



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Non-Technical Summary

April 2021

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<b>Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Preliminary Environmental Information Report Non-Technical Summary</b>	
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## Glossary of Acronyms

AfL	Agreement for Lease
DCO	Development Consent Order
DEP	Dudgeon Offshore Wind Farm Extension Project
EIA	Environmental Impact Assessment
ES	Environmental Statement
IEMA	Institute of Environmental Management and Assessment
MW	Megawatts
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
TCE	The Crown Estate
UK	United Kingdom

## Glossary of Terms

The Applicant	Equinor New Energy Limited
The Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
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.
The Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

## Non-Technical Summary

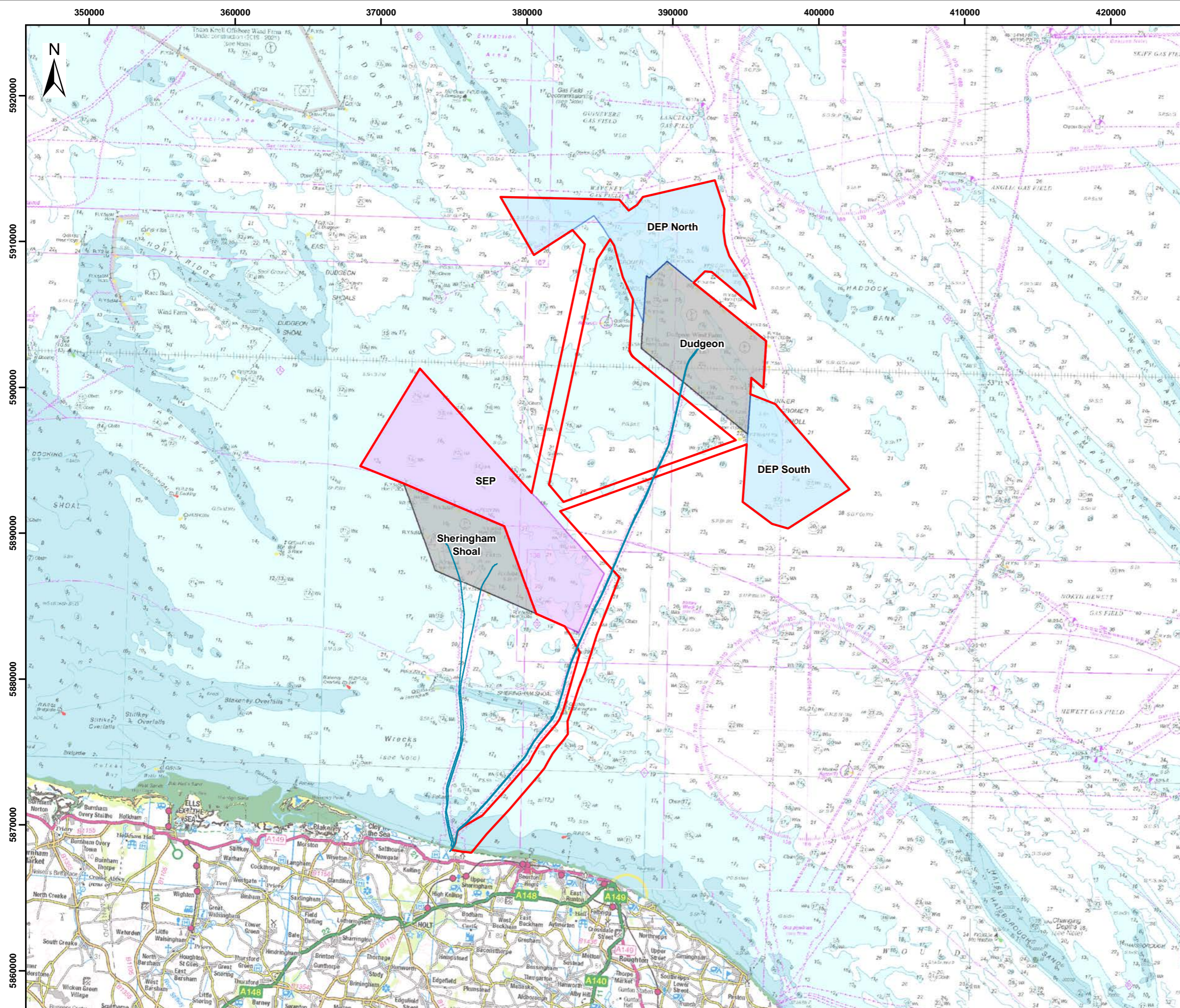
### 1 Introduction

#### 1.1 Purpose of the Document

1. This document is the Non-Technical Summary (NTS) of the Preliminary Environmental Information Report (PEIR) for Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP) and Dudgeon Offshore Wind Farm Extension Project (hereafter DEP). It provides a summary of SEP and DEP, the site selection process and the key findings of the Environmental Impact Assessment (EIA) process to date. The purpose of the EIA is to allow stakeholders to develop an informed view of the impacts of the development, as required by The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations 2017).
2. SEP and DEP are Nationally Significant Infrastructure Projects (NSIPs). Consent to construct, operate and decommission SEP and DEP is therefore being requested from the Secretary of State for Business, Energy and Industrial Strategy, under the Planning Act 2008. The purpose of the PEIR is to provide Preliminary Environmental Information (PEI) which has been gathered and an assessment of the potential significant impacts of SEP and DEP, from construction through to decommissioning.
3. An Environmental Statement (ES) will be prepared detailing the finalised EIA findings for SEP and DEP and will be informed by stakeholder responses to the PEIR. The ES will accompany the application for a Development Consent Order (DCO), expected to be submitted to the Planning Inspectorate later in 2021.
4. Equinor (the Applicant) applied to The Crown Estate (TCE), on behalf of the partners in the operational Dudgeon and Sheringham Shoal offshore wind farms, for an Agreement for Lease (AfL) for the extension of these two sites. An acceptance letter from TCE was received in September 2019 and AfLs were signed in April 2020 for DEP and August 2020 for SEP. Equinor is leading on the development work for both SEP and DEP, and Equinor will be the named Applicant.
5. When operational, SEP and DEP combined will have the potential to generate renewable power for 820,000 United Kingdom (UK) homes from up to 32 wind turbines at DEP and up to 24 wind turbines at SEP.
6. The main components of SEP and DEP comprise offshore wind turbines, offshore substation platform(s), offshore cables, onshore cables and an onshore substation. The offshore SEP and DEP areas are shown in **Figure 1**. The onshore PEIR boundary is shown in **Figure 2**. A more detailed set of plans showing the onshore boundary is available in **Volume 2 of the PEIR Chapter 5 Project Description**.
7. This Non-Technical Summary is a stand-alone document to provide a high-level overview of the potential environmental impacts of SEP and DEP in non-technical terms. For further information, the full PEIR should be referred to, which can be found at:

[event.sepanddep.co.uk](http://event.sepanddep.co.uk)





# Sheringham Shoal and Dudgeon Extension Projects

## Figure 1

### The Offshore DEP and SEP Areas

- Legend:
- PEIR Boundary
  - Dudgeon Offshore Wind Farm Extension Site
  - Sheringham Shoal Offshore Wind Farm Extension Site
  - Existing Offshore Wind Farm Export Cable
  - Existing Offshore Wind Farm

**Data Sources:** Equinor, 2021  
**Base Map:** © British Crown and OceanWise, 2021. All rights reserved. License No. EMS-EK001-627782. Not to be used for Navigation; Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and) contributors, CC-BY-SA



