Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

Volume 3

Appendix 16.1 - Vessel Access Study

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Sheringham Shoal and Dudgeon Extension Projects – Assessment of Impact on Offshore Oil and Gas Installations (Vessel/Rig Access)

Prepared by	Anatec Limited
Presented to	Equinor New Energy Limited
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00	08/09/2021	Initial Draft
01	11/02/2022	Updates following client review

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Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
DCO	Development Consent Order
ERRV	Emergency Response and Rescue Vessel (traditionally known as standby vessel)
DEP	Dudgeon Extension Project
EIA	Environmental Impact Assessment
ES	Environmental Statement
FSA	Formal Safety Assessment
IMO	International Maritime Organization
km^2	Square Kilometre
LAPS	Lancelot Area Production System
m	Metre
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MGN	Marine Guidance Note
MMO	Marine Management Organisation
MRV	Multi Role Vessel
nm	Nautical miles
nm^2	Square Nautical Mile
NRA	Navigational Risk Assessment
NUI	Normally Unmanned Installation
O&G	Oil and Gas
OREI	Offshore Renewable Energy Installation
SEP	Sheringham Extension Project
UK	United Kingdom

1 Introduction

1. Equinor New Energy Limited (hereafter referred to as Equinor) is intending to construct and operate the proposed Sheringham Extension Project (SEP) and Dudgeon Extension Project (DEP) consisting of the two wind farm sites and the offshore export cable corridor.

2. Anatec Ltd have been commissioned to undertake a dedicated vessel/rig access assessment focusing on the impact on access to existing Oil and Gas (O&G) assets as a result of SEP and DEP. This assessment will inform Chapter 16: Petroleum Industry and Other Marine Users of the Environmental Statement (ES).

3. On this basis, the output of this assessment is a significance ranking for each O&G asset assessed in terms of routine access deviations and spacing / proximity concerns. Significance has been determined via the International Maritime Organization (IMO) Formal Safety Assessment (FSA) approach, (IMO, 2018), in line with the approach undertaken within the Navigational Risk Assessment (NRA) (Appendix 13.1 of the ES).

4. The NRA provides assessment of impacts to shipping and navigation users that may be affected by the presence of SEP and DEP and the associated works, and is therefore of relevance to this study. In particular, marine traffic data collected as required under the Maritime and Coastguard Agency's (MCA's) Marine Guidance Note (MGN) 654 as part of the NRA process is utilised as a primary input into this assessment. Full assessment and background of the long term marine traffic data utilised can be found within the NRA.

2 Consultation

5. A summary of key points arising from consultation to date deemed of relevance to the assessment of marine access to O&G assets is detailed in Table 2.1, noting this includes reference to where each point raised is addressed within this report.

Table 2.1 Consultation Summary

Consultation Type	Point Raised	Where Addressed
IOG via Section 42 10th June 2021	Both the Blythe and Elgood assets are regularly serviced by supply and emergency response / standby vessels, therefore, careful coordination is required to ensure IOG can access the Blythe platform and the Elgood well 500m zone at all times. Periodic pipeline and seabed surveys are required outside of these safety zones and therefore, coordination is also required to ensure that these operations can continue unimpeded.	Access impacts to these assets are assessed in Sections 7.2 and 8.2.
Boston Putford (via NRA Regular Operator Analysis) 6th October 2020	The proposed NE and SE corners of the DEP wind farm site impact the passage between Great Yarmouth and the LAPS Field and passage would need to be adjusted to pass east of Lancelot.	Deviation impacts are assessed in Section 7.2, noting this includes access to LAPS.
	Concern over the extent to which the extension would narrow the approach to the Outer Dowsing Channel between the two wind farms.	Deviation impacts are assessed in Section 7.2, noting this includes routeing between the wind farm sites.
	The regular support vessel for the Waveney platform presently uses the Dudgeon light buoy area as a main waypoint, whereby the vessel's course is altered to pass between Cromer Knoll Bank & the Outer Dowsing Bank before proceeding to Waveney or the other LAPS Fields. The proposed Dudgeon extension to the NW would close off this route.	Deviation impacts are assessed in Section 7.2, noting this includes routeing to LAPS and Waveney.

Consultation Type	Point Raised	Where Addressed
	Unlikely vessels would consider choosing a passage through the array of structures without prior extensive risk assessments completed by asset operator.	As per Section 7.1.1, for the purposes of the deviation assessment it has been assumed that O&G vessels will not enter the wind farm sites
	Changes to passage planning to Waveney caused by DEP will not have a major cost element or at least no more than changes to passage planning due to other factors, e.g., weather conditions.	Deviation impacts are assessed in Section 7.2.
Meeting with Perenco, 1st February 2021	Production from Waveney may continue until 2025.	This has been considered within the impact assessments in 7.2 and 8.2.
	Concerns were raised regarding displacement of shipping lanes.	Deviation impacts are assessed in Section 7.2.
	No decommissioning plans are present for the nearby installations and pipelines. No exploration activities are planned in the area.	This has been factored into the impact assessments in 7.2 and 8.2.
Meeting with IOG, 23rd April 2021	Elgood and Blythe are the key IOG assets to be assessed, noting pipeline access will also need to be considered (Elgood will tie back to Blythe, which will then tie into the Thames pipeline).	Access impacts to these assets are assessed in Sections 7.2 and 8.2.
	Following completion of drilling, no further well intervention is expected to be needed until later in the field life.	This has been factored into the impact assessments in Sections 7.2 and 8.2.
Meeting with Perenco, 1st February 2021	Potential concerns with access to Waveney and the neighbouring pipelines (Durango and Bacton-Lancelot)	Access impacts to these assets are assessed in Sections 7.2 and 8.2.
	There will be a need for future decommissioning work which will likely require a jack up rig (and 500m safety zone), noting this includes the Durango well. Consideration needs to be given to access in addition to space to undertake the operations.	Access impacts on decommissioning operations are assessed in Section 8.2.
Email correspondence with IOG 16th July 2021	Anticipated that field will be visited twice per month for 4-5 days total, reducing to one visit per month for 4-5 days total.	This has been considered within the access assessments in Sections 7.2 and 8.2.

Consultation Type	Point Raised	Where Addressed
	Standard Multi Role Vessels (MRV) will be used, and they will likely mobilise from either Lowestoft or Great Yarmouth.	This has been considered within the access assessments in Sections 7.2 and 8.2.
	Following drilling at Elgood and installation of Blythe, there are no further rig or jack up operations planned.	This has been considered within the access assessments in Sections 7.2 and 8.2.

3 Project Description

3.1 Overview

6. An overview of the SEP and DEP wind farm sites and offshore export cable corridor is presented in Figure 3.1.

7. The SEP wind farm site is located approximately 9.7nm from shore and covers an area of approximately 27 square nautical miles (nm^2) (92.6 square kilometres (km^2)). The DEP wind farm site is located 13.4nm from shore and covers an area of approximately 30 nm^2 (103.5 km^2).

8. The study area included within this report is shown in Figure 3.1. In line with the NRA, this constitutes a 10nm buffer of the wind farm sites. This radius ensures relevant routeing is captured whilst still remaining site specific to the wind farm sites.

9. It is noted that the Order Limits include an Offshore Temporary Works Area around the Offshore Cable Corridors and Wind Farm Sites. No permanent infrastructure will be placed within the Offshore Temporary Works Area, and it will only be used to accommodate temporary works (e.g., construction vessel anchor spreads). For the purposes of this report, the Wind Farm Site and Offshore Cable Corridors boundaries shown and referenced hereafter do not include the Offshore Temporary Works Area to ensure the focus is on the areas where permanent infrastructure will be placed, noting it will still be necessary to include the associated works taking place within the Offshore Temporary Works Area in any liaison and / or cooperation agreements with relevant oil and gas operators.

10. The Offshore Temporary Works Area is included in Figure 3.1 for reference. Further details of the Offshore Temporary Works Area are provided in Chapter 4 Project Description.

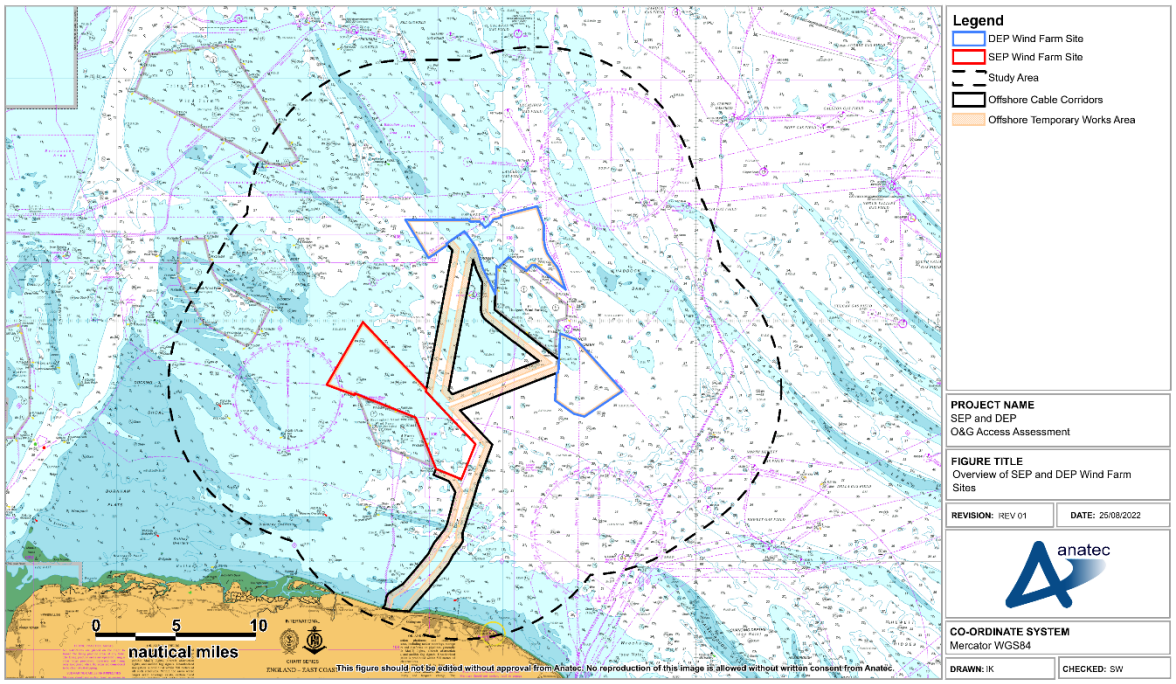

Figure 3.1 Overview of SEP and DEP Wind Farm Sites

3.2 Layout

11. A final layout will be approved via the Marine Management Organisation (MMO) post-consent in liaison with the MCA and Trinity House. Therefore, for the purposes of this assessment and in line with the NRA approach to deviations and displacement, the full wind farm site boundaries will be applied to ensure a worst case is assessed.

