertaken. The draft CoCP will develop in support of the Environmental Statement and will include the mitigation identified through the EIA process. The CoCP will be regularly reviewed and updated post consent, prior to and during the constructed period. The CoCP will be informed by the findings of pre-construction site investigation and include an assessment of the potential risks to human health and controlled waters receptors from DEP and / or SEP. Based on that risk assessment appropriate working methods would be developed to avoid, minimise or mitigate impacts relating to construction. The risk mitigation strategies incorporated into the CoCP would also include appropriate Personal Protective Equipment (PPE), provision of welfare facilities, monitoring of works including air quality and odour and implementation relevant good working practices applied including stockpile management and dust suppression activities to reduce the risk relating to the creation and inhalation of wind-blown dusts.

90. The CoCP would incorporate legislation requirements including the Construction Design Management (CDM) Regulations (2015), Health and Safety at Work Act (1974), CoCP and Control of Substances Hazardous to Health (COSHH) Regulations.

91. In addition, a plan for dealing with unexpected contamination would be developed as part of the CoCP. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention which have been withdrawn from use but still provide a useful best practice guide and include:

- Environment Agency Pollution Prevention Guidance (PPG) 01 – Understanding your environmental responsibilities;
- Environment Agency PPG 05 – Works and maintenance near water;
- Environment Agency PPG 06 – Working at construction and demolition sites: preventing pollution guidance;
- Environment Agency PPG 08 – Safe storage and disposal of used oils, and
- Environment Agency PPG 21 – Pollution incident response planning.

92. Adoption of a CL:AIRE Industry Code of Practice to manage the re-use and disposal of excavated soils on site would also be incorporated as an additional mitigation measures to protect human health, this would aid in maximising sustainability and providing an audit trail to demonstrate the appropriate use of materials. A Materials Management Plan (MMP) would be drafted in advance of any construction works, this would include chemical screening criteria in order to ensure that imported and / or reused materials are chemically suitable for use. If materials identified as containing asbestos are identified, then a specialist contractor should be employed to aid in its removal from site in line with current legislation.

93. Both the CoCP and MMP would be submitted for approval with the relevant statutory bodies in advance of implementation.

#### 19.6.1.1.6 *Residual Impact*

94. For both DEP and SEP in isolation and DEP and SEP together, with the incorporation of the mitigation measures described above, the risk to human health from exposure to potentially contaminated soils during construction of DEP or SEP would be minimised as far as is reasonably possible. This would effectively reduce the magnitude of effect from low to negligible, on a high sensitivity receptor, representing a residual impact of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.1.2 Impact 2: Direct impacts on groundwater quality and groundwater resources

95. Direct impacts to the Secondary A, Secondary B and Secondary Undifferentiated Aquifers within the superficial deposits may occur due to the intrusive nature of trenching (minimum burial depth 1.2m). The significance of the disturbance will be dependent on the depth of the aquifer unit in relation to the proposed depth of the excavation with superficial aquifers present at the surface at greater risk of direct impacts.

96. During construction, surface layers would be excavated, which could allow increased infiltration of rainwater and surface run-off to the subsurface. This could potentially mobilise any residual contamination already present in the overlying strata which could potentially migrate into the underlying shallow superficial aquifers impacting groundwater quality and associated groundwater abstractions. Whilst significant areas of contamination are not expected across the majority of the DEP and SEP study area, there are parts within the study area where crossing potentially contaminated land may be unavoidable.

97. Direct impacts to the Secondary Aquifers, Principal Aquifers of the Wroxham Crag Formation and White Chalk Subgroup and SPZs may occur from deep ground workings related to trenchless crossing (e.g. HDD) operations for cable installation beneath surface infrastructure (e.g. railways) and watercourses. There is potential for creating preferential pathways, for drilling mud / other contaminants to leak along the drill path, which could cause contamination of groundwater. The volume of drilling fluid that could be released is dependent on a number of factors, including the size of the fracture, the permeability of the geological material, the viscosity of the drilling fluid and the pressure of the hydraulic drilling system. Piling may be required for the foundations of substations and has the potential to create preferential pathways through a low permeability layer allowing potential contamination to migrate into an underlying Secondary, Principal Aquifers and SPZs impacting water quality and associated groundwater abstractions.

98. If required, dewatering of perched water or groundwater within excavations could also affect groundwater flow and water quality, resulting in impacts to base flow of local watercourses or impact on groundwater abstractions.

99. In addition, during construction there is the potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur as a result of spillages, leakage or storage. These can enter into the ground and subsequently into groundwater impacting groundwater quality and associated groundwater abstractions.

#### 19.6.1.2.1 *Receptor Sensitivity*

100. There are seven domestic groundwater abstractions recorded within the study area, however at the time of writing, it is not known whether these groundwater abstractions are from within the superficial deposits. As such the sensitivity of the underlying Secondary Aquifers has been assessed conservatively by assuming that private abstractions are taken from the superficial deposits. Therefore, the sensitivity of the superficial Secondary Aquifers (A, B and Undifferentiated) is considered to be of high sensitivity.

101. The Principal Aquifer which underlies the superficial deposits beneath the whole of the DEP and SEP study area and is partly designated as a SPZ 3 is deemed to be of high sensitivity.

#### 19.6.1.2.2 *Magnitude of effect - DEP and SEP in Isolation*

102. The realistic worst-case scenario for DEP or SEP in isolation would involve the excavation of up to 180,000m$^3$ of material within the onshore cable corridor trench over a distance of 60km and a width of 45m (increasing to 100m at trenchless crossings). Additional earthworks will also be required at landfall and at the onshore substation during the construction phase. A maximum construction period of DEP or SEP in isolation is reported as four years within the realistic worst-case scenario section of this chapter (**Section 19.3.2**), however, earthworks would not be operating continuously during the whole construction phase.

103. Any changes to infiltration rates, surface runoff or dewatering that may occur as a direct result of earthworks activities and direct impacts to the underlying superficial aquifers is predicted to be of local spatial extent within each aquifer unit, of short-term duration (related to the working areas only), of intermittent occurrence and high reversibility. The magnitude of effect associated with earthworks is therefore considered to be low.

104. The total number of trenchless crossings (e.g. HDD) required as part of the construction works associated with either DEP or SEP in isolation is yet to be determined, as is the foundation design of the onshore substation, i.e. whether piling is required and the total number of piles. However, the impacts of either trenchless crossings or piling on the underlying Principal Aquifer is predicted to be of local spatial extent (occurring only at trenchless crossing locations and at the substation if piling is required) and of intermittent occurrence. The magnitude of effect associated with trenchless crossings is therefore considered to be low.

#### 19.6.1.2.3 *Magnitude of effect - DEP and SEP Together*

105. DEP and SEP constructed sequentially is considered as the worst-case scenario due to the increased volume of material that would be excavated over a larger footprint and increased number of trenchless crossings required when compared to the construction of DEP and SEP concurrently.

106. If DEP and SEP were constructed sequentially, the realistic worst-case scenario would involve the excavation of up to 360,000m$^3$ of material within the onshore cable corridor trenches (a total of two trenches) over a distance of 60km for each trench and a width of 60m (increasing to 100m at trenchless crossings). Additional earthworks will also be required at landfall and the onshore substation during the construction phase. There would also be an increased number of piles required associated with the onshore substation and a greater number of trenchless crossings if constructed sequentially relative to the number required if DEP and SEP were constructed in isolation. It is assumed that the maximum period of construction for either DEP or SEP would be four years followed by up to a two-year gap prior to the commencement of the second phase of construction of either DEP or SEP which would last a maximum of three years (**Section 19.3.2**).

107. Similar to the impacts discussed in relation to DEP or SEP in isolation, the potential impacts to the superficial Secondary Aquifers and Principal Aquifers is predicted to be of local spatial extent within each aquifer unit, of low-term duration (related to the working areas only) of intermittent occurrence and high reversibility. The magnitude of effect is therefore considered to be low.