Document No: PB8164-RHD-ZZ-OF-DR-Z-0164  
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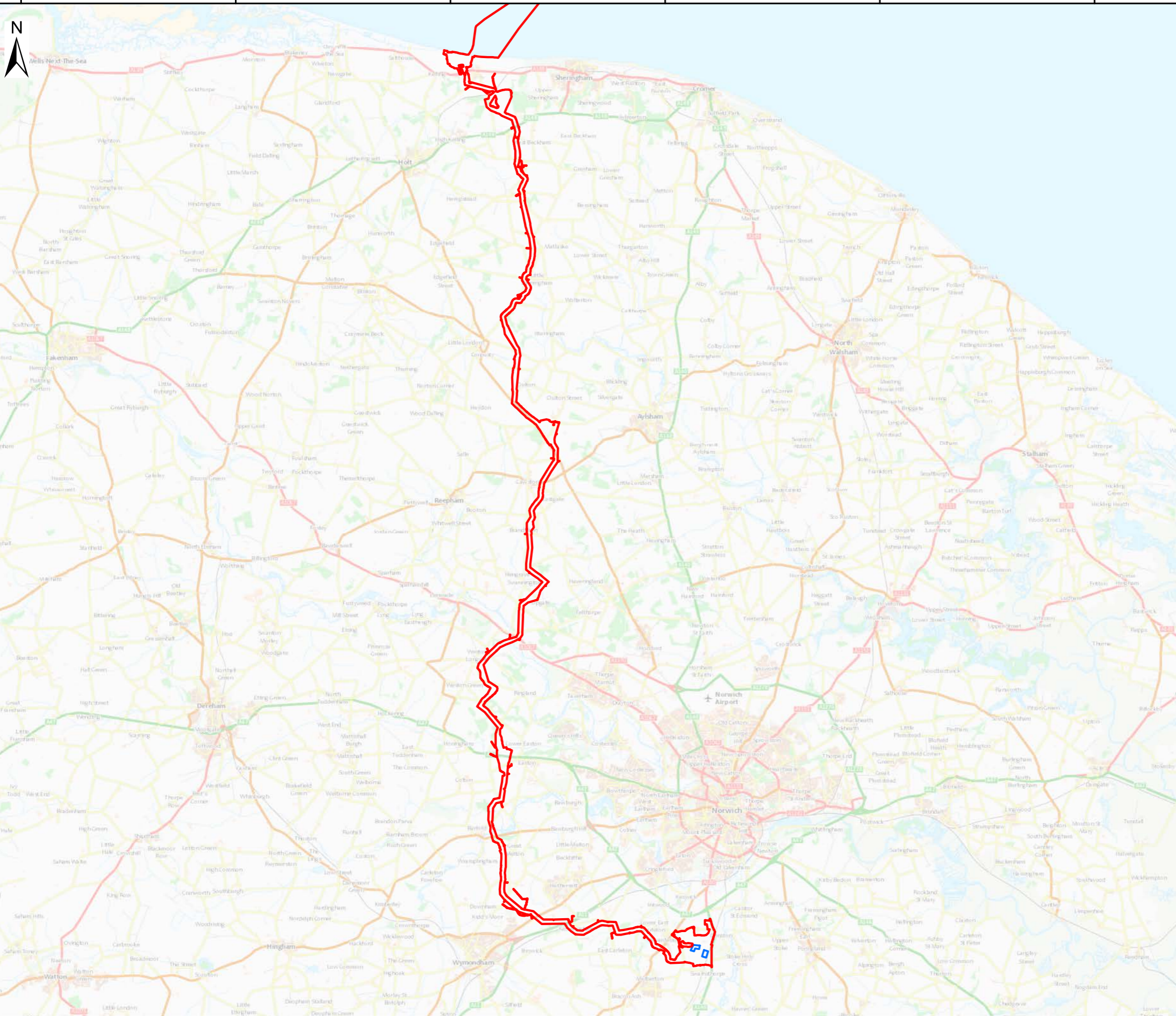
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Report: Non-Technical Summary (NTS)  
 Preliminary Environmental Information Report (PEIR)





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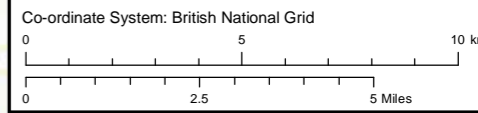
### Sheringham Shoal and Dudgeon Extension Projects Figure 2 Onshore PEIR Boundary

- Legend:
- PEIR Boundary
  - Onshore Substation Site

**Data Sources:** Equinor, 2021  
**Base Map:** © Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and) contributors, CC-BY-SA



Document No: PB8164-RHD-ZZ-ON-DR-Z-0137



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Report: Non-Technical Summary (NTS)  
 Preliminary Environmental Information Report (PEIR)





## 1.2 The Applicant and the Project Team

8. Equinor is an international energy company present in more than 30 countries. It employs 22,000 people globally and 650 in the UK. It is the UK's largest supplier of both crude oil and natural gas, meeting more than 25% of the UK energy demand, produced with one of the lowest carbon footprints in crude oil and natural gas production in the industry. As a broad energy company, Equinor is committed to a long-term low carbon future and has a target to become carbon neutral by 2030. Equinor ASA is already powering more than one million European homes from its four offshore wind farms in the UK and Germany.
9. Equinor ASA has invested over £1bn in the UK offshore renewables sector and has 749 Megawatts (MW) in operational offshore wind farms that provide renewable power for more than 750,000 UK homes.
10. Royal HaskoningDHV is an environmental and engineering consultancy, commissioned by Equinor to lead the EIA for SEP and DEP with support from a number of other specialist consultants. Royal HaskoningDHV has provided environmental, development and consenting support on over 14GW of renewable energy projects across 27 UK offshore wind farms. Their EIA activities and ESs are accredited by the Institute of Environmental Management and Assessment (IEMA) under the EIA Quality Mark Scheme. This demonstrates Royal HaskoningDHV's commitment to ensuring EIA is undertaken to a high quality and in accordance with best practice.

## 1.3 The Need for the Projects

11. Climate change is a global scale issue which is caused by the increase of carbon emissions into the atmosphere. SEP and DEP would make a contribution both to the achievement of UK decarbonisation targets and to global commitments in mitigating climate change. By generating low carbon, renewable electricity in the UK, SEP and DEP will also help to reduce the UK's reliance on imported energy and will increase energy supply security. Further detail is provided on this in PEIR **Volume 1 Chapter 2 Need for the Projects** and **Chapter 3 Policy and Legislative Context**.
12. SEP and DEP will make a substantial contribution to the achievement of national renewable energy targets towards net zero greenhouse gas emissions and to the UK's contribution to global efforts to reduce the effects of climate change.
13. Together SEP and DEP could contribute approximately 2% of the UK offshore wind cumulative deployment target for 2030, with SEP and DEP contributing approximately 1% and 0.7% respectively.
14. The offshore wind farms will provide secure, reliable, affordable renewable energy supply in the UK. SEP and DEP would reduce carbon emissions and contribute to the economy by providing substantial investment locally and nationally, as well as employment and new infrastructure during all phases of SEP and DEP.



15. SEP and DEP will continue to drive technology and development costs down to provide low cost energy to consumers and provide community benefits to help fight fuel poverty. SEP and DEP will also significantly contribute to the UK's commitment to meeting the legally binding target of net zero greenhouse gas emissions by 2050.

#### 1.4 Site Selection and Assessment of Alternatives

16. The site selection and project design process involves early engagement with communities and stakeholders. This ensures that site selection decisions are communicated with people and allows for feedback to influence and refine the project design.
17. The site selection process has been informed by specialists comprising engineers, planners, land advisors, legal and environmental consultants whose expertise was drawn upon throughout the process.
18. The location and design of the SEP and DEP infrastructure has taken into account a wide range of environmental, physical and social considerations. For example, the routing and design of the onshore cables to avoid populated areas and areas of ecological importance where possible. The aim is to establish an overall footprint and set of design parameters that are environmentally and socially acceptable, and feasible from an engineering and commercial perspective. This reflects a long-term consideration to ensure that the lowest possible energy cost is passed onto the consumer.
19. The Applicant has undertaken extensive pre-application engagement with stakeholders, communities and landowners in order to seek input for the ongoing refinement of the SEP and DEP project design, and to communicate the decisions that have been made to date.
20. The Scoping Report (RHDHV, 2019) sets out the development of the site selection and consideration of alternatives at the scoping stage. Consultation feedback was provided by stakeholders through the Scoping Opinion (PINS, 2019). Further consultation was undertaken through a range of methods including public consultation, a consultation website and an information line. Phase 1 consultation on site selection for the onshore substation and cable corridor ran from 9<sup>th</sup> July to 20<sup>th</sup> August 2020 and Phase 2 public consultation for updates and feedback is planned for Spring 2021. Engagement has also been undertaken with landowners and local authorities.
21. Equinor has also engaged with Natural England, the Marine Management Organisation, Cefas, Eastern Inshore Fisheries and Conservation Authority, Royal Society for the Protection of Birds, Historic England, Wildlife Trusts, local authorities, and other stakeholders. Several Expert Topic Groups have been established with these stakeholders to focus on key issues. Details of the technical consultation undertaken are presented in **Chapter 7 Technical Consultation**.

22. For the onshore infrastructure (i.e. landfall, onshore cable route and onshore substation location) the site selection process involved the consideration of engineering constraints, environmental effects and deliverability. More detail with regard to site selection can be found in **PEIR Volume 1 Chapter 4 Site Selection and Assessment of Alternatives. Table 1-1** gives an overview of the site selection decisions that have been described in chapter.