4 Methodology

4.1 Impacts Assessed

12. This assessment has focused on impacts associated with vessel access to O&G assets, noting that separate studies (Anatec, 2021) are being carried out with respect to the impact on helicopter operations.

13. On this basis, impacts considered within this assessment are as follows:

- Wind turbines and associated works may result in deviations to routine support vessel routeing to O&G platforms; and
- Proximity of wind turbines and associated works may restrict / hamper access to O&G platforms and subsurface infrastructure during certain periods (e.g., allowable weather).

4.2 Vessel/Rig Access Assessment Methodology

14. This assessment is intended to inform Chapter 16: Petroleum Industry and Other Marine Users of the ES by undertaking an initial screening and assessment of marine access impacts.

15. As standard for marine risk assessment and in line with the NRA (Appendix 13.1 of the ES), this assessment utilises the FSA (IMO, 2018) approach. The FSA approach within the NRA uses probability (frequency) and consequence to determine the significance of each impact as being either broadly acceptable, tolerable, or unacceptable for each asset assessed. Impacts that are determined to be unacceptable must be reduced to within broadly acceptable or tolerable parameters via additional mitigation over those that are considered embedded.

16. Deviations have been assessed by identifying baseline vessel routeing to key assets via the use of marine traffic data (see Section 6). It should be considered that since the surface assets assessed are Normally Unmanned Installations (NUIs), the low-use nature of these routes means the majority have not been assessed as “main routes” within the NRA.

17. Impacts associated with the potential for operations at O&G assets to be restricted or hampered have been assessed based on the proximity of the assets to the wind farm sites. The available space (i.e., distance between the asset and the wind farm sites) has been assessed against existing cases of O&G operations occurring in the vicinity of constructing or operational wind farms, with consultation undertaken for SEP and DEP with the relevant operators in regard to spacing needs (see Section 2) taken into

consideration. The space available, and relevant existing examples are discussed in Section 8.

18. Significance is then assessed on a qualitative basis according to the criteria detailed in Table 4.1. It is noted that the definitions of these rankings must be considered in conjunction with the assumptions detailed in Section 4.4.

Table 4.1 Access Assessment Significance Criteria

Significance	Description	Assessment Criteria	
		Deviations	**Restriction / Hampering of O&G Operations**
Broadly Acceptable	No impact	Route to asset unaffected by the wind farm sites	No impact on operations
	Adverse – low	Minimal deviation required with limited impact on transit distance / time	Limited impact on O&G operations
Tolerable with Mitigation	Adverse – moderate	Moderate deviation required with potential for notable impact on transit distance / time	Potential for moderate restriction / hampering of O&G operations
Unacceptable	Adverse - High	Deviation not possible without unacceptable impacts on vessel safety	Wind farm sites prevent practicable access to asset by a rig / vessel required to undertake an operation at that asset

4.3 Maximum Design Scenario

19. The Maximum Design Scenario (MDS) within which impacts have been assessed is summarised as follows, noting that further details are provided within the NRA (Appendix 13.1 of the ES) which holds the same MDS:

- Maximum extent of buoyed construction / decommissioning area during the construction and decommissioning phases, and maximum extent of the wind farm sites within the operational phase (maximum deviations, and minimum proximity to O&G assets); and
- Maximum number of structures - 55 locations.

20. As per Section 3.2, the final layouts for SEP and DEP are not yet defined and will be agreed with the MCA and Trinity House post-consent as per the relevant DCO conditions, with indicative layouts (deemed to be worst case from a shipping and navigation perspective) utilised in the NRA. Therefore, for the purposes of this assessment and in line with the NRA approach to deviations and displacement, the full wind farm site boundaries will be applied to ensure a worst case is assessed.

4.4 Assumptions

4.4.1 Assessment Approach

21. Given that Anatec is not privy to individual O&G operator's Safety Cases, it is not possible to determine whether impacts to the relevant assets are "tolerable" within the context of those Safety Cases. It should therefore be considered that the assessment output is based on whether the direct impacts assessed as part of the scope of this particular assessment (i.e., marine access) are considered to be tolerable considering the known mitigations assumed to be in place (see Section 4.4.2). On this basis, cumulative tolerability of all impacts has not been considered, with the focus remaining on marine access.

4.4.2 Mitigation

22. Impacts have been assessed on the assumption that known embedded mitigations will be in place, both on the part of Equinor and the relevant O&G operators. On this basis, where an impact has been assessed as being within tolerable parameters, key measures assumed to be in place include the following:

- Equinor will consider local O&G assets and associated operational requirements, where appropriate (i.e., assets which may be affected in terms of access), within their site design, and continue to consult and liaise with relevant operators in this regard;
- Promulgation of information including to regular commercial vessel operators in the area to ensure they are aware of SEP and DEP, ensuring they can passage plan taking into account both wind farm sites and the existing O&G assets;
- Equinor will promulgate information regarding SEP and DEP as required to relevant O&G vessel operators (including on a targeted basis), who will utilise this information to passage plan for the minimisation of deviations to routes to local assets;
- Cooperation and liaison agreements between SEP and DEP and relevant O&G operators in terms of simultaneous operations to ensure any access issues are minimised, this should include the sharing of information between parties to ensure both Equinor and the relevant O&G operators are aware of each other's operations in advance; and
- Consultation with Trinity House to determine appropriate lighting and marking taking into consideration the existing O&G assets.

5 Oil & Gas Asset Screening

5.1 Screening Overview

23. A screening process has been undertaken to determine which O&G assets in proximity to the wind farm sites require assessment within this report. All assets within 10nm of the wind farm sites have been considered noting this aligns with the study area considered within the NRA (see Section 3.1). Assets considered include both surface platforms and subsea infrastructure (pipelines and wells), noting that surface access will still be required for certain subsea assets.

24. It is noted that screening has been undertaken separately for the routine deviation and proximity spacing impacts assessed within this report (see Section 4.1). Table 5.1 provides a summary of the outputs of the screening, noting the full screening process is detailed in Section 5.2.

Table 5.1 Asset Screening Summary

Routine Deviation Assessment	Spacing / Proximity Assessment
▪ Waveney; ▪ Blythe; ▪ Lancelot A; and ▪ Excalibur EA.	▪ Durango to Waveney pipeline; ▪ Bacton to Lancelot pipeline; ▪ Bacton to Shearwater pipeline; ▪ Blythe to Thames pipeline; ▪ Elgood to Blythe pipeline; ▪ Viking to Theddlethorpe pipeline; ▪ Elgood; ▪ Waveney; and ▪ Blythe.

5.2 Screening Process

25. Table 5.2 presents full details of the asset screening process undertaken for this report, with screened-in assets then presented in Figure 5.1. Screening rationale for each asset is included, noting that this has been based on the following criteria (pipelines have only been considered where they intersect or pass within 500m of the wind farm sites):

- Type of installation;
- Status;
- Location relative to wind farm sites;
- Proximity to wind farm sites; and
- Consultation concern.

Table 5.2 Key Oil & Gas Assets identified within Shipping and Navigation Study Area

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Durango to Waveney Pipeline	Perenco	Pipeline	Active	0nm	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Intersection of pipeline and wind farm site means operational access (for inspection/maintenance) may be impacted.
Bacton to Lancelot Pipeline	Perenco	Pipeline	Active	0nm	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Intersection of pipeline and wind farm site means operational access may be impacted.
Bacton to Shearwater Pipeline	Shell	Pipeline	Active	0nm	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Intersection of pipeline and wind farm site means operational access may be impacted.

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Blythe to Thames Pipeline	IOG	Pipeline	Active	0.2nm (400m)	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Consultation concern.
Elgood to Blythe Pipeline	IOG	Pipeline	Active	0.2nm (400m)	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Consultation concern.
Waveney	Perenco	Normally Unmanned Installation (NUI)	Active	0.3nm (500m)	Yes	Routeing deviations are likely to occur due to the wind farm sites.	Yes	Proximity to DEP wind farm site means operational access may be impacted.
Viking to Theddlethorpe Pipeline	Conoco Phillips	Pipeline	Active	0.3nm (500m)	No	"Routine" visits not required for pipelines; visits will be infrequent.	Yes	Proximity of pipeline to wind farm sites means operational access may be impacted.