#### 19.6.1.2.4 *Impact Significance*

108. For both DEP and SEP in isolation and SEP and SEP together, prior to the mitigation, the overall significance of disturbance causing impacts to water quality or the resource potential of the Secondary Aquifers during construction of DEP or SEP is low magnitude on a high sensitivity receptor, representing a moderate adverse significance. The overall significance on groundwater quality within the Principal Aquifers as a result of trenchless crossings and piling is low magnitude on a high sensitivity receptor, representing a moderate adverse significance.

#### 19.6.1.2.5 *Mitigation*

109. As discussed in **Section 19.6.1.1.5**, additional mitigation measures such as investigations to characterise ground conditions and undertaking remedial works where necessary, would be adopted in order to mitigate the impacts to groundwater both within the Secondary and Principal Aquifers. In addition, a CoCP will be developed which would include specific measures relevant to the storage of fuels, oils, lubricants, waste water and other chemicals during the works. This will include:

- Storing all fuels, oils, lubricants, waste water and other chemicals in impermeable bunds with at least 110% of the stored capacity, with any damaged containers being removed from site.
- Refuelling would take place in a dedicated impermeable area, using a bunder bowser. Biodegradable oils to be used where possible.
- Ensuring that spill kits are available on site at all times as well as sand bags and stop logs for deployment in case of emergency spillages.

110. In addition, mitigation measures relating specifically to impacts to groundwater includes the development of a hydrogeological risk assessment where earthworks/ excavations are within 50m (or 250m dependent upon volume abstracted) of private potable groundwater abstractions. The risk assessment would meet the requirements of Environment Agency's Approach to Groundwater Protection 2018 Framework. Furthermore, a piling risk assessment would be undertaken where piles are to be used in areas of potential contamination, in line with the Environment Agency's Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001). The mitigation measures and monitoring requirements recommended by these assessments, would be implemented during construction works.

#### 19.6.1.2.6 *Residual Impacts*

111. For both DEP and SEP in isolation and SEP and SEP together, following the implementation of the mitigation measures described, the overall risk to groundwaters within the Secondary Aquifers during construction of DEP or SEP would be minimised as far as is reasonably possible. This would effectively reduce the magnitude of the effect to the Secondary Aquifers to negligible on a high sensitivity receptor, representing a residual impact of minor adverse significance.

112. For groundwaters within the Principal Aquifers, following the adoption of mitigation measures, the magnitude of effect would be negligible on a high sensitivity receptor, representing a residual impact of **minor adverse** significance. A minor adverse significance is not significant in EIA terms.

#### 19.6.1.3 Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination.

113. The study area crosses seven main rivers, including Spring Beck, River Bure, River Wensum, River Yare, River Tiffey and the River Tud.

114. In addition to the larger named rivers mentioned above, there are a large number of unnamed watercourses, agricultural drains, drainage channels, lakes and ponds that are located either wholly or partially within the study area.

115. As described in **Table 19.12.**

116. *Table 19.12:* and the PRA, potential sources of contamination have been identified within the study area. Construction of the cable route and onshore substation would require substantial earthworks and piling. These activities have the potential to disturb potential contamination which could migrate and be released into surface water via the following pathways:

- Mobilisation and migration of free phase hydrocarbons, soil contaminants or dissolved phase contaminants in groundwater by construction activities with subsequent release into surface waters;
- Surface water runoff from contaminated Made Ground soils brought to surface during construction;
- Runoff from stockpiles of potentially contaminated soils;
- Migration of soil or groundwater contaminants into surface water drains during construction activities which then enter surface waters;
- Accidental spillage whilst handling, storage or treatment of contaminated water or fuels or other chemicals used during construction.
- The hydraulic regime of the local area could also be affected by the construction of DEP and / or SEP for example backfilling excavated areas with less compacted soil / material could potentially create preferential flow paths into surface water receptors.

##### 19.6.1.3.1 *Receptor Sensitivity*

117. Any migration and discharge of contamination into surface waters could lead to a reduction in surface water quality and impact on the ecological habitats they support. As the DEP and SEP study area crosses the River Wensum, which is a designated site (SSSI and SAC) the sensitivity of surface waters is considered to be high.

118. Additional impacts relating to surface water quality and ecological habitats are provided in **Chapter 20 Water Resources and Flood Risk** and **Chapter 22 Onshore Ecology and Ornithology**.

##### 19.6.1.3.2 *Magnitude of effect*

119. It is possible that there would be multiple sources of contamination within a river catchment for both DEP or SEP in isolation and DEP and SEP together, the magnitude of effect is expected to be medium. However, the impacts are anticipated to be confined to areas of contamination and where these are in close proximity to rivers.

#### 19.6.1.3.3 *Impact Significance*

120. Prior to mitigation the overall significance of impacts to surface water quality from contamination during construction works of DEP or SEP in isolation and DEP and SEP together, is medium magnitude on a high sensitivity receptor is considered to be of **major adverse** significance.

#### 19.6.1.3.4 *Mitigation*

121. Specific mitigation measure would be implemented to prevent the migration of contamination into surface water bodies, this includes the mitigation measures set out in **Sections 19.6.1.1.5** and **19.6.1.2.5**.

122. In addition, in areas of identified contamination, perched waters within Made Ground or groundwater from dewatering activities would be collected within a tank or lagoon prior to any treatment or discharge. Waste water shall either be:

- Discharged to foul sewer under a trade effluent consent agreed with the local water company / supplier; and / or
- Discharged to surface water under an environmental permit issued from the Environment Agency.

123. On site treatment plant may be required to treat the waste water prior to disposal in order to meet discharge limits set by either the Environment Agency or local water company.

#### 19.6.1.3.5 *Residual Impacts*

124. Following the adoption of the mitigation measures discussed, the risk to surface water bodies during construction of DEP or SEP in isolation and DEP and SEP together, would be minimised as far as reasonably possible. This would effectively reduce the magnitude of effect to negligible, on a high sensitivity receptor, representing a residual impact of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.1.4 Impact 4: Sterilisation of future mineral resources

125. As described in **Section 19.5.5**, there are numerous Mineral Safeguarding Areas within the landfall area, onshore cable corridor (7.3km$^2$) and onshore substation zone (0.29km$^2$). Construction activities and installation of cables within these areas would prevent extraction of sands, gravels, clays and shale over the whole construction area of DEP and SEP.

#### 19.6.1.4.1 *Receptor Sensitivity*

126. Mineral Safeguarding Areas are considered to be of regional importance and therefore the sensitivity of the receptor is considered to be medium.

#### 19.6.1.4.2 *Magnitude of effect – DEP and SEP in Isolation*

127. The installation of a single trench for DEP or SEP in isolation within the onshore cable corridor, which runs a length of 60km and a width of 45m (increasing in width to 100m at trenchless crossings) has the potential to sterilise all resources within that footprint during the construction period. However, the areas impacted along the onshore cable corridor are spread along a narrow linear route rather than a single large area which are likely to make the viability of abstraction along the cable route unfeasible. The substation site will be 3.25ha and has the potential to sterilise mineral resource across a single area. Site 2 within the onshore substation zone is located with MIN 79 – Land north of Hickling Lane, Swardeston mineral extraction site. Although withdrawn from the Norfolk County Council plan for proposed mineral abstraction by the mineral operator and landowner, there are potentially economically viable resources present which may be sterilised through the construction of a substation at Site 2. Site 1 is not located within a mineral extraction site, however it is located immediately adjacent to Min 79 - Land north of Hickling Lane, Swardeston mineral extraction site and so construction activities could temporally sterilise the neighbouring site.

128. The impacts of sterilisation are considered to be temporary during construction, as such the magnitude of effect is considered to be low.

#### 19.6.1.4.3 *Magnitude of effect – DEP and SEP Together*

129. The construction of DEP and SEP sequentially is considered to be the worst of the two project scenarios as it has the potential to impact a greater area through the creation of a 60m wide onshore cable corridor (increasing to 100m at trenchless crossings) over a length of 60km. The substation site will be 6 ha and also has the potential to sterilise the mineral resource areas discussed in DEP and SEP in isolation. The sequential construction of DEP and SEP therefore has the potential to sterilise a larger area within the Mineral Safeguarding Area. The impacts of sterilisation are considered to be temporary during construction, as such the magnitude of effect is considered to be low.