*Table 1-1: Summary of key site selection decisions*

Infrastructure Element	Options considered	Decision	Main environmental benefits
Landfall	Weybourne; Bacton; and Happisburgh.	Weybourne (west)	<ul style="list-style-type: none"> <li>• Lower elevation at the coastline and other technical advantages;</li> <li>• Shorter route, minimising footprint;</li> <li>• Avoids populated areas at the coast and those at risk of coastal erosion as far as possible;</li> <li>• Avoids the Wash and North Norfolk Coast Special Area of Conservation;</li> <li>• Less offshore cable and pipeline crossings;</li> <li>• Better access; and</li> <li>• High confidence in the feasibility of horizontal directional drilling (the method used to install the export cables under the beach at the landfall without the need for trenches) due to previous installations.</li> </ul>
Offshore export cable corridor	Multiple	Export cable corridor to Weybourne (with landfall at Weybourne West)	<ul style="list-style-type: none"> <li>• Shorter route, minimising footprint;</li> <li>• Avoids the Wash and North Norfolk Coast Special Area of Conservation;</li> <li>• Less offshore cable and pipeline crossings;</li> <li>• Avoids Bacton sandscaping scheme; and</li> </ul>



Infrastructure Element	Options considered	Decision	Main environmental benefits
			<ul style="list-style-type: none"> <li>Avoids area of outcropping chalk further offshore.</li> </ul>
Onshore substation	17 sites within 5 Zones	Options 1 and 2	Options 1 and 2 are located away from the nearest residential properties and other sensitive receptors. The proximity to the existing Norwich Main substation also minimises the length of buried cabling.
Onshore cable route	<p>The onshore cable route proposed was selected based upon guiding design principles and a cable corridor refinement process which included consultation feedback.</p> <p>The route of the onshore cable route is largely determined by the location and configuration of the onshore substations at PEIR stage.</p>		
National Grid connection point	<p>Following the completion of the CION process National Grid made a grid connection offer in April 2019 for connection at Norwich Main National Grid Substation that would accommodate both SEP and DEP. The Applicant accepted this offer in May 2019.</p>		

## 1.5 The Environmental Impact Assessment Process

23. The EIA considers all relevant topics both onshore and offshore. The topics to be included in the EIA were agreed with the Planning Inspectorate and other stakeholders through the scoping process, with the Planning Inspectorate providing a Scoping Opinion in November 2019 which is available at: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010109/EN010109-000006-EQNR\\_Scoping%20Opinion%202017%20EIA%20Regs.pdf](https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010109/EN010109-000006-EQNR_Scoping%20Opinion%202017%20EIA%20Regs.pdf)
24. The preliminary EIA findings for SEP and DEP are reported within the PEIR. As part of the process, a detailed description of the existing environment for the offshore and onshore development areas has been identified, through a combination of desk based studies, consultation and site-specific surveys.
25. All potential impacts of the construction, operation and decommissioning SEP and DEP have been identified and an assessment made on the significance of each potential impact by EIA topic specialists.

26. Where the impact assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, mitigation measures are proposed to avoid impacts or reduce them to acceptable levels and, if possible, to provide an enhancement to the existing environment. Mitigation will be agreed through ongoing consultation with the relevant authorities.
27. The process also considers:
- Cumulative impacts, where SEP and DEP are considered alongside the predicted impacts of other projects in the nearby area (for example another offshore wind farms or road development);
  - Transboundary impacts, where activities in other countries may be impacted (for example shipping routes and commercial fishing activities); and
  - Inter-relationships, where impacts to one receptor can have a knock-on impact on another (for example noise impacts disturbing people in the nearest properties may also disturb species associated with nearby nature conservation sites).

## 1.6 Role of National Policy Statements in the Decision Making Process

28. There are three National Policy Statements (NPSs) which are relevant to SEP and DEP:
- EN-1 Overarching Energy, which highlights that there should be a presumption in favour of granting consent for projects which fall within relevant NPSs and recognises that offshore wind is a key factor in meeting UK policy objectives;
  - EN-3 Renewable Energy Infrastructure, which covers nationally significant renewable energy infrastructure (including offshore wind farms in excess of 100MW); and
  - EN-5 Electricity Networks, which covers the electrical infrastructure (including electricity cable systems and substations) in conjunction with EN-1.
29. The PEIR outlines how the development of SEP and DEP will comply with the requirements of these NPSs.

### 1.6.1 Other Planning Policies

30. Local authorities are required to prepare and maintain up-to-date Local Development Plans which set out their objectives for the use and development of land within their jurisdiction, and general policies for implementation.
31. The onshore project area falls under the jurisdiction of the following county council and local planning authorities:
- Norfolk County Council;
  - North Norfolk District Council;



- Broadland District Council; and
  - South Norfolk Council.
32. The Local Development Plans have been considered during the onshore site selection for SEP and DEP to avoid conflict with those planning objectives, wherever possible.

## 1.7 The PEIR Structure

33. The PEIR covers SEP and DEP including both the offshore and onshore development areas. The PEIR is comprised of:
- Volume 1: PEIR Chapters (chapter list shown in [Table 1.2](#));
  - Volume 2: Figures;
  - Volume 3: Appendices; and
  - Non-Technical Summary (this document).

*Table 1.2: PEIR Volume 1 Chapter List*

Section	Chapters	Title
<b>Introductory</b>	Chapter 1	Introduction
	Chapter 2	Need for the Project
	Chapter 3	Policy and Legislative Context
	Chapter 4	Site Selection and Assessment of Alternatives
	Chapter 5	Project Description
	Chapter 6	EIA Methodology
	Chapter 7	Technical Consultation
<b>Offshore</b>	Chapter 8	Marine Geology, Oceanography and Physical Processes
	Chapter 9	Marine Water and Sediment Quality
	Chapter 10	Benthic and Intertidal Ecology
	Chapter 11	Fish and Shellfish Ecology
	Chapter 12	Marine Mammal Ecology
	Chapter 13	Offshore Ornithology
	Chapter 14	Commercial Fisheries
	Chapter 15	Shipping and Navigation
	Chapter 16	Offshore Archaeology and Cultural Heritage
	Chapter 17	Aviation and Radar
	Chapter 18	Petroleum Industry and Other Marine Users
<b>Onshore</b>	Chapter 19	Onshore Ground Conditions and Contamination
	Chapter 20	Water Resources and Flood Risk
	Chapter 21	Land Use, Agriculture and Recreation
	Chapter 22	Onshore Ecology and Ornithology
	Chapter 23	Onshore Archaeology and Cultural Heritage
	Chapter 24	Air Quality

Section	Chapters	Title
	Chapter 25	Noise and Vibration
	Chapter 26	Traffic and Transport
<b>Wider Scheme Aspects</b>	Chapter 27	Seascape and Visual Impact Assessment
	Chapter 28	Landscape and Visual Impact Assessment
	Chapter 29	Socio-Economics and Tourism
	Chapter 30	Health
	Chapter 31	Transboundary Impacts Summary

## 1.8 Consultation

34. Equinor has undertaken extensive community and stakeholder consultation, which has informed a number of key decisions in relation to the design and development of SEP and DEP in order to deliver an environmentally sustainable project.
35. A Statement of Community Consultation was produced in July 2020, which outlined how Equinor would consult with local communities on plans to develop SEP and DEP. The approach set out in the Statement of Community Consultations included:
- Community feedback reports shared with all registered participants, key local and community stakeholders, and on the Equinor project website;
  - Phase 1 consultation (2019/2020) with statutory consultees and the public - A six-week consultation exercise was held between 9 July and 20 August 2020;
  - Phase 2 consultation with statutory consultees and the public - A consultation exercise that will run between 29 April 2021 and 10 June 2021, providing the opportunity for the community to comment on refined plans for SEP and DEP as well as the information presented in the PEIR;
  - Parish Council briefings and stakeholder forums—iterative and ongoing engagement with the community and wider stakeholders. Dedicated working groups have been set up in the form of parish council stakeholder forums, with an inception meeting held on 20 April 2021;
  - Direct discussions with landowners;
  - Newsletters distributed throughout the core consultation zone of over 11,000 homes and businesses;
  - Dedicated project e-mail address and freepost address to assist local communities in contacting the Applicant;
  - Provision of a dedicated project website; and
  - Regular and targeted discussions with regulators and other stakeholder bodies through various means including Expert Topic Group meetings, as detailed in **Chapter 7 Technical Consultation**.



36. Full details of SEP and DEP consultation process will be presented in the Consultation Report, which will be submitted as part of the DCO application.

## 1.9 Next Steps

37. Equinor will further refine the SEP and DEP design post-PEIR based upon the consultation responses received. The impact assessment work will then be concluded and the final findings of the EIA will be presented in the ES. A summary of all the consultation responses received will also be provided in the Consultation Report. Both the final ES and the Consultation Report will accompany the DCO application to be submitted later in 2021.