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Elgood	IOG	Subsea Well	Under Development	0.3nm (500m)	No	Routine support visits likely to be infrequent.	Yes	Proximity to DEP north array area means operational access may be impacted.
Blythe	IOG	NUI	Under Development	0.6nm	Yes	Routeing deviations are likely to occur due to the wind farm sites.	Yes	Proximity to DEP south array area means operational access may be impacted.
Lancelot A	Perenco	NUI	Active	2.7nm	Yes	Routeing deviations are likely to occur due to the wind farm sites.	No	Sufficient separation distance such that operations are unlikely to be impacted.
Durango	Perenco	Subsea Well	Active	2.7nm	No	Routine support visits likely to be infrequent.	Yes	Consultation concern.

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Excalibur EA	Perenco	NUI	Active	6.1nm	Yes	Wind farm sites may result in potential routeing deviations to this platform.	No	Sufficient separation distance such that operations are unlikely to be impacted.
Dawn	Eni Hewett Limited	Subsea Well	Decommissioning Ongoing	6.2nm	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.
Anglia West	Ithaca Energy	Subsea Well	Decommissioning Ongoing	6.7nm	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Anglia A	Ithaca Energy	NUI	Decommissioning Ongoing	8.9nm	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.
Hewett 48/29B	Eni Hewett Limited	NUI	Decommissioning Ongoing	9.0nm	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.

Installation	Operator	Type	Status	Minimum Distance from Wind Farm Sites	Routine Deviation Assessment		Proximity / Spacing Assessment	
					Screened In	Rationale	Screened In	Rationale
Hewett 48/29C	Eni Hewett Limited	NUI	Decommissioning Ongoing	9.4nm	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.	No	In the event that decommissioning overlaps with construction of SEP and DEP, proximity is such that operations are unlikely to be impacted.

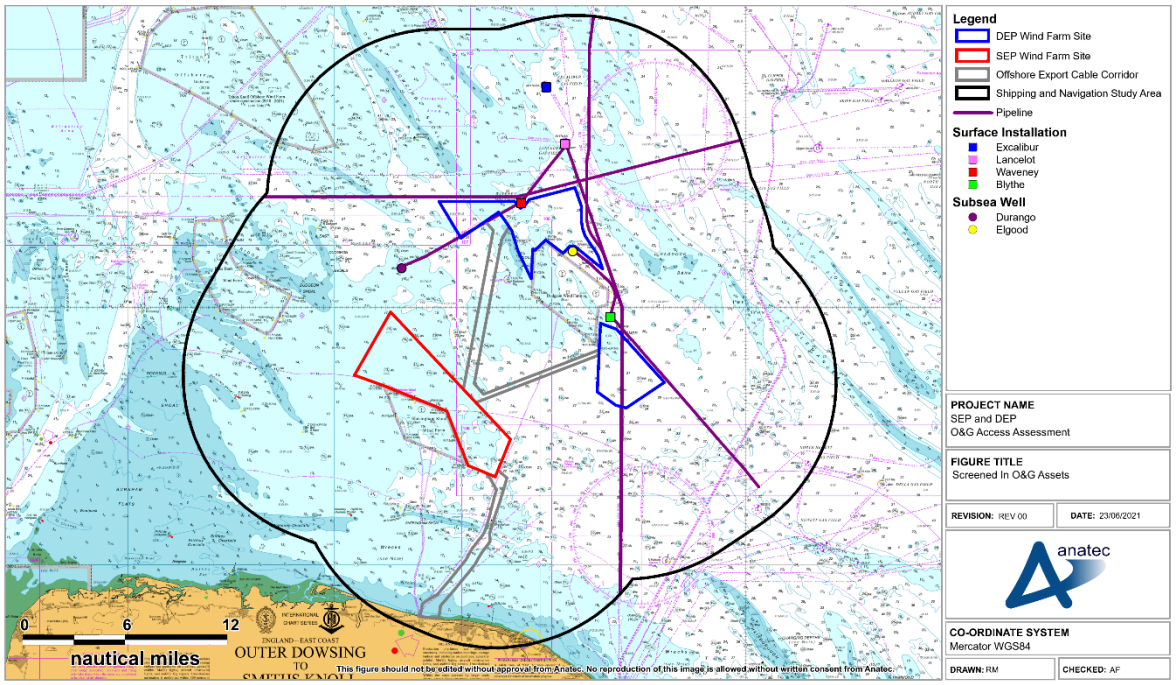

Figure 5.1 Screened In O&G Assets

6 Marine Traffic Assessment

6.1 Data Sources

26. As part of the NRA (Appendix 13.1 of the ES) process, Automatic Identification System (AIS) data was collected from coastal receivers for the entirety of 2019. This data was used to assess vessel routeing within the study area, noting that the long-term nature of this dataset ensured seasonal variation, low use routes, and adverse weather routeing were captured. On this basis the 12-month dataset has also been used to assess routeing to O&G assets within this report given it allows for longer term assessment and the capture of infrequent routeing. The full assessment of this data (including analysis of all vessel types) is provided in Annex B of the NRA.

27. It should be considered that while the long term 2019 data precedes any effects of the COVID 19 pandemic, it also precedes activity at the Blythe and Elgood assets which were not yet being developed in 2019. Therefore, more recent data covering periods when operations were ongoing at these assets has been assessed as follows:

- 20 days of data from April 2021 covering drilling operation activity at the Elgood well (spudded on 9th April 2021); and
- 25 days of data from May-June 2021 covering the installation of the Blythe NUI platform.

28. It is considered unlikely that the COVID 19 pandemic will have had any notable effect on these analyses given they are focussed on specific local operations (as opposed to longer term vessel routeing).

6.2 Long Term 2019 Data

6.2.1 Data Overview

29. All O&G vessel activity on AIS recorded within the study area during the long term 2019 data is presented in Figure 6.1 with the key assets considered shown for context.

30. Following this, the O&G support vessels recorded regularly visiting key screened in surface assets during the study period are presented in Figure 6.2 (see Section 5 for details of the asset screening process). Where practicable, vessel tracks visiting the Waveney platform in close proximity to the DEP wind farm site have been colour-coded separately to those visiting the other Lancelot Area Pipeline System (LAPS) installations within the study area (i.e., the Lancelot and Excalibur platforms). The key surface assets are also shown for context.

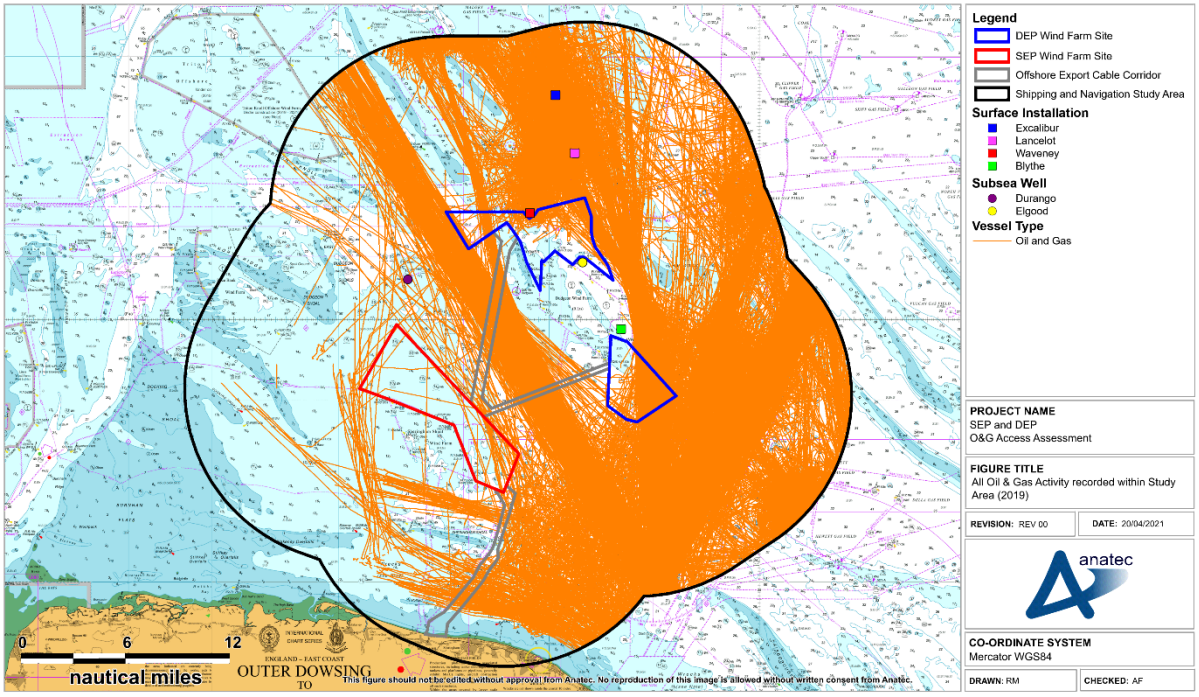

Figure 6.1 Oil & Gas Activity recorded within Study Area (2019)