#### 19.6.1.4.4 *Impact Significance*

130. Without mitigation, the potential impact on mineral resources associated with the construction of DEP and SEP in isolation and DEP and SEP together is low magnitude on a medium sensitivity receptor, representing an impact of **minor adverse** significance.

#### 19.6.1.4.5 *Mitigation*

131. Mitigation will include consultation with Norfolk County Council Mineral Planning Authority regarding the practicality and viability of extraction of the mineral resource. Supporting information will include a ground investigation prior to construction to help better determine the depth, accessibility and quality of the mineral resource and enable a quantification of the amount of the mineral that may be sterilised.

132. Mineral Resource Assessment will be undertaken if required to provide an indication of the likely quality and extent of the mineral resource, the commercial viability of extraction and environmental impact. If mineral use is deemed feasible, and subject to agreement with stakeholders, an MMP will be developed, which would include mitigation measures to be implemented during construction i.e. such as the extraction and reuse of the mineral resource on site where feasible within construction phase.

#### 19.6.1.4.6 *Residual Impacts – DEP or SEP in Isolation or Together*

133. Following the mitigation described above, it is considered that the magnitude of the impact from DEP and SEP in isolation and DEP and SEP together to mineral resources during construction would remain low on the medium sensitivity receptor. Therefore, the residual impact would be of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.1.5 Impact 5: Built environment

134. The construction phase has the potential to impact the existing built environment. This may be through creating new preferential pathways for contaminants or gases to migrate that may lead to degradation of utilities and concrete from aggressive attack. This could potentially compromise the integrity of buildings or utilities, or the migration of ground gases into buildings could cause explosion.

#### 19.6.1.5.1 *Receptor Sensitivity*

135. Within the study area there are a number of both commercial and residential buildings present (including, for example, the villages of Weybourne and Little Barningham), particularly within the onshore cable corridor. Therefore, the sensitivity of the built environment is considered to be medium.

#### 19.6.1.5.2 *Magnitude of effect – DEP and SEP in Isolation*

136. Commercial properties and utilities are present within the study area and in some cases may be in close proximity to the construction works. However, the impacts are likely to be of local spatial extent (localised to the work areas and areas of contamination). The magnitude of effect is considered to be medium.

#### 19.6.1.5.3 *Magnitude of effect – DEP and SEP Together*

137. The construction of DEP and SEP sequentially is considered to be the worst case of the two project scenarios as it would affect a greater area through the creation of two trenches within the onshore cable corridor with a maximum width of 60m (increasing to 100m at trenchless crossings). Although the sequential construction of DEP and SEP has the potential to impact a larger area of the built environment compared to DEP and SEP in isolation, the magnitude of effect is still considered to be medium.

#### 19.6.1.5.4 *Impact Significance*

138. Without mitigation, the potential impact on the built environment associated with the construction of DEP and SEP in isolation or DEP and SEP together is medium magnitude on a medium sensitivity receptor, representing an impact of **moderate adverse** significance.

#### 19.6.1.5.5 *Mitigation*

139. Mitigation include the reduction of construction activities in close proximity to commercial or residential buildings where possible. However, where this isn't possible pre-construction site characterisation works in areas identified as potential sources of contamination will allow for the identification of potential contamination and the risks these may present to the built environment during construction works. Following the identification of areas of concern, appropriate remediation works would be undertaken which would mitigate the potential impacts on the built environment.

#### 19.6.1.5.6 *Residual Impacts*

140. Following the implementation of the mitigation measures described above, the risk to the built environment during the construction of both DEP and SEP in isolation and DEP and SEP together will be reduced. The reduced risk lowers the magnitude of effect to low on the medium sensitivity receptor, representing a residual impact of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.2 Potential Impacts during Operation

#### 19.6.2.1 Impact 1: Exposure of workforce, land owners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts

141. There would be no planned maintenance along the cable route, during operation, that would require the excavation of soils. In the unlikely event of a cable failure then that stretch of cable between two joint bays may need to be replaced. This would require excavation at the two joint locations to expose the joint bays and allow the cable to be pulled out and replaced. If contaminated materials are brought to the surface during maintenance works and no mitigation measures are implemented, these materials will permanently be exposed at surface. This creates the potential for maintenance workers, workers at the substation, land owners, land users and neighbouring land users to come in to direct contact with contaminated soils left in-situ via direct contact pathways.

#### 19.6.2.1.1 *Receptor Sensitivity*

142. The sensitivity of maintenance workers and land owners, land users and neighbouring land users is considered to be high.

#### 19.6.2.1.2 *Magnitude of effect*

143. There may be a need for ground excavations to be undertaken at joint bays as part of the maintenance for both DEP and SEP in isolation and DEP and SEP together. The impacts are predicted to be of local spatial extent (localised to areas where contamination may be present and to areas where excavation works are required), of short term duration, of intermittent occurrence and high reversibility (occurring only during the maintenance works). The magnitude is therefore, considered to be low for the operation of DEP or SEP in isolation.

#### 19.6.2.1.3 *Impact Significance*

144. Without mitigation, the potential impact on human health associated with the operation of DEP and SEP in isolation and DEP and SEP together is low magnitude on a high sensitivity receptor, representing a **moderate adverse** significance.

#### 19.6.2.1.4 *Mitigation*

145. Remedial works would be undertaken if areas of contamination are identified during the site characterisation works prior to construction and if unexpected contamination is identified during construction. This would mean that contaminated soils would not be permanently left at surface during the operational phases of DEP and SEP. The remedial works would be undertaken prior to the operation of DEP and / or SEP would reduce the potential for impact to human health.

146. Maintenance workers that are required to undertake ground excavations during the operation of DEP and SEP will be provided with information regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessment and method statements and implement their recommendations.

#### 19.6.2.1.5 *Residual Impact*

147. With the incorporation of the mitigation measures described above, the risk to human health during the operation of DEP and SEP in isolation or DEP and SEP together would be minimised as far as possible. The magnitude of impact is considered to be negligible on the medium sensitivity receptor following mitigation. Therefore, the impact to human receptors is of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.2.2 Impact 2: Impact on controlled waters (groundwater and surface waters)

148. Maintenance activities at the landfall, along the onshore cable corridor and at the onshore substation have the potential to mobilise pre-existing contamination or create new contamination through the leakage or spillage of fuels, oils or other chemicals from machinery, vehicles or operational equipment. This could affect water quality within the aquifers underlying the site, surface water receptors and the water abstractions they support.

#### 19.6.2.2.1 *Receptor Sensitivity*

149. The sensitivity of controlled waters is considered to be medium.

#### 19.6.2.2.2 *Magnitude of effect*

150. For both DEP and SEP in isolation and DEP and SEP together, maintenance works could involve soils being exposed at surface. However, it is not anticipated that the entirety of the DEP or SEP footprint would be subject to excavation works during maintenance works.

151. The impacts are predicted to be of local spatial extent (localised to areas of excavation/ maintenance and where contamination may be present). The magnitude is therefore, considered to be low for the operation.

#### 19.6.2.2.3 *Impact Significant*

152. Without mitigation, the potential impact on controlled waters resulting from the operation of DEP and SEP in isolation or DEP and SEP together is low magnitude on a medium sensitivity receptor, representing a **minor adverse** significance.

#### 19.6.2.2.4 *Mitigation*

153. Maintenance workers that are required to undertake ground excavations or maintenance works during the operation of DEP and SEP will be provided with information regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessment and method statements and implement their recommendations to protect controlled waters.

154. At the onshore substation, all fuels, oils lubricants and other chemicals will be stored in an impermeable bund with at least 110% of stored capacity. Spill kits will be available on site at all times and an emergency response plan will be developed which outlines mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials.