## 2 SEP and DEP Project Description

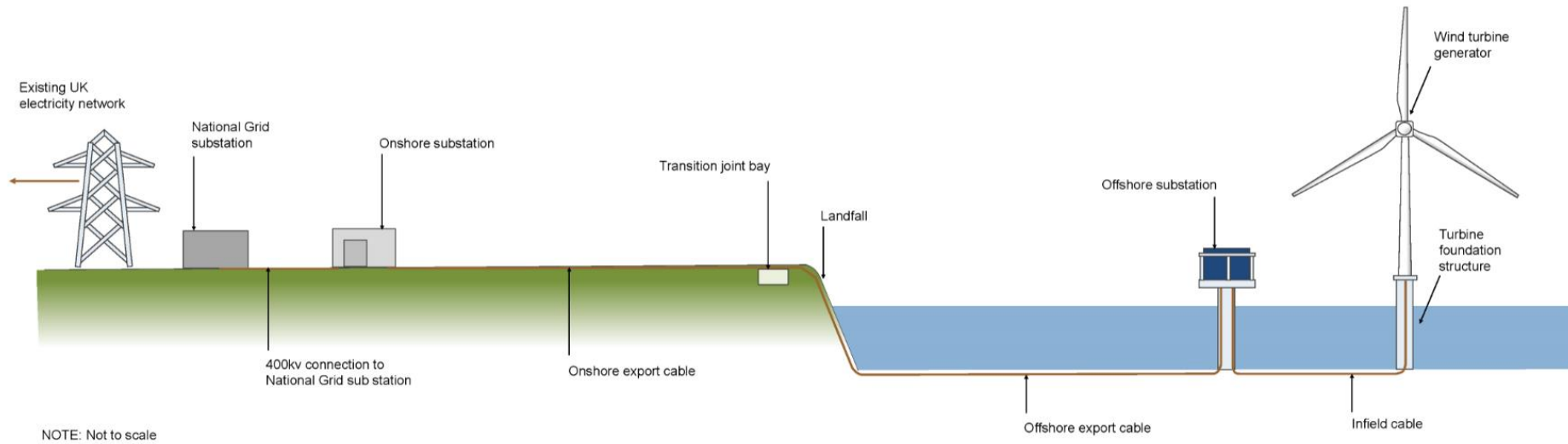
38. SEP and DEP are located in the Greater Wash region of the southern North Sea. The closest point to the coast is approximately 14km from SEP and 25km from DEP (**Figure 1**). The offshore area (**Figure 1**) includes the SEP and DEP wind farm sites where the wind turbines will be located, and the offshore cable corridors that connect the wind farm sites to the landfall.
39. The key offshore components are:
- Offshore wind turbines, offshore substation platform(s) and their associated foundations; and
  - Offshore cables.
40. SEP and DEP will also require onshore infrastructure in order to transmit and connect the offshore wind farms to the onshore substation (**Figure 2**), which in summary would comprise:
- Landfall at Weybourne, where the offshore export cables are brought ashore and jointed to the onshore cables;
  - Underground cables between the landfall and the grid connection at the existing National Grid Norwich Main substation; and
  - An onshore substation for SEP and DEP next to the Norwich Main substation.
41. **Figure 3** illustrates the main elements of SEP and DEP that would be installed. Further details of the key offshore and onshore components can be found in **Chapter 5 Project Description** of the PEIR.
42. The earliest that construction could commence in 2024, with the onshore construction works likely to commence first.

### 2.1 Offshore Works

43. Up to 32 14MW wind turbines will be installed at DEP and up to 24 14MW wind turbines at SEP, although a range of different turbines sizes and associated foundations are under consideration. If larger capacity wind turbines are used (up to 26MW), fewer will be required in total. It is assumed that the total capacity of SEP and DEP would be up to 448MW and 338MW respectively.

44. Infield cables will link the wind turbines to the offshore substation platform(s). Depending on the development scenario (see [Section 2.3](#) below), the wind farm sites will be connected to one another via interlink cables, with up to two offshore substation platforms. An offshore export cable corridor will link the wind farm site/s with the cable landfall at Weybourne.
45. Offshore construction works would require up to two years per project, assuming SEP and DEP were built at different times. There could be a gap of up to one year between the completion of offshore construction works on the first project and the start at the second. However, if built at the same time, offshore construction could be completed in two years.

Figure 3: SEP and DEP overview schematic (N.B. not to scale).





## 2.2 Onshore Works

46. The offshore export cables will make landfall at Weybourne, at a preferred location to the west of Weybourne beach car park at the Muckleburgh Military Collection. The cables would be installed under the beach using a horizontal directional drilling method, which will minimise the need for construction activity on the beach. The landfall area of the PEIR boundary comprises a 1,500m stretch of coastline that extends west, beyond the preferred drilling location. This provides space for the drilling compound as well as an extended area adjacent to the beach for preparing the ducts within which the cables are installed. The landfall area also extends inland to allow the transition joint bays to be located beyond any areas at risk of natural coastal erosion, and to provide space for temporary construction areas and access requirements.
47. From the landfall at Weybourne, the onshore cable corridor travels south, crossing Sheringham Road (A149), and the North Norfolk Railway line between Holt and Sheringham and continuing south to cross Cromer Road (A148) to the east of High Kelling. South of the North Norfolk Railway line, the cable corridor widens out to 1,200m in proximity to Weybourne Wood. A number of potential routing options are under consideration through Weybourne Wood and will be refined down to a single preferred option within the final DCO application.
48. The cable corridor continues south passing the villages of Oulton and Cawston, crossing the River Wensum near Attlebridge and then crossing the A47 between Hockering and Easton. From this point the onshore cable corridor heads south east, crossing the A11 at Ketteringham before reaching the two onshore substation site options near the existing Norwich Main substation.
49. The cable corridor width of 45m (single project) or 60m (two projects) would also include a haul road to deliver equipment to the installation site from construction compounds, storage areas for excavated soils, and drainage.
50. Two onshore substation site options have been identified and assessed within the PEIR – each option is of sufficient size to accommodate the maximum footprint required for both SEP and DEP. Only one of these two options will be taken forward for the DCO application. The decision on the preferred substation site option will be informed by stakeholder feedback on the information provided in the PEIR, as well as further technical studies and ongoing environmental survey and assessment work.
51. The installation of the onshore cables is expected to take up to 24 months in total if either SEP and DEP is constructed in isolation or if both SEP and DEP are constructed at the same time. If SEP and DEP are built one after the other, there would be two separate onshore construction periods of up to 24 months.
52. The onshore substation will be constructed to accommodate both DEP and SEP. If only one project comes forward the substation will be up to 3.25ha in size. If both projects are taken forward a single substation will be constructed to accommodate both connections and will be up to 6.25ha. Landscape and tree planting schemes will be carefully designed to reduce visual impacts of the onshore substation.

53. Following completion of the onshore construction works the onshore area will be reinstated and can return to its previous uses, with the exception of the onshore substation which will remain in place throughout the 35 year operational life of SEP and DEP.

## 2.3 Project Development Scenarios

54. Whilst SEP and DEP are each NSIPs in their own right, a single application for development consent will be made covering both wind farms, and the infrastructure required to connect SEP and DEP to the grid. A single planning process is intended to provide for consistency in the approach to the assessment, consultation and examination.
55. Furthermore, Equinor will seek to develop SEP and DEP as an integrated project, with an integrated grid option providing transmission infrastructure which serves both of the wind farms being the preferred option. This strategic approach will particularly benefit the planning and construction of the electrical infrastructure system, is likely to reduce the overall environmental impact and disruption, and responds to concerns regarding the lack of an holistic approach to offshore wind development in general.
56. However, given the different ownership arrangements for SEP and DEP, a separated grid option (i.e. transmission infrastructure which allows each Project to transmit electricity entirely separately) will allow SEP and DEP to be constructed in a phased approach, if necessary. Therefore the DCO application will seek consent for alternative grid solutions in the same overall corridors to allow for both the integrated and separated grid options.
57. The PEIR has considered the appropriate realistic worst-case associated with the different development scenarios and presented the results accordingly.

## 3 Topics Considered in the Environmental Impact Assessment

58. The PEIR covers a wide range of offshore and onshore environmental topics for which potential impacts have been assessed. Many of these technical assessments are related to each other and these links are highlighted within the PEIR chapters.
59. The SEP and DEP PEIR presents assessments for all of the topics and potential impacts that were specified within the Planning Inspectorate's Scoping Opinion (PINS, 2019). Each of those topics have been summarised as part of this Non-Technical Summary in the sections that follow.

### 3.1 Offshore

#### 3.1.1 Marine Geology, Oceanography and Physical Processes

60. The assessment considers the construction, operation, and decommissioning phases of SEP and DEP and the potential impacts on relevant receptors, including the Cromer Shoal Chalk Beds Marine Conservation Zone and East Anglian coast. The former is important for a range of subtidal habitats including outcropping chalk and the latter for gravel/sand beaches, dunes and cliffs. The assessment considers the effects on waves, currents and movement of sediment, both in the water column and along the sea bed.

61. Potential effects have been assessed using an evidence-based approach, utilising the range of data available. The baseline conditions are described using data collected for the Project, a review of existing knowledge about this part of the southern North Sea, and numerical modelling and theoretical studies undertaken for the adjacent Dudgeon and Sheringham Shoal offshore wind farms.
62. Most of the sea bed comprises sediment with large particle sizes that cannot be suspended in the water column and will not form part of a sediment plume if disturbed during construction. In areas where construction activities may encounter finer sea bed sediments, these are likely to be suspended in the water column, but for a short time only (hours to days).
63. Changes to waves, currents and sediment movement due to the presence of the foundation structures would be small in magnitude and local in spatial extent. Importantly, a commitment has been made to bury, as far as possible, all offshore cables below the sea bed, to minimise the need for external cable protection (e.g. rock).
64. Overall, construction and operational effects on waves, currents and movement of sediment are predicted to be small scale, localised and temporary. Hence, they are categorised as negligible impact or no impact. This applies to SEP and/or DEP in isolation, together and cumulatively with other plans, projects and activities.
65. The Marine Geology, Oceanography and Physical Processes chapter was used as a basis for the assessments of some of the following marine topics, particularly marine water and sediment quality, benthic ecology, and fish and shellfish ecology.

### 3.1.2 Marine Water and Sediment Quality

66. The existing marine water and sediment quality environment within the proposed wind farm areas and cable corridors has been characterised using site-specific survey data and supplemented where available by information held on national databases.
67. The water quality within the area of the wind farms is reported to be improving, with concentrations of contaminants below levels which could harm marine life. Concentrations of sediment suspended in the water column vary substantially depending on the season and may increase significantly during storm events. The offshore export cable corridor passes through two Water Framework Directive coastal water bodies and within 10km of two designated bathing waters. These designations indicate good water quality in relation to parameters monitored in the bathing waters and some issues with water quality in the coastal water bodies associated with some contaminants. Site specific surveys took sediment samples at the wind farm sites and along the offshore cable corridors which were analysed for levels of contamination. The analysis results showed that concentrations of contaminants within the sediments are below levels of concern.