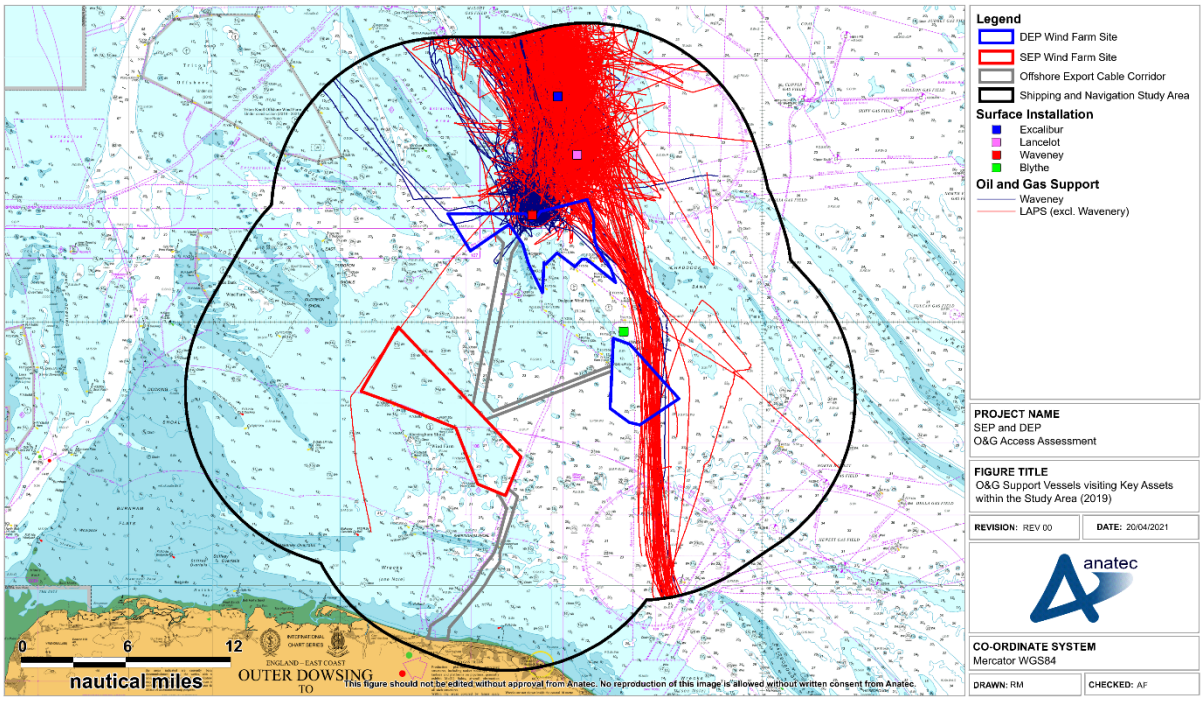

Figure 6.2 O&G Support Vessels visiting Key Assets within the Study Area (2019)

31. The majority of O&G support vessels were observed to be associated with the Excalibur and Lancelot platforms in addition to the activity observed at Waveney, noting these assets are part of the LAPS Hub. It is noted that other LAPS Hub assets, i.e., the Galahad and Malory platforms, are outside the study area and not considered

within this report. Therefore, for the purposes of this report, when comparing activity at Waveney to other LAPS assets, this refers only to the Lancelot A and Excalibur EA platforms.

32. The Blythe Field is under development and does not currently receive regular visits from support vessels, however additional assessment of more recent data is provided in Section 6.4.

6.2.2 Vessel Counts

33. Based on the marine traffic data studied, an average of 9 to 10 unique O&G vessels were recorded within the study area per day, with an estimated 9% of this activity being associated with Waveney, Excalibur or Lancelot. The estimated average number of vessel visits per month to these platforms is shown in Table 6.1. It is noted that these estimates are approximate and based on a combination of the long-term AIS data and Anatec's internal ShipRoutes database (Anatec, 2021).

Table 6.1 Estimated Platform Visit Frequency

Platform	Average Number of Visits per Month
Excalibur / Lancelot	4
Waveney	1 to 2

6.2.3 Vessel Routeing

34. Where possible, the 2019 marine traffic data was used to identify the O&G routes within the study area using the principles set out in MGN 654 (MCA, 2021), noting this approach aligns with that used within the NRA (Appendix 13.1 of the ES). It is noted that the equivalent assessment within the NRA identifies all "main" routes within the area, and this does not include low use / infrequent routes. Therefore, refined assessment of the 2019 data has been undertaken for the purposes of this report to capture all relevant O&G routeing. Anatec's internal routeing database (Anatec, 2021) has also been considered where frequency of visits to certain assets within the AIS data was insufficient to define a route, noting this includes Blythe which is still under development (see Section 6.4).

35. A total of seven routes were identified on this basis. The identified routes are shown relative to the wind farm sites and the screened in surface assets in Figure 6.3. Following this, Table 6.2 presents additional details of relevance including route frequency and terminus / origin locations.

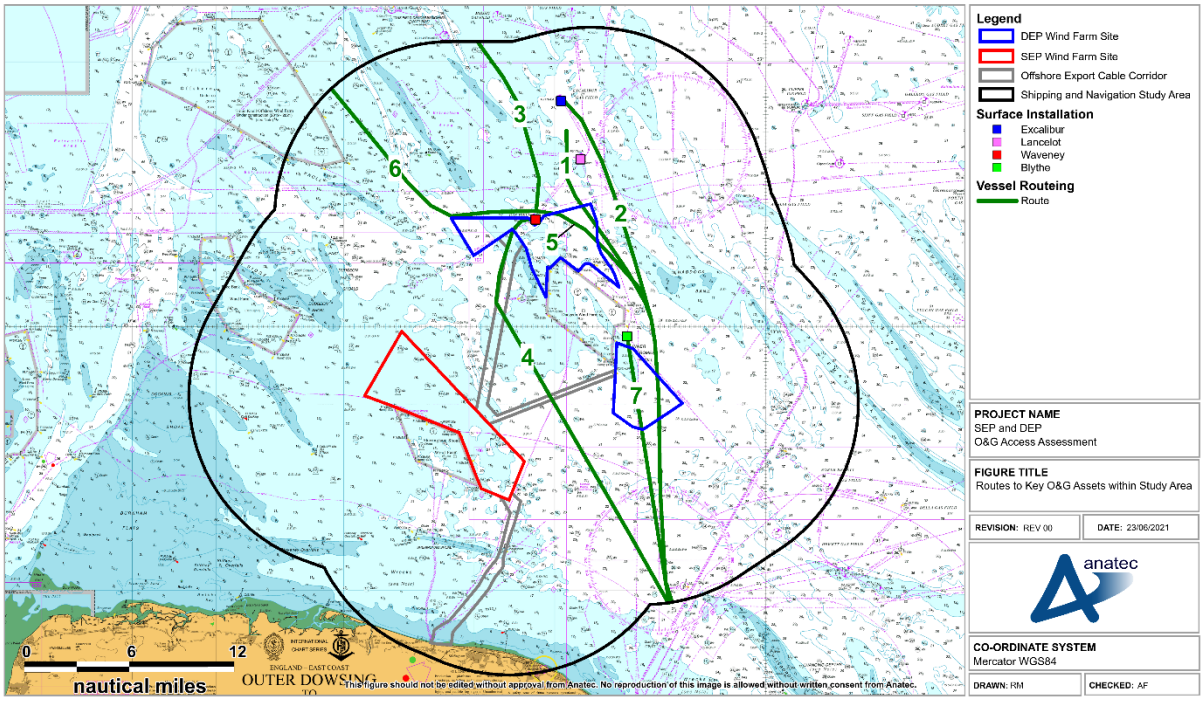

Figure 6.3 Routes to Key O&G Assets within Study Area

Table 6.2 Offshore Support Routes to Screened In O&G Assets

Route ID	Route	Visiting Frequency
1	Great Yarmouth-LAPS	Twice per month
2	Great Yarmouth-Excalibur	Twice per month
3	West Sole-Waveney	Once to twice per month
4	Great Yarmouth-Waveney a	Once per month
5	Great Yarmouth-Waveney b	Three times per year
6	Amethyst-Waveney	Twice per year
7	Great Yarmouth-Blythe	Unknown (route not yet active)

6.3 April 2021 – Activity at Elgood

36. As per Section 6.1, the long term 2019 data assessed does not capture relevant activity at the Elgood asset given drilling did not commence until 2021. Therefore, additional data has been assessed to capture recent drilling activity beginning in April 2021.

37. The support vessel activity associated with this drilling is shown in Figure 6.4, covering a three week period between the 1st and 20th April 2021.