#### 19.6.2.2.5 *Residual Impact*

155. Following the implementation of mitigation measures described above, the risk to controlled waters during the operation of DEP and SEP in isolation or DEP and SEP together would be minimised as far as possible. This would effectively reduce the magnitude of effect to negligible on the medium sensitivity receptor. Therefore, the impact to controlled water receptors during operation is of **minor adverse** significance, which is not significant in EIA terms.

### 19.6.2.3 Impact 3: Sterilisation of future mineral resources

156. The installation of cables within the onshore cable corridor and the permanent footprint of landfall and the onshore substation within areas identified as strategic Mineral Safeguarding Areas would prevent future extraction of resources within the permanent footprint of DEP and SEP for the duration of operation (35 years). The impacts are predicted to be permanent and could affect the receptor directly, however the proportion of the total Mineral Safeguarding Areas that would effectively be sterilised is considered to be small. Receptor Sensitivity

157. The sensitivity of future mineral resources is considered to medium.

#### 19.6.2.3.1 *Magnitude of effect*

158. If DEP and SEP were to be constructed in isolation, the realistic worst-case scenario would involve the sterilisation of mineral resources along a 60km cable corridor plus easement and the substation which is 3.25ha in area.

159. If DEP and SEP were to be constructed together, the realistic worst-case scenario would involve the sterilisation of mineral resources along two 60km cable corridor plus easement and the substation which is 6.25ha in area.

160. The impacts are predicted to be of local spatial extent the magnitude is therefore, considered to be medium for the operation of DEP and SEP in isolation or together.

#### 19.6.2.3.2 *Impact Significant*

161. Without mitigation, the potential impact on the mineral resource resulting from the operation of DEP and SEP in isolation or DEP and SEP together is medium magnitude on a medium sensitivity receptor, representing an impact of **moderate adverse** significance.

#### 19.6.2.3.3 *Mitigation*

162. As discussed in **Section 19.6.1.4** prior to construction and operation consultation with Norfolk County Council Mineral Planning Authority will be undertaken to determine the feasibility of mineral extraction. A minerals resource assessment will be undertaken to determine the amount of mineral at risk from sterilisation and the viability of extraction. Where viable, consideration will be given to the extraction of the mineral resource during construction with use in DEP and SEP.

#### 19.6.2.3.4 *Residual Impact*

163. Following the implementation of mitigation measures described above, the magnitude of impact is considered to be negligible on the medium sensitivity receptor. Therefore, the impact to mineral resources during operation is of **minor adverse** significance.

### 19.6.2.4 Impact 4: Built environment

164. Materials such as concrete used in the infrastructure associated with DEP and SEP have the potential to undergo degradation, such as chemical attack, from aggressive ground conditions due to the presence of acids or sulphates. This has the potential to compromise the integrity of structures associated with the substation.

165. In addition, the presence of contaminants in soils could also result in a risk of corrosion and permeation of utilities such as plastic water supply pipes that may be installed at the onshore substation.

166. Buildings built on or near sources of ground gas (such as infilled land) could also be at risk from the accumulation of gases potentially causing explosion.

#### 19.6.2.4.1 *Receptor Sensitivity*

167. Due to the presence of the substation and ancillary structures as well as neighbouring commercial and residential properties within the study area, the sensitivity of the built environment is considered to be medium.

#### 19.6.2.4.2 *Magnitude of effect*

168. Without mitigation, the potential impact on the built environment resulting from the operation of DEP and SEP in isolation or together is high magnitude on a medium selectivity receptor, representing an impact of **major adverse** significance.

#### 19.6.2.4.3 *Mitigation*

169. Desk based information indicates that the substation is not situated on or near potential sources of ground gases, such as infilled land. However, if unexpected source of ground gas are identified prior to or during construction works, a ground investigation will be undertaken to characterise ground conditions and assessment potential risks. Depending on the outcome of the assessment, mitigation measures such as the use of gas protection measures within building will be implemented.

170. If utilities corridors are within land affected by contamination, construction of clean or lined service corridors will be installed to protect land users and utilities.

171. The use of materials suitable for the identified ground conditions, in line with BRE Special Digest 1, during design will adopt the correct concrete type for the environment. This will mitigate against the potential for ongoing material degradation of infrastructure and utilities during the operational life of DEP and SEP.

#### 19.6.2.4.4 *Residual Impact*

172. Following the implementation of mitigation measures described above, the risk to the built environment during the operation of DEP and SEP in isolation or DEP and SEP together would be minimised as far as possible. This would effectively reduce the magnitude of impact to negligible on the medium selectivity receptor. Therefore, the impact to the built environment during operation is of **negligible** significance, which is not significant in EIA terms.

### 19.6.3 Potential Impacts during Decommissioning

173. No decision has been made regarding the final decommissioning policy for the onshore export cables, as it is recognised that industry best practice, rules and legislation change over time. It is likely that the cables would be pulled through the ducts and removed, with the ducts themselves left in situ.

174. In relation to the substation, the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined later within the lifetime of DEP and SEP, but are expected to include:

- dismantling and removal of outside electrical equipment from site located outside of the substation(s) buildings;
- removal of cabling from site;
- dismantling and removal of electrical equipment from within the substation(s) buildings;
- removal of main substation(s) building and minor services equipment;
- demolition of support buildings and removal of fencing;
- landscaping and reinstatement of the site (including land drainage); and
- removal of areas of hard standing.

175. Whilst details regarding the decommissioning of the substation are currently unknown, considering a worst-case scenario, which would be the removal and reinstatement of the current land use, it is anticipated that the impacts would be similar or less than those during construction. This is because areas of identified contamination would have been remediated during the construction phase.

176. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of DEP and SEP so as to be in line with current guidance, policy and legalisation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing and consenting approach.

## 19.7 Cumulative Impacts

### 19.7.1 Identification of Potential Cumulative Impacts

177. The first step in the cumulative assessment is the identification of which residual impacts assessed for DEP and/or SEP on their own have the potential for a cumulative impact with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 19.13** below, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale. Only potential impacts assessed in **Section 19.6** as negligible or above are included in the CIA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

178. **Table 19.13** identifies the potential cumulative impacts in relation to ground conditions and contamination.

*Table 19.13: Potential cumulative impacts (impact screening).*

| Impact | Residual Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|---|
| **Construction** | | | |
| Impact 1: Exposure of Workforce, Landowners, Land Users and Neighbouring Land Users to Contaminated Soils and Groundwater and Associated Health Impacts | Minor adverse significance | Yes | The impacts to construction workers will be confined to the work area for all scenarios.<br><br>Impacts to landowners, land users and neighbouring land users may be exacerbated by other projects for all scenarios. |
| Impact 2: Direct Impacts on Groundwater Quality and Groundwater Resources | Minor adverse significance | Yes | Impacts to secondary and principal aquifers may be exacerbated by other projects for all scenarios which are located on the same aquifer and/or SPZ. |
| Impact 3: Impacts on Surface Water Quality and the Ecological | Minor adverse significance | Yes | Impacts to surface water and the ecological habitats they support may be exacerbated by other projects for all scenarios that are within the same river catchment. |

| Impact | Residual Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|---|
| Habitats they Support. | | | |
| Impact 4: Sterilisation of Future Mineral Resources | Minor adverse significance | Yes | Impacts to Mineral Safeguarding Areas may be exacerbated by other projects for all scenarios if within the same safeguarding area. |
| Impact 5: Built Environment | Minor adverse significance | Yes | Impacts to the built environment may be exacerbated by other projects for all scenarios if located near the same buildings, hence the greatest potential for cumulative impact are those projects immediately adjacent to the onshore elements. |
| **Operation** | | | |
| Impact 1: Exposure of Workforce, Landowners, Land Users and Neighbouring Land Users to Contaminated Soils and Groundwater and Associated Health Impacts | Minor adverse significance | Yes | The impacts to construction workers will be confined to the work area for all scenarios.<br><br>Impacts to landowners, land users and neighbouring land users may be exacerbated by other projects for all scenarios. |
| Impact 2: Impact on Controlled Waters (Groundwater and Surface Waters) | Minor adverse significance | Yes | Impacts to controlled waters may be exacerbated by other projects for all scenarios which are located on the same aquifer and/or SPZ. |
| Impact 3: Sterilisation of Future Mineral Resources | Minor adverse significance | Yes | Impacts to Mineral Safeguarding Areas may be exacerbated by other projects for all scenarios if |

| Impact | Residual Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|---|
| | | | within the same safeguarding area. |
| Impact 4: Built Environment | Negligible significance | Yes | Impacts to the built environment may be exacerbated by other projects for all scenarios if located near the same buildings, hence the greatest potential for cumulative impact are those projects immediately adjacent to the onshore elements. |
| **Decommissioning** | | | |
| The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage. | | | |

### 19.7.2 Other Plans, Projects and Activities

179. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CIA (described as 'project screening'). This information is set out in **Table 19.14** below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to DEP and SEP, status of available data and rationale for including or excluding from the assessment.