68. The subsequent impact assessment determined that during the construction, operation and decommissioning works for SEP and DEP either in isolation or together, significant impacts on water quality would not occur, including cumulatively with other projects.

### 3.1.3 Benthic and Intertidal Ecology

69. Seabed surveys were undertaken across the wind farms sites and cable corridors to provide a detailed understanding of the benthic ecology of the area. The survey results were used to produce habitat maps to inform the assessment. The export cables at the landfall will be installed under the beach using a drilling method (as was completed for the existing Dudgeon and Sheringham Shoal offshore wind farms), avoiding any direct impacts on the intertidal environment.
70. The seabed across the project areas is dominated by sands and gravels, with the corresponding benthic communities typical of these sediments within the southern North Sea. An area of outcropping chalk was identified close to shore, however this area is completely avoided through the drilling method that will be used at the landfall.
71. Potential impacts include temporary disturbance and/or loss of habitats, increases in suspended sediments and sediment deposition, and impacts on the designated Cromer Shoal Chalk Beds Marine Conservation Zone. The majority of impacts are temporary in nature and localised to the project boundaries and immediate surrounding area. Impacts from SEP and/or DEP, including cumulative impacts, were assessed to be negligible or minor adverse due to the small scale of the seabed footprint of SEP and DEP relative to the extent of similar habitats in the wider area.

### 3.1.4 Fish Ecology

72. The fish and shellfish species and populations that may be impacted by SEP and DEP have been characterised using numerous literature and data sources, with the latter including extensive site surveys, habitat mapping, and historical surveys of the operational Dudgeon and Sheringham Shoal offshore wind farms. This identified a number of species of interest due to their ecosystem, commercial and/or conservation value, for example sandeel, herring, edible crab, lobster and European eel.
73. A range of activities during the construction, operation and decommissioning phases of SEP and DEP have the potential to impact fish and shellfish. These include, for example, activities that cause disturbance to the seabed, habitat loss and underwater noise. The assessment of effects of underwater noise was informed through an underwater noise modelling study.
74. In all cases the assessment established that there will be some negligible to minor adverse residual impacts resulting from SEP and/or DEP. The impacts are generally localised in nature, being restricted to the project boundaries and surrounding area. The same is true of the potential for cumulative impacts, which are limited by the temporary and/or localised nature of the effects in question.

### 3.1.5 Marine Mammal Ecology

75. Site characterisation using project specific surveys, existing data from other offshore wind farms and other available information for the region identified harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, grey seal and harbour seal as the key marine mammal species for assessment.
76. Activities during the construction, operation, maintenance and decommissioning phases have the potential to impact marine mammals. The impacts that have been assessed include the potential for underwater noise from unexploded ordnance clearance, piling (including use of acoustic deterrent devices), other construction activities, operation and maintenance works and vessels to result in auditory injury, disturbance, behavioural impacts, barrier effects (i.e. preventing movement of animals) and changes to food availability. Other potential impacts assessed include increased collision risk with vessels, changes to prey resource and changes in water quality.
77. The underwater noise modelling and the impact assessment concluded that only minor impacts to marine mammals would occur as a result of SEP and/or DEP, with the implementation of mitigation measures during unexploded ordnance clearance and piling outlined in the Marine Mammal Mitigation Protocol. There is the potential for cumulative impacts when considering other activities and noise sources in the wider area, including with other offshore wind farms. These impacts have the potential to affect marine mammals, but with the implementation of appropriate mitigation measures, the cumulative impact on marine mammals was also assessed as minor.

### 3.1.6 Offshore Ornithology

78. Characterisation of the existing environment for Offshore Ornithology has been undertaken based on project-specific survey data and existing data and literature. The former consisted of two years of digital aerial surveys conducted at least monthly, covering an area containing DEP, SEP and surrounding waters. All birds recorded were assessed with regard to their nature conservation value and sensitivity to the potential effects of offshore wind farms.
79. There is connectivity between SEP and DEP, and important populations of breeding seabirds (e.g. Sandwich tern breeding on the North Norfolk Coast, and kittiwake breeding at the Flamborough and Filey Coast). However, neither DEP, SEP or surrounding waters are of particularly high importance for foraging, commuting to foraging areas, or other activities for any species. Outside the breeding season, SEP and DEP are of limited importance to offshore ornithology receptors that inhabit the wider southern North Sea.
80. The impacts that could potentially occur on offshore ornithology receptors during the construction and decommissioning of SEP and DEP are disturbance, displacement and barrier effects, and indirect impacts through effects on habitats and prey species. During the operational phase, the potential impacts include disturbance, displacement and barrier effects, collision risk and indirect impacts through effects on habitats and prey species.

81. During the construction and decommissioning of SEP and DEP, no predicted impacts have been assessed to be greater than minor adverse significance for any offshore ornithology receptor. This includes the more sensitive receptors screened into detailed assessment for disturbance, displacement and barrier effects, namely guillemot, razorbill and red-throated diver.
82. During the operational phase of SEP and DEP, disturbance, displacement and barrier effects on the more sensitive receptors screened into detailed assessment (gannet, little gull, guillemot, razorbill, red-throated diver and Sandwich tern) would not create impacts of more than minor adverse significance. Collision risk is assessed as no greater than minor adverse significance for all species recorded in flight at SEP and DEP. This includes the species screened into detailed assessment (common tern, gannet, great black-backed gull, herring gull, kittiwake, lesser black-backed gull, little gull and Sandwich tern).
83. The assessment concludes that significant impacts to offshore ornithology receptors would not occur as a result of the construction, operation and decommissioning of SEP and DEP in isolation, together, and cumulatively with other projects.

### 3.1.7 Commercial Fisheries

84. Commercial fishing activity has been characterised using landings statistics, vessel monitoring and surveillance data, and consultation with the fishing industry.
85. The key fleets considered in the assessment are: UK potters targeting lobster, brown crab and whelk; UK beam trawlers targeting brown shrimp; French demersal and midwater trawlers targeting whiting and mackerel; Dutch beam trawlers and fly shooting targeting sole, plaice and mixed demersal finfish species; Belgian beam trawlers targeting sole, plaice and mixed demersal finfish species; and Danish demersal trawlers targeting sandeel throughout the North Sea with occasional effort overlapping the project area.
86. Based on quota allocations and landing statistics, vessels registered to other countries including the Netherlands, France, Belgium and Denmark have low levels of activity within the SEP and DEP wind farm areas and cable corridors.
87. The assessment has established that impacts from SEP and/or DEP in isolation, together and cumulatively with other projects, will be of generally negligible to minor adverse significance on commercial fishing fleet receptors. Without mitigation, there is the potential for moderate adverse impacts on the UK potting fleet during construction and decommissioning. These impacts may arise as a result of reduction in access to, or exclusion from established fishing grounds, and displacement from the wind farm site leading to gear conflict and increased pressure on adjacent grounds. However, potential impacts on the UK potting fleet will be mitigated through justifiable disturbance payments in line with the Fishing Liaison with Offshore Wind and Wet Renewables Group best practice guidance, reducing the significance of residual impacts to minor adverse.



### 3.1.8 Shipping and Navigation

88. Shipping and navigation consists of the transport of people or goods (both commercially or for recreational purposes) and vessels associated with extraction activities (fishing, aggregates and oil and gas) in the marine environment. In order to assess potential impacts on shipping and navigation, existing vessel traffic and navigational features in the vicinity of SEP and DEP have been analysed and recorded using marine data sets and targeted marine surveys.
89. Analysis shows that tanker, cargo and passenger (commercial) vessels account for the majority of the traffic, with aggregate dredgers, oil and gas support vessels, wind farm support vessels, fishing vessels and recreational vessels present to a lesser degree. The highest level of vessel passage is found between the operational Dudgeon and Sheringham Shoal offshore wind farms. Other key navigational features include the oil and gas platforms which are in close proximity to DEP.
90. Impacts are identified and assessed considering the shipping and navigation features in the vicinity and the activities associated with construction, operation and decommissioning of SEP and/or DEP, as well as cumulatively with other plans and projects.
91. Identified impacts include an increase in vessel to vessel collision risk and the potential for a vessel to interact with surface structures. The reduced navigable space between the operational Dudgeon and Sheringham Shoal offshore wind farms was identified as a key factor, however with suitable mitigation and consultation with marine users and vessel operators, impacts were considered to be within tolerable risk levels.
92. Minimal deviations to main shipping routes in terms of the change in journey distance were identified, and the impact of vessel displacement overall was considered to be within tolerable risk levels, with further mitigation and consultation needed to facilitate safe coexistence. In particular, further consultation is required to establish both the planned and emergency access requirements of the nearby oil and gas platforms, which will also be part of layout planning, to determine the full extent of access restrictions and mitigation requirements.
93. Further identified impacts include a reduction in under keel clearance (reduced depth), and potential interaction with cables and diminishment of Search and Rescue resources. These impacts were identified to be within acceptable risk levels given good practice marine coordination and communication that will be employed.
94. For all impacts suitable mitigation measures will be implemented where necessary and requirements will be refined by continued consultation with stakeholders and regulators.