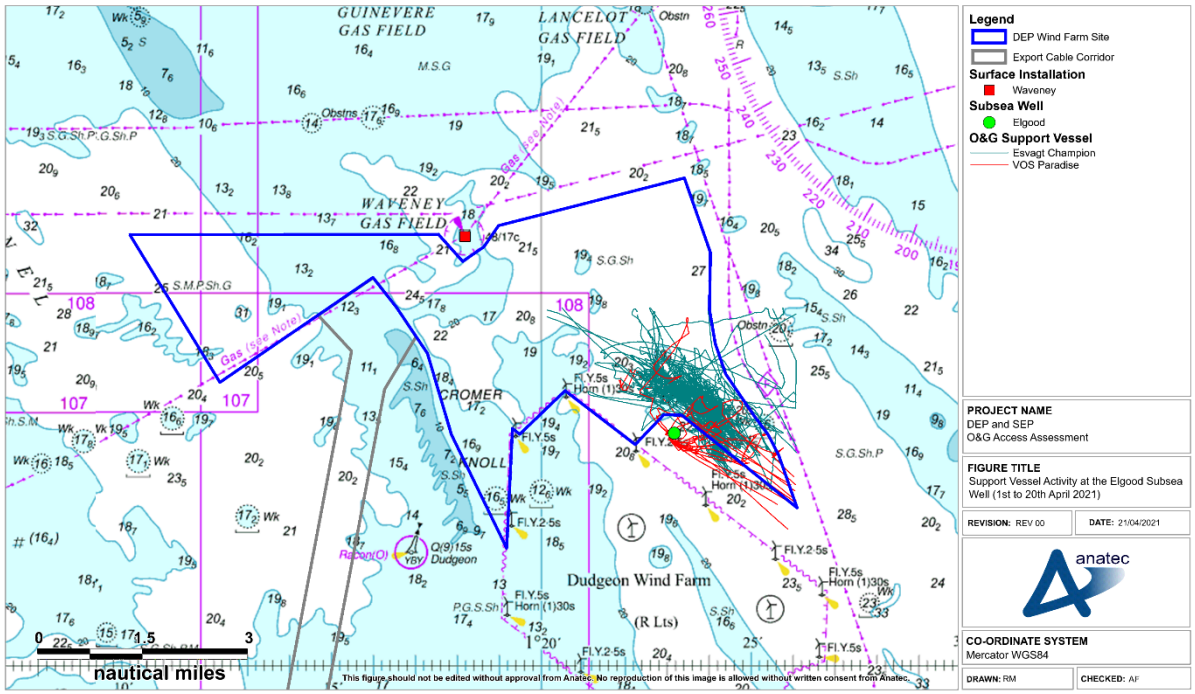

Figure 6.4 Support Vessel Activity at the Elgood Subsea Well (1st to 20th April 2021)

38. The Emergency Response and Rescue Vessel (ERRV) *Esvagt Champion* approached the Elgood location from the east on 1st April 2021 and was recorded on-site every day except for one between 1st and 20th April 2021. The vessel operated primarily within the DEP north array area site boundary.

39. The offshore supply vessel *VOS Paradise* was recorded on the 7th May 2021 approaching Elgood from the south-east. While the vessel was recorded within the DEP north array area, the majority of work during this period was carried out between 400-600m from the boundary. The nearest distance to the existing Dudgeon wind farm site recorded was approximately 650m.

6.4 May to June 2021 – Activity at Blythe

40. As per Section 6.1, the long term 2019 data assessed does not capture relevant activity at the Blythe asset, given installation of the platform did not begin until 2021. Therefore, to inform this report additional data covering the installation operation has been assessed, and is shown in Figure 6.5. The data shown covers the period from 15th May to 8th June 2021.

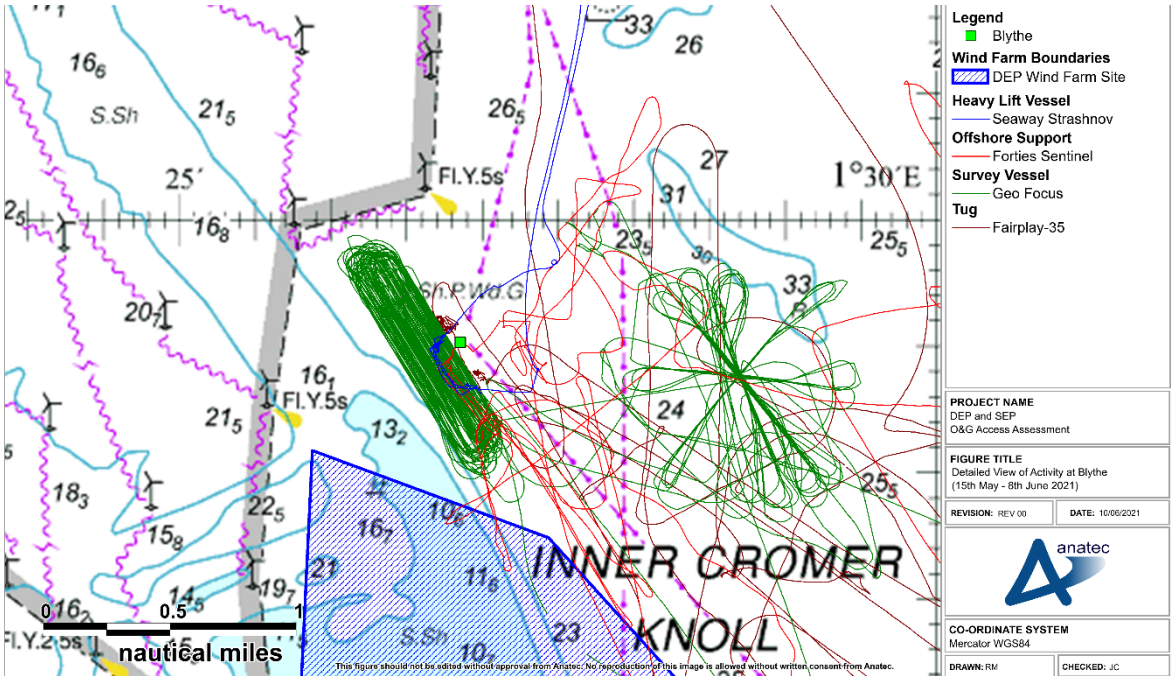

Figure 6.5 Detailed View of Activity at Blythe (15th May – 8th June 2021)

41. The Heavy Lift Vessel (HLV) *Seaway Strashnov* approached the Blythe location from the north on 27th May 2021, and exited to the north again on 2nd June 2021, passing approximately 800m east of the existing Dudgeon Wind Farm boundary.

42. The multirole ERRV *Forties Sentinel* was recorded arriving at Blythe on the 2nd June 2021 approaching from the south. The vessel was recorded at a minimum distance of 0.6nm from the existing Dudgeon Wind Farm boundary to the east while in the area on the 4th June.

43. The hydrographic survey vessel *Geo Focus* was recorded arriving at Blythe on 15th May from the south-east, working within a distance of 150m from the existing Dudgeon Wind Farm boundary, and left the area on 17th May.

44. The tug *Fairplay-35* was recorded arriving at Blythe on 27th May from the south-east, working within a minimum distance of approximately 900m of the existing Dudgeon Wind Farm boundary and leaving the area on 1st June.

7 Deviation Impacts for Routine Visits

45. This section assesses potential impacts in relation to deviations to routeing to O&G assets that may arise as a result of the construction and operation of SEP and DEP. Impacts associated with access requirements for large scale operations are assessed separately in Section 8.

7.1 Post Wind Farm Deviation Assessment

7.1.1 Methodology

46. The pre wind farm routeing has been assessed relative to the wind farm sites to determine likely post wind routeing (i.e., deviations). Deviations have been determined using the same approach as that utilised within the NRA (Appendix 13.1 of the ES), whereby the following assumptions are made:

- Commercial vessels (including O&G vessels) will not transit through the wind farm sites (noting there would be no restrictions on such passage other than through active safety zones);
- All alternative Mean Route Positions (MRP) maintain a minimum distance of 1nm from offshore installations and existing wind farm structures – note that this approach assumes vessel transits are distributed around the MRP, and as such certain vessels will still pass closer than 1nm to assets; and
- All routes take into account sandbanks and known routeing preferences.

47. It is noted that the deviations consider any relevant input raised during consultation (see Section 2).

48. Based on a review of the destination information transmitted on AIS (see Section 6), and Anatec's Internal Routeing database, the majority of support vessels making routine visits to the screened in surface assets from outside the study area will originate from Great Yarmouth or Lowestoft. Routeing to the surface platforms has been defined on this basis as per Section 6.2.3.

7.1.2 Post Wind Farm Routes

49. The post wind farm routeing assessed as per the methodology in Section 7.1.1 is shown in Figure 7.1 relative to the wind farm sites and relevant O&G assets. Following this, Table 7.1 summarises the deviations in terms of additional transit distances.

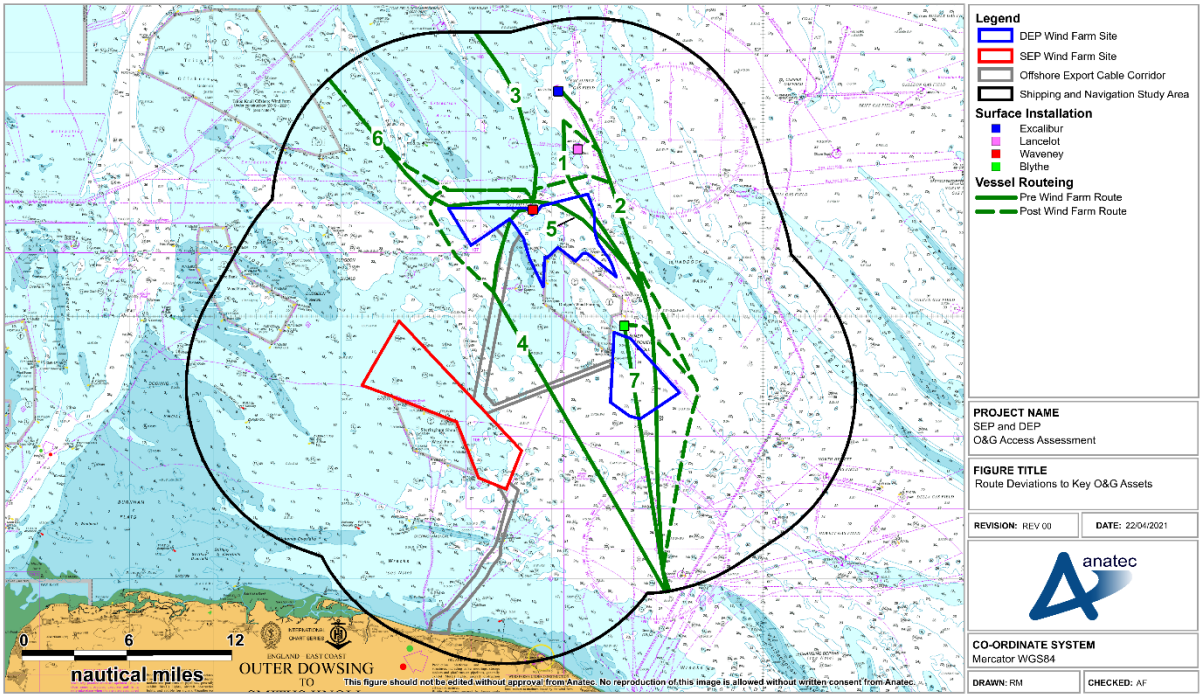

Figure 7.1 Route Deviations to Key O&G Assets

Table 7.1 Key O&G Assets assessed in terms of Access Impacts

Route ID	Deviation Required for Routine Visits	Pre Wind Farm Distance in Study Area (nm)	Post Wind Distance in Study Area (nm)	Estimated Additional Transit Distance (nm)
1	Yes	28.3	29.1	0.8 (3% increase)
2	Yes	29.6	30.5	0.9 (3% increase)
3	No	10.5	10.5	No change
4	Yes	25.5	32.5	7 (27% increase)
5	Yes	25.7	29.7	4 (16% increase)
6	Yes	14.8	14.8	No change
7	Yes	15.5	17.6	2.1 (14% increase)