180. The project screening has been informed by the development of a CIA Project List which forms an exhaustive list of plans, projects and activities in a very large study area relevant to DEP and SEP. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out. Those projects that are located more than 1km away are not included in **Table 19.14** as the risks relating to ground condition and contamination diminishes with increasing distances.

*Table 19.14: Summary of projects considered for the CIA in relation to ground conditions and contamination.*

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Hornsea Project Three Offshore Windfarm | DCO consented | 2021-2025 (single phase)<br><br>2021-2031 (two phase) | 0 – cable intersects DEP and SEP<br>0.8 between onshore substations | Yes | The Hornsea Three ES identified impacts to Mineral Safeguarding Areas, secondary aquifers, groundwater quality and flow within principal aquifers and SPZs as of negligible to minor adverse significance due to designed-in mitigation measures.<br>Due to the nature and scale of the development there is the potential for the onshore elements of the project to have direct and / or indirect cumulative effects on the receptors identified. There is likely to be a temporal overlap during the construction and operational phases of both Hornsea Three and DEP and SEP. However, due to the mitigation measures incorporated into the design of Hornsea Three, the potential for cumulative effects to occur is limited. |
| Norfolk Vanguard Offshore Wind Farm | DCO consented[1] | Expected construction 2021 to 2027 | 0 – cable intersects DEP and SEP | Yes | The Norfolk Vanguard ES identified impacts to the coastline (including designated geological sites), secondary aquifers, principal aquifer (including SPZs), surface waters, human health and mineral resources as |

[1] Following completion of this CIA, the ruling of a Judicial Review brought against the Secretary of State for Business Energy and Industrial Strategy's (BEIS) decision to award a DCO for NV has been handed down. The decision to grant the order has been submitted to the Secretary of State for redetermination. BEIS will be considering its options, namely appeal or redetermination. Until such time as this process reached a conclusion it has been decided to maintain the NV/ NB cumulative assessment for stakeholder review.

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | negligible to moderate adverse significance. Mitigation measures, additional to those embedded within the project, were proposed that reduced moderate adverse impacts to minor adverse.<br><br>Due to the nature and scale of the development there is the potential for the onshore elements of the project to have direct and / or indirect cumulative effects on the receptors identified. There is likely to be a temporal overlap during the construction and operational phases of both Hornsea Three and DEP and SEP. However, due to both the embedded mitigation measures and, when required additional mitigation measures, being incorporated into Norfolk Vanguard, the potential for cumulative effects to occur is limited. |
| Norfolk Boreas Offshore Windfarm | DCO examination | Expected construction 2026 to 2027 (if Norfolk Vanguard lay ducts as part of project) | 0 – cable intersects DEP and SEP | Yes | The Norfolk Boreas ES identified impacts to the coastline (including designated geological sites), secondary aquifers, principal aquifers (including SPZs), surface waters, human health and mineral resources as negligible to major adverse. Mitigation measures, additional to those embedded within the project, were proposed that reduced the impacts to the receptors to minor adverse.<br>Due to the nature and scale of the development there is the potential for the onshore elements of the project to |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | have direct and / or indirect cumulative effects on the receptors identified. There is likely to be a temporal overlap during the construction and operational phases of both Hornsea Three and DEP and SEP. However, due to both the embedded mitigation measures and, when required additional mitigation measures, being incorporated into Norfolk Boreas, the potential for cumulative effects to occur is limited. |
| A47 North Tuddenham to Easton RIS | Pre-application (application due Q1 2021) | Expected construction 2023 to 2024/5 | 0 – A47 intersects PEIR boundary | Yes | Due to the nature and scale of the development there is the potential for the onshore elements of the project to have direct and / or indirect cumulative effects on the receptors identified. There is a possibility that there will be a temporal overlap between the A47 project and DEP and SEP during the construction phase. However, the works will take place under a DCO and appropriate mitigation measures (e.g. CEMP etc.) will be incorporated into the design thus limiting the potential for cumulative effects to occur. |
| Demolition of four existing units and developmen t of 10 | Final decision | Approved 20/12/2018 | 0.09 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example ground gases, to migrate and impact on the development. However, the proposed development is at least 400m away from known areas of potential infilling within the DEP and SEP study |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| residential units, 1-4 Station Road Swanningto n NR9 5SY | | | | | area and therefore potential risk are likely to be low. If areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |
| Screening opinion (EIA) regulations 2017 – proposed developmen t of a ground mounted solar farm and associated infrastructur e. Land north of The Street Cawston | Final decision – EIA not required 4/6/20 | Not known | 0 | No | Although there is the potential for spatial overlap between the two projects, cumulative effects relating to ground conditions and contamination are considered unlikely due to the minimal construction works likely required for the project. Therefore, there is limited potential for cumulative effects to occur.<br><br>Where usage and storage of fuels and chemicals are required, it is likely that applicable guidance and legislation will be followed. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Agricultural building. Beerhouse Farm, Oulton Street Cawston, NR10 4HX | No prior approval needed (15/8/19) | Not known | 0.14 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |
| Milling Tower Building & 6 No Storage Hopper Silos for Food Processing & Production. Greater Norwich Food Enterprise Zone, Red | Approved 7/2/19 | Not known | 0.09 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Barn Lane, Honingham<br>Approx NR9 5BU | | | | | |
| 1. Infiltration Lagoon to serve Food Enterprise Park 2. Submission of details under condition 2.25 of the Local Development Order REF. 20170052. Land west of Blind Lane, | Approved 21/12/18 | Not known | 0.09 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example contamination, to migrate and impact on the development. However, if areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Honingham<br><br>Approx NR9 5BU | | | | | |
| Change of use from potato store to agricultural chemical storage. Honingham Thorpe Farm, Norwich Road, Honingham , NR9 5BZ | Approved 20/3/2018 | Not known | 0 | No | Storage of agricultural chemicals are likely to follow applicable guidance and legislation thereby limiting the potential for cumulative effects relating to ground conditions and contamination to occur. |
| Erection of agricultural building and shed. (Resubmis sion of | Approved with conditions 6/6/19 | Not known | 0 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| planning consent 2013/1403) . The Old Hall The Street Colton NR9 5DB | | | | | |
| Agricultural building. Land At Hall Farm Gowthorpe Lane Swardeston Norfolk NR14 8DS | Prior approval not required 11/10/17 | Not known | 0.6 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |
| Demolition of garage and outbuilding; erection of detached garage, | Approved 22/10/19 | Not known | 0 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| single storey side extension, alterations to some windows openings and overcladding of external brickwork. Greenacres, Cromer Road, Bodham, Holt, NR25 6QQ | | | | | |
| Proposal to demolish garages replacing with construction of | Advice given 3/5/19 | Not known | 0 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example ground gases, to migrate and impact on the development. However, if areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| wheelchair adaptable bungalow (affordable unit). Land west of 23, The Street, Bodham, Holt, Norfolk | | | | | measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |
| Proposed erection of detached double garage and erection of a detached outbuilding to provide two self-contained holiday lets. Greenacres, Cromer | Advice given 29/11/18 | Not known | 0 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example ground gases, to migrate and impact on the development. However, if areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Road, Bodham, Holt, NR25 6QQ | | | | | |
| Demolition of former school and erection of four dwelling houses. The School House, Cromer Road, Bodham, Holt, NR25 6QG | Advice given 1/12/17 | Not known | 0 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example ground gases, to migrate and impact on the development. However, the proposed development is at least 165m away from known area of potential infilling within the DEP and SEP study area and therefore potential risks are likely to be low. If areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |
| Affordable housing developme nt. Field Adjacent to Sheringha | Advice given 25/6/18 | Not known | 0 | No | There is the potential for the construction works associated with DEP and SEP to create preferential pathways that would allow, for example ground gases, to migrate and impact on the development. However, if areas of contamination are identified within the DEP and SEP construction works area, appropriate mitigation |