### 3.1.9 Offshore Archaeology and Cultural Heritage

95. A characterisation of the existing environment for Offshore Archaeology and Cultural Heritage has been undertaken based on both existing and site specific geophysical survey data. This has considered the potential for seabed prehistory sites, paleogeographic features and seabed features of archaeological interest, such as wrecks of either maritime or aviation origin.
96. There are no known seabed prehistory sites within the study area, although a number of paleogeographic features, such as former river channels, have been interpreted from the geophysical survey data. These are of interest from an archaeological perspective because they may be associated with surviving terrestrial features and deposits corresponding to times when sea levels were lower and the study area may have been inhabited. This will be further investigated through geotechnical surveys, such as the collection of sediment samples or 'cores', prior to the start of construction.
97. Seabed features are categorised according to their level of archaeological interest, from A1 to A3. Features described as A1 include all those of anthropogenic origin or archaeological interest, of which 30 have been identified within the SEP and DEP study area, including 16 wrecks. The approach to mitigation is to avoid these features via Archaeological Exclusion Zones and micro-siting during detailed design to ensure that direct impacts will not occur. This will include further investigations prior to the start of construction, such as high resolution geophysical survey and seabed imagery.
98. In order to account for unexpected archaeological finds such as wrecks or aircraft crash sites potentially concealed beneath the seabed and not seen by the geophysical surveys, a formal protocol for archaeological discoveries will be agreed with regulators and implemented during construction. The approach to the implementation of mitigation measures will be agreed in consultation with Historic England in accordance with industry standards and guidance. An Outline Written Scheme of Investigation will be submitted as part of the consent application, setting out the methodology for all proposed mitigation.
99. With the application of recommended measures, significant impacts to offshore archaeology and cultural heritage from SEP and/or DEP (including cumulative and transboundary impacts) would not occur. There is the potential for beneficial effects through the contribution of data to academic and scientific objectives, and public outreach and engagement, both within the UK and wider European networks. In the case of SEP and DEP this will build on the already extensive body of literature that has been developed for the existing Dudgeon and Sheringham Shoal offshore wind farms.

#### 3.1.10 Aviation and Radar

100. The airspace in the vicinity of SEP and DEP comprises military exercise areas, restrictive airspace, airways and offshore helicopter platforms and transit routes. Wind turbines can interfere with radar equipment and operations and cause physical obstruction to aircraft, which have safety implications.

101. It is predicted that the wind turbines will be detectable and have the potential to affect the National Air Traffic Services Primary Surveillance Radar located at Claxby and Cromer, the Royal Air Force Primary Surveillance Radar located at Coningsby, the Ministry Of Defence Air Defence Radar at Trimingham and the Primary Surveillance Radar at Norwich Airport. The export cable route is also within the Royal Air Force Weybourne transmitter site safeguarding zone. The assessment undertaken to date has identified the potential for unacceptable impacts from SEP and/or DEP on some radar operations and thus further consultation with stakeholders are required to identify technical solutions which will reduce impacts to acceptable levels and facilitate continued safe radar operations.
102. Considering physical obstruction, a range of measures, in the form of appropriate notification to aviation stakeholders, lighting and marking will be employed to minimise effects to aviation flight operations. Potential impacts on the two oil and gas platforms in proximity to DEP in terms of the associated helicopter operations, are addressed as part of the Petroleum Industry and Other Marine Users assessment.

### 3.1.11 Petroleum Industry and Other Marine Users

103. The Petroleum Industry and Other Marine Users assessment considers activities associated with the offshore oil and gas industry, other offshore wind farm developments, telecommunications cables and interconnectors, marine aggregate extraction, marine disposal sites, unexploded ordnance, aquaculture and marine recreation. It covers a wide geographic scope to ensure that all activities with the potential to interact with SEP and DEP are identified.
104. The site selection process was used to avoid overlap as far as possible with other marine users. As such the potential impacts from SEP and/or DEP, which are largely associated with the potential for interference with other activities, are largely avoided or minor (including cumulative impacts). The potential for damage to other infrastructure will be prevented by the operation of all industries in a safe manner. Potential impacts on the two oil and gas platforms in proximity to DEP, in terms of the associated helicopter operations, have been identified as needing further analysis and consultation with operators to ensure safe coexistence. This is an ongoing process, the outcomes of which will be reported in the Environmental Statement.

## 3.2 Onshore

### 3.2.1 Onshore Ground Conditions and Contamination

105. The ground conditions and contamination assessment used a desk-based approach to review the known ground conditions within the PEIR boundary.
106. The impacts assessed include the potential for any known contamination in the ground to be disturbed during construction, resulting in an impact to the surrounding soils and groundwater quality; the potential for ground contamination caused by accidental fuel spills during construction; and the extent of existing mineral resources and how they might be affected by SEP and DEP (for example areas identified by the local planning authority for potential future sand and gravel extraction).

107. A Code of Construction Practice will be produced for each stage of construction, which will provide details of the industry best practice measures that would be undertaken to reduce potential construction impacts onshore. Provided the best practice measures are in place, the construction of SEP and DEP is predicted to have no significant impacts in relation to ground conditions and contamination during construction.
108. Whilst constructing both SEP and DEP would affect a larger area compared to either SEP or DEP in isolation, the assessment predicted no significant impacts across all project development scenarios assessed. No potential impacts on existing ground conditions are anticipated during the operation of SEP and DEP.
109. Cumulative impacts with other projects during construction phase have been assessed as being not significant provided the best practice measures outlined in the Code of Construction Practice are in place.

### 3.2.2 Water Resources and Flood Risk

110. A desk-based review of both publicly available data, and data obtained from the Environment Agency and Internal Drainage Boards, was undertaken to inform the assessment. In addition, a walkover survey was undertaken at locations where the onshore cable corridor would cross key rivers to understand the structure of the river bed and banks.
111. The study area for this assessment was categorised by the four main surface water catchments; the North Norfolk Rivers catchment, River Bure catchment, the River Wensum catchment, and the River Yare catchment. The River Wensum is designated Special Area of Conservation and Site of Special Scientific Interest, and several of its tributaries, including Blackwater Drain, Swannington Beck and the River Tud will be crossed by the onshore cable corridor. Due to the designated status of the River Wensum, this river and its tributaries are considered to be receptors of high value.
112. The impact assessment considered potential impacts such as the disturbance of rivers and streams during construction, soils entering rivers and streams, accidental fuel spills during construction, and activities that could increase the risk of flooding in surrounding areas.
113. Overall impacts to rivers will be short-term, with impacts relating to duct installation works for the onshore cables. These will be undertaken sequentially in 1km sections at a time, and would take approximately four weeks for each 1km section. Typically, impacts would be reversible once activities have been completed.
114. Mitigation measures have been identified including a commitment to cross a number of sensitive rivers and streams by drilling the cable ducts underneath rather than trenching through them, appropriate storage of soils during excavation works, and installing drainage systems to manage excess water.



115. The presence of new permanent above ground infrastructure has the potential to increase flood risk where permeable ground is replaced with buildings and other hard surfaces. Both of the onshore substation site options are located within Flood Zone 1, which represents a low risk of flooding (less than 0.1% chance of flooding in any year). The risk of flooding associated with the introduction of this new above ground infrastructure has been assessed, and a suite of mitigation measures will be incorporated into the design to mitigate any potential risk. This includes capturing surface water (from rainfall and water flowing overland) as it reaches the onshore substation and discharging it in a controlled manner to mimic the surface water run-off rate for the existing land. With these measures in place, the risk of flooding associated with the introduction of new above ground infrastructure has been assessed as negligible.
116. Whilst SEP or DEP in isolation has a smaller land take (and would result in a smaller area of disturbance in each catchment) than SEP and DEP together, this does not result in any significant differences between the scenarios.

### 3.2.3 Land Use, Agriculture and Recreation

117. To inform the land use, agriculture and recreation impact assessment, a desk based literature review was undertaken of existing reports and survey data to provide an understanding of existing baseline conditions.
118. The assessment considered the potential impacts of the project on agricultural land and practices, agricultural drainage, soil quality, Environmental Stewardship Schemes and Public Rights of Way.
119. The onshore construction will be principally located within agricultural land with the potential for impacts to existing agricultural practices and to the soil itself. The onshore cable corridor will also cross a number of Public Rights of Way and construction activities could disrupt walkers and other users of the network of footpaths.
120. Mitigation measures include the use of an Agricultural Liaison Officer, ensuring agricultural drainage systems are maintained, minimising impacts to the best and most versatile agricultural land, and employing best practice measures through a Soils Management Plan. Wherever practicable, access for farm vehicles will be maintained.
121. In addition, access along Public Rights of Way will be maintained throughout construction. If a temporary closure is required a suitable diversion will be agreed in advance with the Countryside Access Officer at Norfolk County Council.
122. Most of the impacts are temporary and fully reversible once construction is complete. Provided mitigation measures are in place, SEP and DEP is not predicted to have any significant impacts in relation to land use, agriculture and recreation, with the exception of the temporary disturbance to agricultural activities. Where agricultural practices are unavoidable private agreements (or compensation in line with the compulsory purchase compensation code) will be sought with relevant landowners/occupiers.