7.2 Impact Assessment

7.2.1 Subsea Assets

50. As per Section 5.2, subsea assets (wells and pipelines) have been screened out of the deviation assessment given visits will be non-routine and infrequent, noting this is reflected within the marine traffic data studied (see Section 6.2). The primary concern

for the subsea assets is ensuring that there is available sea room for operations, including access of the required vessels. This is assessed separately in Section 8.2.1.

7.2.2 Surface Assets

51. As per Section 6.2, review of the available data and consultation indicates that the majority of vessels visiting the key surface assets within 10nm of SEP and DEP do so from Great Yarmouth or Lowestoft, and as such will approach from the south. On this basis, as illustrated in Figure 6.2, vessels associated with the Excalibur, Lancelot, Waveney and Blythe platforms may be affected by the construction of SEP and DEP in terms of routine visits, given that these assets are located north of the southern extent of the wind farm sites.

52. Based on the post wind farm routeing assessment, vessels on O&G routes currently passing east of the existing Dudgeon project will be required to pass further east to avoid the DEP wind farm site. There is considered to be sufficient sea room to accommodate such transit, and this aligns with consultation undertaken with Boston Putford (see Section 2), who indicated that while there would be additional transit distance, there would be no additional hazards associated with these deviations.

53. O&G vessels accessing the surface LAPS assets that currently pass west of the existing Dudgeon project will be required either to:

- Deviate further west around the north-west corner of the DEP wind farm site before passing south of the Outer Dowsing Bank; or
- Pass east of the DEP wind farm site in line with other existing routeing.

54. Should vessels prefer the latter, as discussed previously there is available sea room east of the DEP wind farm site to accommodate vessel transit. In terms of the former option, there is considered to be sea room to accommodate such a deviation between the DEP wind farm site and the Outer Dowsing Bank as illustrated in Figure 7.2, which shows the DEP wind farm site relative to the 10m contour of the bank. It is noted that based on the analysis of all vessel types undertaken within the NRA (Appendix 13.1 of the ES), commercial vessels of equivalent or greater size than the relevant O&G support vessels already transit this area.

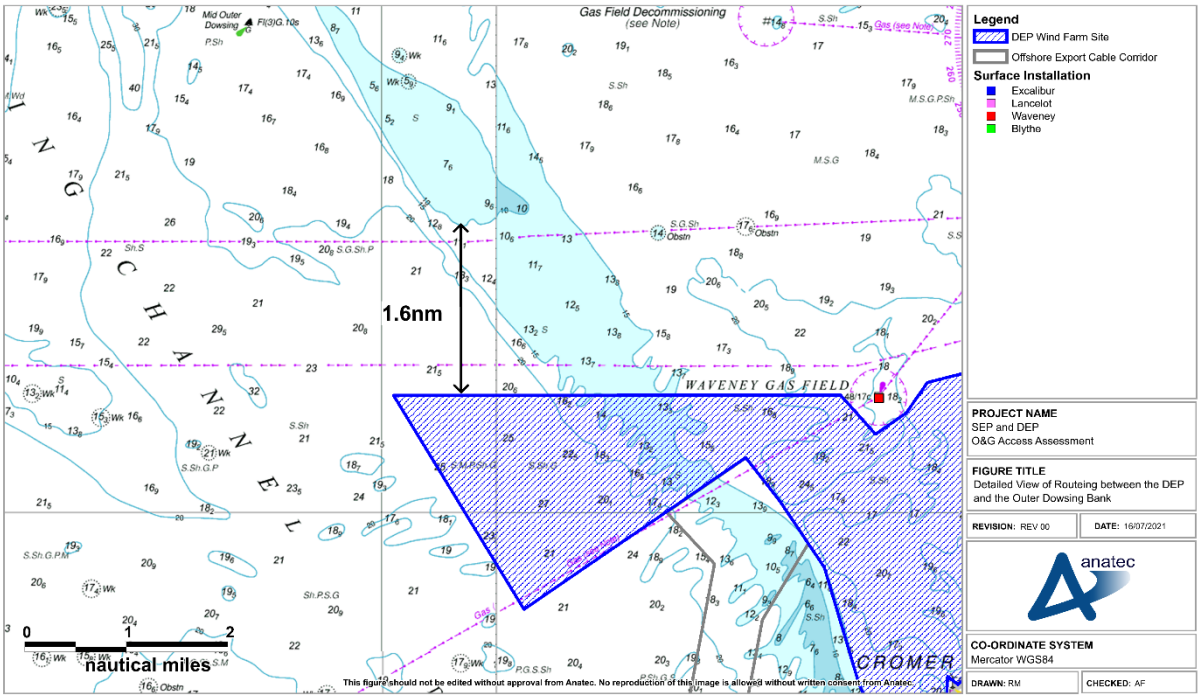

Figure 7.2 DEP Wind Farm Site relative to the Outer Dowsing Bank

55. It is noted that while there are no navigational safety impacts anticipated, transit times will increase for certain assets, in particular to the Waveney platform. However, relevant consultation with Boston Putford indicated deviations to Waveney would "not have a major cost element, or at least no more than changes to passage planning due to weather conditions". It is noted that precise routeing to the Blythe platform has not yet been established, however based on likely routeing, a predicted deviation in excess of 2nm will also be required for routine support visits to this asset following commencement of construction of SEP and DEP.

56. It should be considered that given all surface assets in the area are NUI, vessel visits are likely to be less frequent than would be the case for manned assets. This aligns with both the marine traffic assessment of baseline vessel routeing (see Section 6.2.3) and consultation, noting that IOG indicated once past initial stages of the Blythe development, routine visits are only likely to occur once per month.

57. Further, details of SEP and DEP would be promulgated in advance via the usual means (e.g., Notice to Mariners), including directly to the relevant operators as identified within this assessment and consulted with to date. This will facilitate advanced passage planning, ensuring any deviations are minimal, and will allow the locations of completed or partially completed structures to be accounted for.

58. Given the potential extent of the deviations required, the impact is assessed as being **tolerable with embedded mitigation** for the Waveney and Blythe platforms. The Lancelot and Excalibur platforms are considered to be of **broadly acceptable** significance, given only minor deviations are likely to be required.

8 Proximity / Spacing Impacts

59. This section assesses potential impacts in relation to proximity and spacing needed for specific operations (as opposed to routine vessel transits) both in terms of spacing requirements of the operations but also any requirements to access the relevant assets.

8.1 Proximity Overview

60. As per Section 5, the following assets have been screened into the proximity / spacing assessment:

- Durango to Waveney pipeline (Intersects DEP wind farm site);
- Bacton to Lancelot pipeline (Intersects DEP wind farm site site);
- Bacton to Shearwater pipeline (Intersects DEP wind farm site)
- Thames to Blythe pipeline (0.2nm);
- Blythe to Elgood pipeline (0.2nm);
- Viking to Theddlethorpe Pipeline (0.3nm);
- Elgood (0.3nm);
- Waveney (0.3nm);
- Blythe (0.6nm); and
- Durango (2.7nm).

61. Overviews of these assets relative to the wind farm sites are provided in Sections 8.1.1 to 8.1.5, with associated assessment then provided in 8.2.

8.1.1 Elgood Overview

62. Figure 8.1 presents an overview of the proximity of the Elgood well location and pipeline tie-in to the Blythe platform relative to the DEP wind farm site. As shown, the location of Elgood is positioned 0.25nm from the DEP wind farm site, noting that a "corridor" of approximate minimum width 0.7nm is maintained between the DEP wind farm site and the existing Dudgeon project.