| Project | Status | Construction Period | Distance from PEIR boundary (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| m Road, Weybourne, NR25 7EY | | | | | measures, e.g. remediation, will be undertaken which would limit the potential for cumulative effects to occur. |
| Prior notification to erect replacement agricultural storage building. Breck Farm, Weybourne Road, Weybourne, Holt, NR25 6QL | Permission not required 10/10/17 | Not known | 0 | No | Cumulative effects relating to ground conditions and contamination are considered unlikely due to the low likelihood of temporal overlap in construction between the project and DEP and SEP. |

### 19.7.3 Assessment of Cumulative Impacts

181. Having established the residual impacts from DEP and SEP with the potential for a cumulative impact, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of impact that may arise.

#### 19.7.3.1 Cumulative Impact 1: Exposure of Workforce, Land Owners, Land Users and Neighbouring Land Users to Contaminated Soils and Groundwater and Associated Health Impacts

182. Hornsea Project Three is anticipated to make landfall within the PEIR boundary, to the north west of the village of Weybourne. The onshore cable corridor follows a similar route as DEP and SEP, but for the most part, at distances greater than 250m. The Hornsea Project Three onshore cable corridor crosses the DEP and SEP onshore cable corridor to the south of Attlebridge and is immediately adjacent to the PEIR boundary near the village of Easton. The onshore substation for both projects is within the same onshore substation zone.

183. The impact assessment within the geology and ground conditions chapter for the Hornsea Project Three did not include an assessment of the impacts to human health.

184. The onshore cable corridor for both the Norfolk Boreas and Norfolk Vanguard projects crosses the DEP and SEP onshore cable corridor to the north east of the village of Southgate. The impact assessment for both projects identified that short term risks to construction workers would be managed through the use of appropriate working practices and the use of PPE. In addition to these measures a written scheme was to be produced outlining the procedures for the management of contaminated soils and groundwaters and submitted to the local authority for approval. Both a CoCP and a site waste management plan (SWMP) have been produced for both projects.

185. An EIA has yet to be produced for the A47 project, the application for the project is expected to be submitted in spring 2021. The proposed A47 project will cross the cable corridor to the west of the village of Easton.

186. Given the likely embedded mitigation measures of both DEP and SEP and the projects discussed above, and considering that any alteration to ground conditions would be highly localised it is considered that no cumulative impacts are likely to occur during both the construction and operational phases of each development. Therefore, the residual impact to human health is not considered to increase from the **minor adverse** impact predicted for DEP and SEP alone.

#### 19.7.3.2 Cumulative Impact 2: Impacts on Groundwater Quality and Groundwater Resources

187. The potential cumulative impacts to superficial aquifers are likely to occur as a result of accidental spillages of fuels or chemicals during construction. Given the close proximity of onshore cable routes of Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas and roadworks associated with the A47 project to the onshore cable corridor of DEP and SEP there is the potential for multiple projects to share the same aquifer.

188. Impacts to the underlying aquifers as part of the construction phases of Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas will be managed through embedded mitigation measures. These measures include, for example, following good environmental practices based on guidance such as CIRIA C532 Control of Water Pollution from Constructions Sites – Guidance for Consultants and Contractors (2001) (Hornsea Project Three). As mentioned previously, an EIA has yet to be produced for the A47 project and so comments on the proposed mitigation measures cannot be made at this stage.

189. Given the likely embedded mitigation measures of both DEP and SEP and those included within the other three offshore wind farm projects, and considering that any effect would be highly localised, of short duration and of intermittent it is considered that no cumulative effects are likely to occur.

190. Impacts to the Principal Aquifer and SPZs may occur where there is piling or trenchless crossing within the same aquifer and/or SPZ (e.g. Hornsea Project Three and DEP and SEP substations both piling into the White Chalk Subgroup Principal Aquifer) and where there is overlap in the construction phases of the projects. Where construction is undertaken at the same time there is potential for cumulative impacts which could lead to contamination of the Principal Aquifer, SPZs and abstractions they protect. The impacts could result in reduced groundwater quality or disruption to flow.

191. Therefore, the residual impact to the aquifers is not considered to increase from the **minor adverse** impact predicted for DEP and SEP alone.

#### 19.7.3.3 Cumulative Impact 3: Impacts on Surface Water Quality and the Ecological Habitats they Support

192. Direct cumulative impacts on surface waters are likely to occur if there are spatial or temporal overlaps between DEP and SEP and subsequent onshore cable routes or roadworks associated within the A47 project located within cross proximity to the DEP and SEP onshore cable corridor. The cumulative direct impacts to surface waters from accidental discharge would be likely to occur as a result of accidental spillages of fuel or chemicals during construction.

193. Given the nature of the likely embedded mitigation measures of DEP and SEP, and those mitigation measures described in cumulative impact 2 above, it is considered unlikely that there would be an alteration in the magnitude of impacts to surface waters from the proposed developments.

194. The cumulative indirect impacts to groundwater and subsequent surface water discharge is likely to be highly localised and will be unlikely to have long term impacts on groundwater discharge to surface water if spatial overlap between projects was present. Therefore, the residual cumulative impact is not considered to increase from the **minor adverse** impact predicted for DEP and SEP alone.

#### 19.7.3.4 Cumulative Impact 4: Sterilisation of Future Mineral Resources

195. The DEP and SEP onshore elements and Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas or roadworks associated within the A47 project will likely have increased cumulative impacts on strategic mineral resources. Additional areas will be utilised and therefore there would be an increase in the potential loss of strategic resource through mineral sterilisation of different areas (assuming that the resource cannot be avoided). However, the areas impacted along the onshore cable corridors for each project are mainly spread along narrow linear routes rather than a single large area, this will only sterilise a very small proportion of each mineral resource safeguarding area. It is therefore considered that the cumulative impact along cable corridor routes would remain **minor adverse**.

196. Hornsea Project Three and DEP and SEP proposed substation locations are close to each other within the vicinity of the current Norwich Main National Grid Substation. This location also overlaps with a mineral resource safeguarding area which has previously been identified by Norfolk County Council Mineral Planning Authority for proposed strategic mineral extraction, although this proposal has now been withdrawn. The cumulative impact of substations for both projects being constructed in a similar location within the same mineral resource safeguarding area is likely cause the impact to be **moderate adverse** significance.

197. As part of the planning applications process, all projects over 1 ha are required to follow guidance provided by Norfolk County Council Mineral Planning Authority to investigate the quality of the resource and the feasibility of extraction prior to development. Therefore, where viable mineral resources exist within the substation zones for both Hornsea Project Three and DEP and SEP, it is assumed these resources would be extracted prior to development if feasible. The Hornsea Project Three identified that the mitigation requirements in relation to mineral resources involved consultation with the Norfolk County Council Mineral Planning Authority to investigate the quality of the resource and feasibility of extraction prior to development. In addition to this it is proposed that a comprehensive assessment of local mineral resources and the viability for extraction will also be undertaken as part of DEP and SEP in order to reduce the impact on mineral resources.

198. These mitigation measures would reduce the cumulative impact to **minor adverse** significance (assuming no avoidance).