- 123. No significant cumulative impacts with other relevant projects have been identified.
- 124. Whilst SEP and DEP in isolation has a smaller land take (and would result in a smaller area of disturbance) than SEP and DEP together, this does not result in any significant differences between the construction scenarios.

### 3.2.4 Onshore Ecology and Ornithology

- 125. A suite of ecological surveys was undertaken during 2020 including habitats, great crested newts, birds (breeding birds and wintering birds) and bats was undertaken to describe the ecological baseline. The scope of these surveys was agreed in advance with Natural England. Further surveys will also be undertaken during 2021 and will be used to inform the ecological impact assessment submitted to support the DCO application.
- 126. All statutory and sites designated for their nature conservation value, have been avoided, where possible, during the site selection process. Where avoidance was not possible, for example at the River Wensum Special Area of Conservation, alternative construction techniques have been selected to avoid impacts (e.g. trenchless techniques to pass beneath the feature).
- 127. Ancient woodland and woodland parcels have been avoided where possible and, where hedgerows are crossed the working width will be reduced to 20m to minimise potential impacts. Temporary habitat loss and fragmentation will occur during the project construction phase. Habitats will be reinstated as far as practicable following construction and the effects will be reversible in the long-term.
- 128. Without mitigation there is the potential for construction activities to have significant impacts to several habitat types including woodland, hedgerows and grasslands as well as to several protected species including badgers, bats, water voles, otters, great crested newts and common reptiles. These impacts include disturbance and risk of injury, permanent and temporary habitat loss and habitat fragmentation. Species-specific mitigation has been identified for these impacts, which includes further micro-siting of the cable route to further avoid sensitive features, sensitive timing of the works for certain species, precautionary methods of working and reinstatement of lost habitats.
- 129. Significant residual impacts may remain after mitigation for hedgerow and woodland; however, these impacts will reduce to non-significant over time as replacements planting matures.
- 130. No significant impacts have been identified associated with the operation of SEP and DEP and no cumulative impacts have been identified with other relevant projects.

### 3.2.5 Onshore Archaeology and Cultural Heritage

- 131. The existing onshore archaeology and cultural heritage baseline has been established by a desk based exercise and supplemented by a programme of aerial photographic assessment and non-intrusive surveys reading changes in the magnetic field to identify potential archaeological features underground.

132. The onshore archaeological and cultural heritage existing environment comprises both designated and non-designated heritage assets and includes both below ground archaeological remains and above ground built heritage assets. The assessment also considers the historic landscape character.
133. Designated heritage assets (e.g. Scheduled Monuments) have been avoided as part of the site selection process and as such, no direct physical impacts are anticipated to occur. However, indirect impacts have the potential to occur, such as impacts to the setting of a heritage asset. Non-designated heritage assets may be subject to impacts as a result of ground excavation during construction.
134. Further refinement of the current 200m wide onshore cable corridor down to a 60m wide onshore cable corridor for the DCO application will seek to further avoid known heritage assets. In addition a further programme of post-consent survey will be undertaken to inform the exact form of mitigation to be delivered. The programme of post-consent survey is expected to include outstanding non-intrusive surveys (magnetometry and targeted field walking and metal detecting), and the excavation of shallow trenches to investigate features identified from the non-intrusive methods.
135. With these commitments in place any impacts are not considered to be significant.
136. Whilst SEP or DEP in isolation has a smaller land take (and would result in a smaller area of disturbance) than SEP and DEP together, this does not result in any significant differences between the construction scenarios.
137. Heritage setting assessment work is ongoing, and the final impact assessment conclusions have not yet been determined at this stage. The settings assessment work will, however, be progressed and reported in full in the ES for the DCO application.
138. Similarly, the potential for cumulative impacts to occur to potential onshore archaeological and cultural heritage assets will be assessed following refinement of the PEIR boundary and reported in full in the final DCO application.

### 3.2.6 Air Quality

139. A desk-based assessment was carried out using air quality monitoring data collected by Local Authorities, as well as air pollution maps provided by the Department of Environment, Food and Rural Affairs (Defra), to establish existing pollution levels. The air quality assessment considered the potential impacts associated with dust generated during excavation works as well as dust and exhaust emissions from construction traffic.
140. A Dust Management Plan will be developed post-consent which will include a collection of best-practice measures to control dust and other emissions. This will include measures such as dampening down the haul road during dry periods to minimise dust generation and having road sweeper(s) available to remove any soils tracked out of the site onto local roads. With the implementation of the mitigation measures, for example dust suppression, dust impacts are not considered significant and cumulative impacts with other relevant projects are also assessed as being not significant.

141. Whilst SEP or DEP in isolation has a smaller footprint (and would result in a smaller area of soil excavated) than SEP and DEP together, this does not result in any significant differences between the construction scenarios.

### 3.2.7 Noise & Vibration

142. To inform the noise and vibration impact assessment baseline noise previously reported as part of the Hornsea Project Three Offshore Wind Farm consent application was used to characterise the existing noise environment in the vicinity of proposed onshore works areas. As a result of the Covid-19 Pandemic there has been a significant reduction in road traffic which results in a background noise that is not representative for this part of Norfolk. Dedicated noise monitoring for SEP and DEP is programmed to take place in 2021 and will inform the updated assessment as part of the full DCO application.
143. Noise modelling was undertaken in order to determine any potential impacts relating to the construction and operation of SEP and DEP at agreed locations.
144. Potential noise impacts from construction works in a small number of locations along the onshore cable corridor were identified; however, provided that best practice measures are in place, the project is predicted to have no significant impacts in relation to construction noise.
145. The operation of the onshore substation has the potential to generate noise that would represent a disturbance during night time at the nearest residential properties for both substation site options. There are many proven mitigation options that can be combined to ensure that noise levels at the nearby properties remain below the night time noise levels agreed with the local planning authority. This includes noise reduction technologies in the form of equipment housing and refining the layout of the substation during the detailed design process.
146. The onshore substation operational noise assessment focussed on both SEP and DEP in operation at the same time. Should either SEP and DEP be developed in isolation the operational noise levels would be lower.
147. Whilst SEP and DEP and Hornsea Project Three onshore substations are all near to the existing National Grid substation at Norwich Main, no cumulative noise impacts have been identified when all of these are in operation at the same time.
148. No impacts from vibration effects have been identified in the assessment.

### 3.2.8 Traffic & Transport

149. Transport requirements were determined through a series of desk based assessments utilising data obtained from the Department for Transport and the relevant Highway Authorities. Further traffic data was obtained via traffic count surveys undertaken in 2020. To ensure traffic numbers collected during the Covid-19 Pandemic were representative of the normal traffic present on roads in this part of Norfolk a calculation was applied to the data and agreed with the Highways Authorities to ensure that the traffic numbers used in the assessment reflect the expected baseline outside of Covid-19 Pandemic..



150. For the purposes of the PEIR only SEP and DEP built at the same time has been assessed as this is considered to represent a highest possible construction traffic numbers of the potential project development scenarios. An assessment of the other construction scenarios will be included as part of the ES to support the DCO application.
151. A total of 156 roads identified within the traffic and transport study area have been assessed for the effects of severance (when a community becomes separated either side of a road experience major increases in traffic), pedestrian amenity (the relative pleasantness of the pedestrian experience which is affected by traffic), road safety and driver delay.
152. With the application of mitigation measures impacts for all roads was assessed to be not significant.
153. No significant impacts were identified for the operational phase and no significant cumulative impacts with other projects (including Norfolk Vanguard and Hornsea Project Three) were identified.

### 3.3 Wider Impacts

#### 3.3.1 Seascape Visual Impact Assessment

154. The assessment describes the existing seascape, landscape and visual environments for the proposed offshore developments, assesses their sensitivity to change, and assesses the significance of seascape, landscape and visual impacts that would be caused by SEP or DEP in isolation, and SEP and DEP if they were constructed and in operation together, including cumulatively with other plans, projects and activities. A study area (50km radius from each offshore area) was agreed with the relevant consultees as being appropriate to cover all potentially material seascape, landscape and visual impacts.
155. The assessment is based on a realistic worst case scenario of DEP and SEP being built either together (concurrently or sequentially) or in isolation, without further mitigation to reduce significant effects. This realistic worst case scenario comprises the largest sized turbines that would achieve the maximum potential generation capacity likely to be implemented. Further mitigation will be considered post-PEIR submission and included in the DCO submission.
156. The assessment describes how SEP and/or DEP would extend existing offshore wind farms within areas of sea that are currently influenced by the presence of wind farms adjoining the proposed wind farm sites and in the wider seascape. SEP and / or DEP would be visible from offshore and onshore locations and seen in the context of other existing wind farms at Inner Dowsing, Lincs, Lynn, Race Bank, Triton Knoll, Sheringham Shoal and Dudgeon. Offshore wind farms are already characteristic of the existing seascape character, and already visible in seaward views from areas of the coastal landscape including the Norfolk Coast Area of Outstanding Natural Beauty and the North Norfolk Heritage Coast.