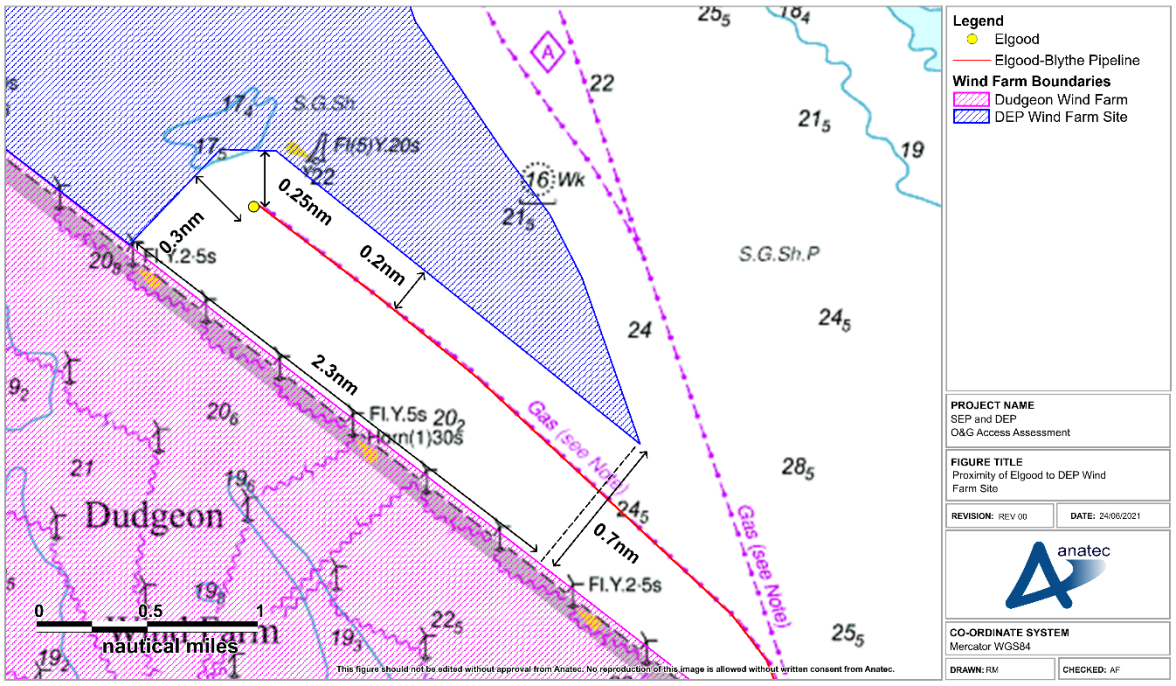

Figure 8.1 Proximity of Elgood to the DEP Wind Farm Site

8.1.2 Waveney Overview

63. Figure 8.2 presents an overview of the proximity of the Waveney platform and the Durango to Waveney pipeline relative to the DEP. As shown, the wind farm site has been designed to sit outside of the 500m safety zone.

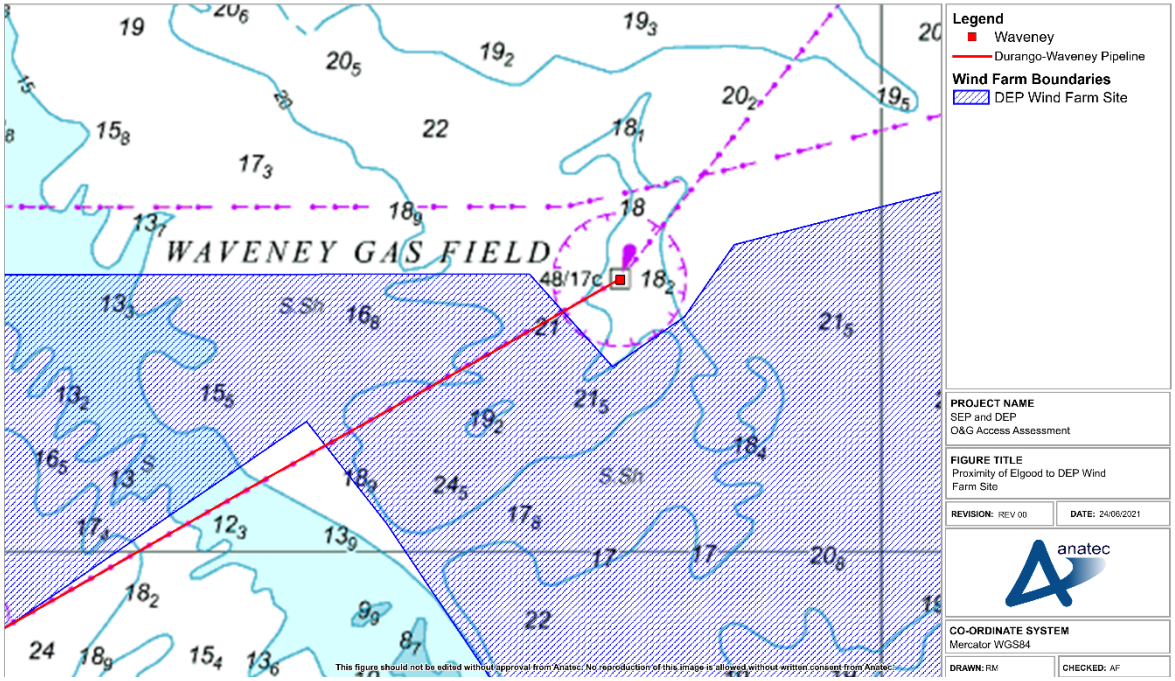

Figure 8.2 Proximity of Waveney to the DEP Wind Farm Site

8.1.3 Blythe Overview

64. Figure 8.3 presents an overview of the proximity of the Blythe platform and associated pipelines relative to the DEP wind farm site. The Blythe platform is located 0.6nm from the DEP wind farm site and 0.6nm from the existing Dudgeon wind farm.

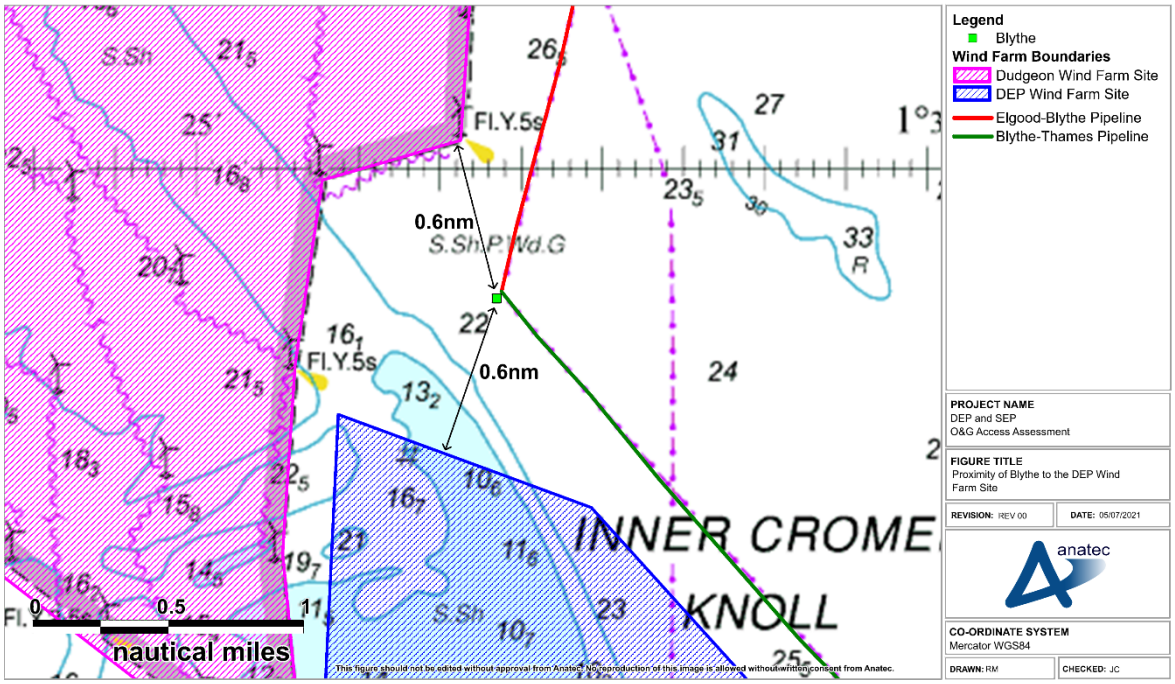

Figure 8.3 Proximity of Blythe to the DEP Wind Farm Site

8.1.4 Durango Overview

65. Figure 8.4 presents an overview of the proximity of the Durango subsea well and associated pipeline relative to the wind farm sites. The Durango well is located 2.7nm from the SEP wind farm site and 3.8nm from the DEP wind farm site.