#### 19.7.3.5 Cumulative Impact 5: Built Environment

199. Impacts to the built environment are not discussed within the EIAs for the three offshore windfarms. However, given the likely embedded mitigation measures of both DEP and SEP, the three offshore windfarms and the A47 project, and considering that any alteration to ground conditions would be highly localised it is considered that no cumulative impacts are likely to occur. Therefore, the residual impact to the built environment is not considered to increase from the **minor adverse** impact predicted for DEP and SEP alone.

## 19.8 Transboundary Impacts

200. There are no transboundary impacts with regard to ground conditions and contamination as the study area would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and are not considered further.

## 19.9 Inter-relationships

201. The receptors identified within this chapter (including human health, controlled waters, the built environment, mineral resources and sensitive sites) are intrinsically linked to:

- Water resources (including surface waters and groundwaters), which are influenced by ground conditions and contamination through the quality of groundwater, groundwater flow within the subsurface strata and interactions with surface waters.
- Water and sediment quality, which is influenced by the ground conditions and contamination through surface run-off from surrounding potentially contaminated soils and the chemical quality of groundwater and surface waters.
- Ecology, which is influenced by ground conditions and contamination through the chemical quality of groundwater, surface waters and soils.

202. A summary of the potential inter-relationships between ground conditions and contamination, water resources, water and sediment quality and onshore ecology is provided in **Table 19.15**.

*Table 19.15: Ground conditions and contamination inter-relationships.*

| Topic and description | Related chapter | Where addressed in this chapter | Rationale |
|---|---|---|---|
| Construction | | | |
| Impacts on the quality and quantity of surface waters fed by groundwater. | Chapter 20 Water Resources and Flood Risk | **Sections 19.6** and **19.7**. | Any project-related impacts on the quality and quantity of surface waters could impact upon hydrologically connected groundwaters. |
| Impacts on the quality and quantity of surface waters fed by groundwater. | Chapter 8 Water and Sediment Quality | **Sections 19.6** and **19.7**. | Changes to ground condition and contamination could impact water quality. |

| Topic and description | Related chapter | Where addressed in this chapter | Rationale |
|---|---|---|---|
| Impacts on designated sites | Chapter 22 Onshore Ecology | **Sections 19.6** and **19.7**. | Any project-related impacts on designated sites could impact on the ecology of the study area and within a zone of influence. |
| Decommissioning | | | |
| Impacts associated with the decommissioning phase would be no greater than those identified for the construction phase. | | | |

## 19.10 Interactions

203. The impacts identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between impacts are presented in **Table 19.16**:. This provides a screening tool for which impacts have the potential to interact. **Table 19.17**: provides an assessment for each receptor (or receptor group) as related to these impacts.

204. Within **Table 19.17**: the impacts are assessed relative to each development phase (Phase assessment, i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

205. The significance of each individual impact is determined by the sensitivity of the receptor and the magnitude of effect; the sensitivity is constant whereas the magnitude may differ. Therefore, when considering the potential for impacts to be additive it is the magnitude of effect which is important – the magnitudes of the different effects are combined upon the same sensitivity receptor.

*Table 19.16: Interaction between impacts – screening.*

| Potential Interaction between Impacts | | | | | |
|---|---|---|---|---|---|
| **Construction** | | | | | |
| | Impact 1 | Impact 2 | Impact 3 | Impact 4 | Impact 5 |
| Impact 1 | - | Yes | No | No | No |
| Impact 2 | Yes | - | Yes | No | No |
| Impact 3 | No | Yes | - | No | No |
| Impact 4 | No | No | No | - | No |
| Impact 5 | No | No | No | No | - |
| **Operation** | | | | | |
| | Impact 1 | Impact 2 | Impact 3 | Impact 4 | |
| Impact 1 | - | Yes | No | No | |
| Impact 2 | Yes | - | No | No | |
| Impact 3 | No | No | - | No | |
| Impact 4: | No | No | No | - | |

*Table 19.17: Interaction between impacts – phase and lifetime assessment.*

| | **Highest significance level** | | | | |
|---|---|---|---|---|---|
| Receptor | Construction | Operation | Decommissioning | Phase assessment | Lifetime assessment |
| Human Health | Minor adverse | Negligible | Minor adverse | **No greater than individually assessed impact**<br>The impacts to human health are considered to have a magnitude of effect of negligible to minor adverse significance on receptors deemed to be of high sensitivity, with the most sensitive receptors identified as construction workers. Impacts to human health during construction, operation and decommissioning phases will be managed through standard and best practice methodologies. Given the proposed mitigation measures and the negligible to minor adverse magnitudes, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of DEP and SEP or that interactions would be no greater than when assessed individually. | **No greater than individually assessed impact**<br>The impacts to human health are only considered a potential risk during the construction and decommissioning phases. Risks associated with the operational phase of DEP and SEP will be managed through best practice. Therefore, no lifetime effects for receptors are anticipated. |

| | Highest significance level | | | | |
|---|---|---|---|---|---|
| Groundwater | Minor adverse | Negligible | Minor adverse | **No greater than individually assessed impact**<br>The impacts to groundwater are considered to have a magnitude of effect of negligible to minor adverse significance on receptors deemed to be of high sensitivity. Impacts to groundwater during construction, operation and decommissioning phases will be managed through standard and best practice methodologies. Given the proposed mitigation measures and the negligible to minor adverse magnitudes, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of DEP and SEP or that interactions would be no greater than when assessed individually. | **No greater than individually assessed impact**<br>The impacts to groundwater quality in the superficial aquifers during earthworks are only considered a potential risk during the construction and decommissioning phases. It is considered unlikely that earthworks activities will be required during the operational phase of DEP and SEP, if earthworks are required, they are anticipated to be managed in line with best practice with appropriate risk assessments conducted and submitted to the relevant agency. |

| | Highest significance level | | | | |
|---|---|---|---|---|---|
| | | | | | The impacts to groundwater quality in the bedrock aquifers resulting from trenchless crossings and piling activities are only considered a potential risk during the construction phase. It is considered unlikely that trenchless crossing and piling activities will be required during the operational phase of DEP and SEP. Piling and trenchless crossings are not anticipated to be required during the decommission phase.<br><br>Therefore, no lifetime effects for receptors are anticipated for either superficial or bedrock groundwater. |

| | Highest significance level | | | | |
|---|---|---|---|---|---|
| Surface Water | Minor adverse | Negligible | Minor adverse | **No greater than individually assessed impact**<br>The impacts to surface waters are considered to have a magnitude of effect of negligible to minor adverse significance on receptors deemed to be of high sensitivity. Impacts to surface waters during construction, operation and decommissioning phases will be managed through standard and best practice methodologies. Given the proposed mitigation measures and the negligible to minor adverse magnitudes, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of DEP and SEP or that interactions would be no greater than when assessed individually. | **No greater than individually assessed impact**<br>The impacts to surface water quality from contamination of groundwater are only considered a potential risk during the construction and decommissioning phases. Risks associated with the operational phase of DEP and SEP will be managed through best practice. Therefore, no lifetime effects for receptors are anticipated. |
| Mineral Resources | Minor adverse | Minor adverse | Minor adverse | **No greater than individually assessed impact**<br>The impacts to mineral resources are considered to have a magnitude of effect of minor adverse significance | **No greater than individually assessed impact**<br>Impacts to Mineral Safeguarding Areas are |

| | Highest significance level | | | | |
|---|---|---|---|---|---|
| | | | | on receptors deemed to be of medium sensitivity. Loss of mineral resources during construction, operation and decommissioning phases will be managed by undertaking an assessment of the feasibility of abstraction prior to development and where viable undertaking abstraction prior to development. Given the proposed mitigation measures and the minor adverse magnitude, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of DEP and SEP or that interactions would be no greater than when assessed individually. | considered a potential risk during the construction, operational and decommissioning phases of DEP and SEP. Therefore, no lifetime effects for the receptors is considered likely. |
| Built Environment | Minor adverse | Minor adverse | Minor adverse | **No greater than individually assessed impact**<br>The impacts to the built environment are considered to have a magnitude of effect of minor adverse significance on receptors deemed to be of medium sensitivity. Impacts to the built environment during construction, operation and decommissioning | **No greater than individually assessed impact**<br>The impacts to the built environment are considered a potential risk during construction, operation and decommissioning of DEP |

| | Highest significance level | | | | |
|---|---|---|---|---|---|
| | | | | phases will be managed through standard and best practice methodologies. Given the proposed mitigation measures and the minor adverse magnitude, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of DEP and SEP or that interactions would be no greater than when assessed individually. | and SEP. Risks associated with the operational phase of DEP and SEP will be managed through best practice thereby reducing the potential impacts to the built environment. Therefore, no lifetime effects for the receptors is considered likely. |

## 19.11 Potential Monitoring Requirements

206. Groundwater and ground gas monitoring may be required as part of any targeted ground investigations that may be required in order to determine the site characteristics and if they pose a potential risk to human health, groundwater and surface water receptors identified within this chapter.