157. There would be some effects on seascape, landscape and visual receptors (including designated and defined landscapes) during the construction, operation and decommissioning phases of SEP and/or DEP. Operational effects would be longer term and greater than effects during the construction and decommissioning phases.
158. The assessment describes how SEP would cause greater or the same effects as DEP, on all seascape, landscape and visual receptors except those within close proximity to the DEP. Within this local area around DEP, effects caused by DEP would be greater than those caused by SEP given that these receptors lie in closer proximity to DEP than SEP.
159. Effects that are major-moderate or major are considered to be significant. Significant effects during the operational phase have been identified due to SEP on the settlements of Cromer and Sheringham; users of the Peddars Way, Norfolk Coast Path and England Coast Path; visual receptor group Blakeney to Mundesley; and visitors to the viewing gazebo at Oak Wood, being at most of a major-moderate significance and adverse. No significant effects have been identified on other landscape and visual receptors for SEP during the operational phase.
160. No significant effects have been identified for DEP during the operational phase.
161. No significant effects have been identified during the construction and decommissioning phases for SEP and/or DEP.

### 3.3.2 Landscape and Visual Impact Assessment

162. The assessment considers impacts arising due to the onshore cable corridor (including the landfall on the coast) and the two onshore substation site options. Study areas were agreed with the relevant consultees as being appropriate to cover all potentially material landscape and visual impacts as follows:
  - 1km from the extents of the onshore cable corridor; and
  - 4km from the two site options for the onshore substation.
163. The assessment describes the landscape and visual environments, assesses their sensitivity to change, and assesses the significance of landscape and visual impacts during the construction, operation and decommissioning phases of the proposed onshore developments of SEP or DEP in isolation, DEP and SEP together, and cumulatively with other plans, projects and activities.
164. Two onshore substation site options have been assessed, with one single site to be selected and taken forward to the final DCO submission. Landscape and visual considerations fed into the site selection process and the two substation site options are considered to be suitable sites from a landscape and visual perspective being within an area of land enclosed by trees and woodland, within an area already influenced by existing electrical infrastructure, and where there are relatively few sensitive landscape or visual receptors. Site selection is therefore a key part of the embedded mitigation proposals. Further mitigation including substation, landscape and planting design will be considered post-PEIR submission and included in the DCO submission.

165. The assessment is based on a realistic worst case scenario of each component of the onshore development. The realistic worst case scenario for the construction of the onshore cable corridor and the onshore substation is with DEP and SEP built sequentially with four years between construction of each Project. It is assessed that, in light of the various possible scenarios of DEP and SEP, should they be developed in isolation or together (either concurrently or sequentially), there would be no material difference in the resultant impacts between the various Project scenarios.
166. The realistic worst case scenario for the onshore cable corridor would occur during the construction phases of SEP and / or DEP and result from the maximum construction duration and land-take. During operation of SEP and / or DEP, the onshore cables would be buried and not result in any landscape or visual effects, except for effects as replacement planting matures, and where trees are not replaced over the cable easements. Link boxes would either be buried or above ground level but would not result in any significant effects. Cable ducts would be left in the ground and trenches would not be re-excavated during decommissioning, and there would be no landscape or visual effects due to the onshore cable corridor during the decommissioning phases of SEP and / or DEP.
167. For the onshore substation site options, the greatest effects would result from the maximum footprint and height parameters. The assessment has identified that the significance of effects would be the same during the construction, operation and decommissioning phases of SEP and / or DEP.
168. There would be some effects on landscape and visual receptors (including designated landscapes and landscapes protected by policy) during construction, operation and decommissioning phases of the onshore cable corridor and substation site options for SEP and / or DEP, although limited to the immediate surroundings of the onshore developments.
169. Effects that are major-moderate or major are considered to be significant.
170. Significant effects during the construction phase of the onshore cable corridor have been identified at Weybourne Wood Open Access Land within the North Norfolk Coast Area of Outstanding Natural Beauty if the eastern onshore cable corridor option is used at this location and would be at most of a major-moderate significance and adverse. If the western or trenchless options are used at this location there would be no significant effects at Weybourne Wood Open Access Land. No other significant effects have been identified during the construction, operation or decommissioning phases of the onshore cable corridor for SEP and / or DEP.
171. Significant effects during the construction, operation and decommissioning phases of the onshore substation sites have been identified on the users of a group of Public Rights of Way, a permissive bridleway and Gowthorpe Lane that surround the fields in which the onshore substation sites lie. Effects would be at most of a major significance and adverse. No other significant effects have been identified during the construction, operation or decommissioning phases of the onshore substation site options for SEP and / or DEP.

### 3.3.3 Socio-Economics and Tourism

172. A review of policy, strategy, and business analysis that was undertaken showed that the offshore wind industry in East Anglia is growing quickly, with Equinor seen as a significant contributor in this growth. DEP and SEP may create up to 1,640 UK jobs during construction if both projects are built together (of which up to 430 jobs may be based in East Anglia); and up to 260 UK jobs during operation (of which 140 jobs may be based in East Anglia). With appropriate skills and training programmes in place, the East Anglia job market could supply this demand.
173. Whilst the creation of these new jobs is a benefit, compared to the size of the UK and East Anglia job markets these benefits are considered negligible at the project scale and cumulatively with other major offshore wind farm projects in the region.
174. The construction of and operation of DEP and SEP has the potential to negatively impact tourism activity in Norfolk, primarily on areas that are close to work areas during construction and that have a view of the installed turbines during operation.

### 3.3.4 Health

175. An assessment of activities which may have an impact on physical or mental health during the construction, operation and decommissioning of DEP and SEP was undertaken.
176. The human health effects that were considered included: construction and operational noise, air quality, exposure to contaminated land during construction and operation, and exposure to electromagnetic fields (EMF) during operation.
177. The onshore infrastructure is largely routed through agricultural land and away from towns and villages, therefore the potential number of people and communities potentially affected has been reduced through site selection and project design.
178. With the implementation of the mitigation measures identified within the separate topics (such as measures to minimise construction noise and to minimise the risk of dust generation), there are not predicted to be any significant health effects.
179. As with any electrical current carrying device the buried cable systems will produce EMFs. Public Health England has produced guidelines identifying EMF thresholds above which there is the potential for human health effects. The level of EMFs produced by DEP and SEP buried cable systems is significantly lower than the value Public Health England has identified as safe. As such, the conclusion of the assessment is that there would be no effect from DEP and SEP alone or cumulatively with other projects to population health due to EMFs during operation.



## 4 Conclusions

180. For the majority of offshore topics, the assessments conclude that following mitigation, DEP and SEP will not result in significant impacts, including cumulative impacts. The site selection and early design process has been used to avoid or minimise impacts, alongside additional mitigation where required.
181. Potentially significant residual impacts have been identified in relation to seascape, landscape and visual receptors, and on designated and defined landscapes. Whilst an effect may be significant, that does not necessarily mean that such an impact would be unacceptable. Specifically, significant effects during the operational phase have been identified due to SEP on the settlements of Cromer and Sheringham; the Peddars Way, Norfolk Coast Path and England Coast Path; visual receptor group Blakeney to Mundesley; and the viewing gazebo at Oak Wood.
182. Further consultation is required to establish both the planned and emergency access requirements of the oil and gas platforms nearby to DEP, which will also be factored into the planning of the layout of the wind farm post-consent, to determine the full extent of any access restrictions and mitigation requirements.
183. It is also predicted that the wind turbines will be detectable and have the potential to affect radar operations. The assessment undertaken to date has identified the potential for unacceptable impacts on radar operations and further consultation with stakeholders is required to identify technical solutions which will reduce impacts to acceptable levels and facilitate continued safe radar operations.
184. For the majority of onshore topics, the assessments conclude that following mitigation, DEP and SEP will not result in significant impacts, including cumulative impacts. This is primarily a result of the site selection work to ensure DEP and SEP is located away from local communities and other sensitive sites and features.
185. Potentially significant landscape and visual impacts may arise as a result of the onshore project substation; however, these impacts are very localised and will reduce over time following the establishment of mitigation tree planting. Significant residual impacts will remain after mitigation for bats (loss of connective hedgerow habitat), but these impacts will also reduce to non-significant over time as replacement hedgerows mature.
186. A total of 156 roads were assessed for the effects of construction traffic on local communities and other road users. A Traffic Management Plan will be developed and agreed with the relevant Highways Authorities with measures for managing construction traffic, which will reduce potential impacts to not significant.
187. The operation of the onshore substation could potentially lead to noise disturbance (during night time) at the nearest residential properties. However, proven noise reducing technologies will ensure that the operational noise levels remain below those agreed with the local planning authority.

188. There are potential significant impacts associated with the number of highly sensitive watercourse crossings and the potential increases in sediment experienced during construction. However, these will be a short term impacts and reversible once construction is complete and with the implementation of appropriate measures, the impacts are reduced and considered not to be significant.
189. Throughout the PEIR, Equinor has committed to implement mitigation that will ensure that impacts are below the level that would be considered unacceptable under the relevant technical guidance and standards. This includes the potential for cumulative impacts, which have been considered in relation to each topic.

## 5 References

PINS (2019). SCOPING OPINION: Proposed Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions
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Royal HaskoningDHV (2019) Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Scoping Report
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