## 19.12 Assessment Summary

207. This chapter has provided a characterisation of the existing environment for ground conditions and contamination based on existing site-specific survey data, which has established that there will be some minor adverse residual impacts (provided mitigation measures are in place) on the receptors associated with ground conditions and contamination identified during construction, operation and decommissioning phases of DEP and SEP.

208. The assessment has established that the receptors relating to ground conditions and contamination could be affected as a result of direct disturbance and mobilisation, introduction of new sources of contamination and mineral sterilisation during the construction, operation and decommissioning phases. Although the residual impacts on the receptors identified following implementation of mitigation measures would be negligible to minor adverse and therefore not significant in EIA terms.

209. The assessment has demonstrated that although the scenario involving DEP and SEP together has a larger land area and would lead to greater ground disturbance than if DEP and SEP would be undertaken in isolation, there is no difference in the residual impacts on the receptors for each of the scenarios assessed.

*Table 19.18: Summary of potential impacts on ground conditions and contamination topic.*

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Impact 1: Exposure of Work Force, Land Owners, Land Users and Neighbouring Land Users to Contaminated Soils and Groundwater and Associated to Health Impacts | Human health | High | Low | Moderate adverse | A pre-construction targeted ground investigation will be undertaken in areas identified as potential sources of contamination in order to assess site characteristics. This will then allow for the assessment contaminated areas and appropriate remediation strategies to be produced and implemented following approval by the local authorities.<br><br>Additional mitigation measures including the implementation of a CoCP, which incorporates a range of best practice and current guidelines in order to help reduce the potential impacts to human health receptors. This will include strategies for dealing with unexpected contamination if encountered during construction. | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| | | | | | Adoption of a CL:AIRE Industry Code of Practice to manage the re-use and disposal of excavated soils on site will also be incorporated as an additional mitigation measure protective of human health. | |
| Impact 2: Impacts on Groundwater Quality and Groundwater Resources | Secondary A, Secondary B, Secondary Undifferentiated and Principal Aquifers | High | Low | Moderate adverse | A pre-construction targeted ground investigation will be undertaken in areas identified as potential sources of contamination in order to assess site characteristics. This will then allow for the identification of contaminated areas and appropriate remediation strategies to be produced and implemented following approval by the local authorities.<br><br>Additional mitigation measures, including a hydrogeological risk assessment and a piling risk assessment will be undertaken and the recommendations | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| | | | | | implemented in order to reduce the potential risks.<br>A CoCP will also be developed which will include specific measures relevant to the storage of fuels, oils, lubricants, wastewater and other chemicals during the works. | |
| Impact 3: Impacts on Surface Water Quality and the ecological Habitats they Support | Controlled waters | High | Medium | Major adverse | A pre-construction targeted ground investigation will be undertaken in areas identified as potential sources of contamination in order to assess site characteristics. This will then allow for the identification of contaminated areas and appropriate remediation strategies to be produced and implemented following approval by the local authorities.<br>A CoCP will also be produced and approved by the local authority. The measures outlined in the CoCP such as the correct storage fuels, oils and chemicals will be implemented. | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| | | | | | Furthermore, contaminated waste water within Made Ground or groundwater from dewatering activities in areas of contamination shall be collected within a tank or lagoon prior to any treatment or discharge. | |
| Impact 4: Sterilisation of Future Mineral Resources | Mineral Safeguarding Areas | Medium | Low | Minor adverse | Mitigation will include consultation with the Norfolk County Council Mineral Planning Authority with regards to the feasibility of mineral extraction prior to development. This will be supported by ground investigations prior to construction to help better determine the depth, accessibility and quality of the mineral resource and enable a quantification of the amount of the mineral that may be sterilised. A Mineral Resource Assessment will be undertaken if required, to provide an indication of the likely quality and extent of the mineral | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| | | | | | resource, the commercial viability of extraction and environmental impact.<br>Subject to agreement with the relevant stakeholders, if mineral extraction is feasible, a MMP will be developed which would include mitigation measures such as reusing materials on site where possible. | |
| Impact 5: Built Environment | Buildings and utilities | Medium | Medium | Moderate adverse | A pre-construction targeted ground investigation will be undertaken in areas identified as potential sources of contamination in order to assess site characteristics. This will then allow for the identification of contaminated areas and appropriate remediation strategies to be produced and implemented following approval by the local authorities. | Minor adverse |
| Operation | | | | | | |
| Impact 1: Exposure of Work | Human health | High | Low | Moderate adverse | A programme of remedial works would be undertaken if areas of | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| Force, Landowners, Land Users and Neighbouring Land Users to Contaminated Soils and Groundwater and Associated to Health Impacts | | | | | contamination identified during the site characterisation works would be undertaken prior to the operation of DEP and / or SEP would reduce the potential for impact to human health. Maintenance workers that are required to undertake ground excavations during the operation of DEP and SEP will be provided with information regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessment and method statements and implement their recommendations | |
| Impact 2: Impact on Controlled Waters (Groundwater and Surface Waters) | Controlled waters | Medium | Low | Minor adverse | Maintenance workers that are required to undertake ground excavations or maintenance works during the operation of DEP and SEP will be provided with information regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessment and method statements and implement | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| | | | | | their recommendations to protect controlled waters.<br>At the onshore substation, all fuels, oils lubricants and other chemicals will be stored in an impermeable bund with at least 110% of stored capacity. Spill kits will be available on site at all times and an emergency response plan will be developed which outlines mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials. | |
| Impact 3: Sterilisation of Future Mineral Resources | Mineral Safeguarding Areas | Medium | Medium | Moderate adverse | Prior to construction and operation, a mineral resource assessment will be undertaken if required, to determine the amount of mineral at risk from sterilisation and the viability of extraction. Where viable, consideration will be given to the extraction of the mineral resource during construction with use in the Projects. | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| Impact 4: Built Environment | Buildings and utilities | Medium | High | Major adverse | The concrete used within the built elements of DEP and SEP will be designed in accordance with BRE Special Digest 1 in order to ensure that the correct concrete is used for the ground conditions present.<br><br>If the substation is to be situated on or near potential sources of ground gases, such as infilled land, prior to construction a ground investigation will be undertaken to characterise ground conditions and assessment potential risks. This will then enable the correct ground gas protection measures to be installed, if required.<br><br>Construction of clean or lined service corridors will be installed to protect land users and utilities. | Minor adverse |
| Decommissioning | | | | | | |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| No decision has been made regarding the final decommissioning policies for either DEP or SEP as it is recognised that industry best practice, rules and legislation change over time. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator with a decommissioning plan provided.<br><br>However, it is considered likely that the proposed onshore substation would be removed and will be reused or recycled and that the onshore cables would be removed and recycled, with the landfall transition joint bays and cable ducts (where used) left *in situ*. For the purposes of a worst-case scenario, it is considered that the impacts associated with the decommissioning phase would be no greater than those identified for the construction phase. | | | | | | |

## 19.13 References


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