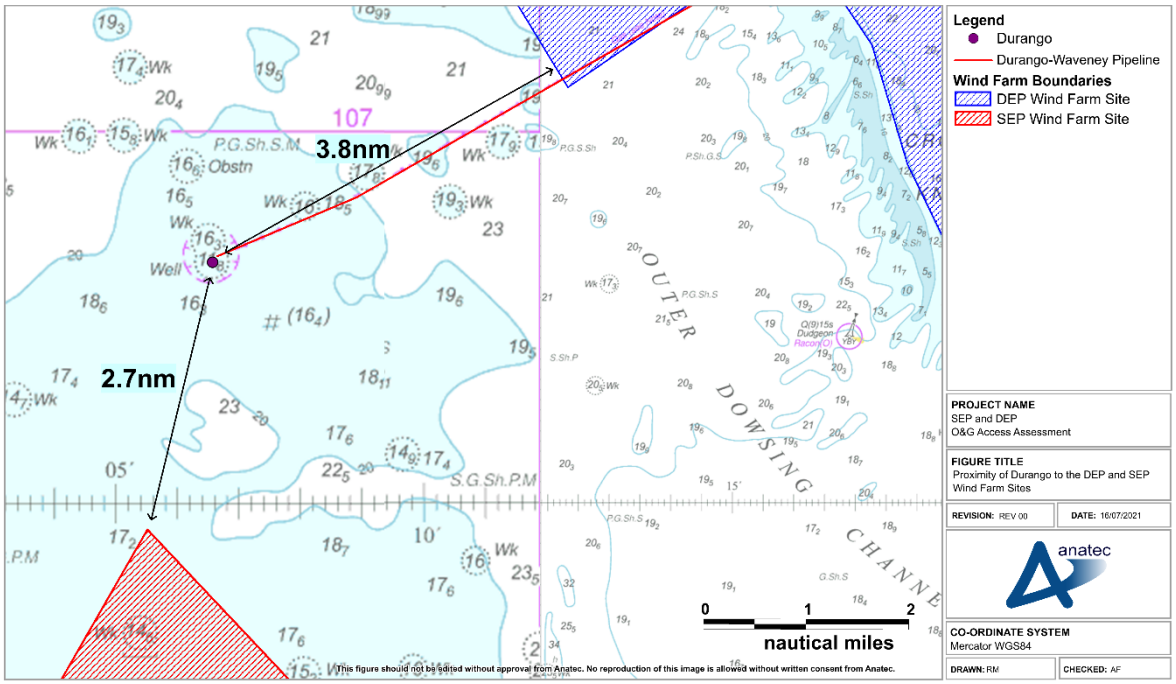

Figure 8.4 Proximity of Durango to the Wind Farm Sites

8.1.5 Subsea Pipeline Overview

66. Figure 8.5 presents an overview of the subsea pipelines screened into the proximity / spacing assessment.

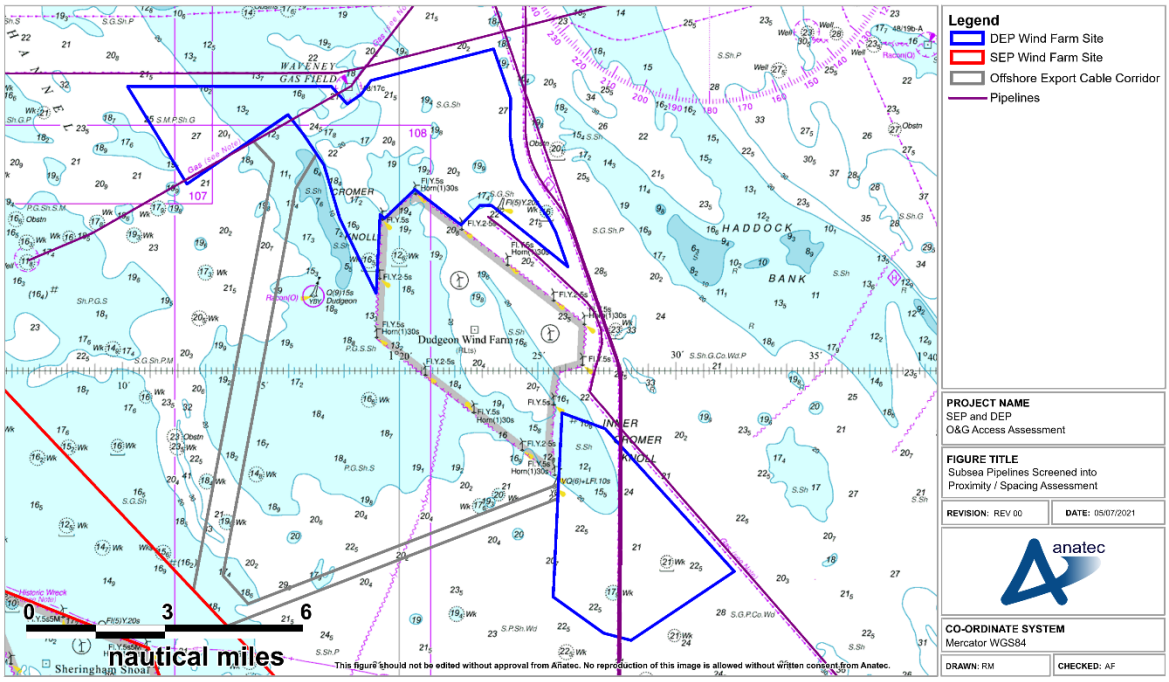

Figure 8.5 Subsea Pipelines Screened into Proximity / Spacing Assessment

67. One pipeline (Durango to Waveney) intersects the DEP North array area while two pipelines (Bacton to Shearwater and Bacton to Lancelot) intersect the DEP South array area. The Blythe to Elgood, Blythe to Thames, and Viking to Theddlethorpe pipelines are also considered due to their close proximity to the DEP wind farm site (all within 500m).

8.2 Impact Assessment

8.2.1 Subsea Assets

68. Subsea assets screened into the proximity / spacing assessment comprise the Elgood well, the Durango well, the subsea pipelines intersecting the wind farm sites and a further two pipelines passing in close proximity.

8.2.1.1 Elgood Well

69. Consultation with IOG (see Section 2) has indicated that following drilling, further well intervention at Elgood will not be required until later in field life (i.e., there are no further planned operations). Regardless, access to the asset will still need to be accommodated by the DEP layout (e.g., for inspections, maintenance interventions, emergency repairs, decommissioning). The vessels associated with these operations (including supporting vessels) will require room to operate, and anchor spreads (if required) would also need to be accommodated, both in terms of accessing the asset

and room to set the anchors. The spatial extent of these operations cannot be defined given they will depend on the vessels used, and whether anchor spreads are required.

70. The limited searoom caused by DEP may result in restrictions of the periods when Elgood can be practicably accessed (e.g., due to more onerous restrictions due to weather), and/or may require vessels of a higher specification to be utilised over those that would be required in areas of open water.

71. This could have implications, noting that certain operations may require additional searoom beyond the 500m threshold of the safety zone (e.g., where support tugs are required, anchor spreads etc). The potential for such operations will need to be considered by Equinor during the layout design and approval process.

72. Similarly, routeing to Elgood for operations involving larger vessels (such as a jack up rig) and any supporting tugs will need to be planned with respect to the available searoom, noting that limits on spacing in this regard may restrict the periods in which the assets can be practicably accessed for such operations (e.g., allowable weather), and/or restrict the types of vessels that can be used. This will also need to be considered as part of the layout design.

73. Experience at other wind farms that have been constructed within close proximity to O&G assets also shows that large rig operations can still occur within limited searoom. It is noted in this regard that the drilling of the Elgood well (see Section 6.3) involved operations in close proximity to the exiting Dudgeon wind farm, which is located 0.48nm from the well location. The installation of the Blythe platform (see Section 6.4) also took place in proximity to the existing Dudgeon site, with the HLV used passing within 800m of the site boundary.

74. Another relevant example is the Walney Extension Offshore Wind Farm located within the Irish Sea, where three wells (an exploration, appraisal, and development well) are present inside the Walney extension array area. The nearest wind turbines to these wells are at a distance of 0.86nm from the exploration well, and 1.3nm from the development and appraisal wells. Despite periodic intervention being required (typically every few years), to date there have been no reported issues.

75. Similarly, HLV activities associated with wind farm construction has occurred within arrays. An example would be the *Stanislav Yudin* HLV (with anchor spread) which has carried out operations in the Dudgeon and Beatrice Wind Farms, as well as O&G decommissioning operations where there are other platforms in proximity.

76. These operations are able to be undertaken noting the available industry experience and guidance, such as the Guidelines for Offshore Marine Operations (GOMO) (2020). This guidance facilitates effective planning of these types of operations, taking into account restrictions, to help ensure safe and efficient operations even when searoom is limited.

77. It should be considered that as per Section 8.1.1, spacing between Elgood and the DEP wind farm site is 0.25nm as a minimum, and therefore is lower than the case of Walney Extension. However, unlike Walney Extension, Elgood is located outside of the wind farm site and within a corridor between the DEP wind farm site and the existing Dudgeon turbines. Regardless, consultation will be required on the layout to determine appropriate access is maintained.

78. Close liaison will also be necessary during the construction phase or during periods of major maintenance to ensure any simultaneous operations are managed effectively. Appropriate protocols should therefore be agreed.

79. Noting the spacing between Elgood and the DEP wind farm site means consultation will be necessary to ensure appropriate access, the impact to the Elgood asset is considered to be **tolerable with embedded mitigation**.

8.2.1.2 Durango Well

80. Concerns over ability to access the Durango well were raised during consultation with Perenco (see Section 2). As per Section 8.1.4, the well is located in excess of 2.7nm from the wind farm sites, and as such there is not considered likely to be any impact on undertaking large scale operations as a result of SEP and DEP. In terms of access needs for such operations, sea room is considered to be available (including for large vessels, jack ups, rigs and any associated support tugs) to the north, west, and south to accommodate such transit to the well location.

81. On this basis, the impact to the Durango asset is considered to be **broadly acceptable**.

8.2.1.3 Subsea Pipelines

82. While operations required on subsea pipelines are likely to be infrequent, there still may be a need for periodic maintenance and / or surveys. Therefore, the layout must ensure appropriate access to local subsea pipelines is facilitated.

83. A total of three pipelines intersect the DEP wind farm site as follows (noting that none intersect the SEP wind farm site):

- Bacton to Lancelot;

- Bacton to Shearwater; and
- Durango to Waveney.

84. As per Section 3.2, a final layout will likely not be defined until the post consent stage, where an approval process will be undertaken with MMO via MCA and Trinity House consultation. However, regardless of layout, all structures within the wind farm sites will be located a minimum of 500m from subsea pipelines, meaning in effect a 1km corridor centred on the pipelines internal to the wind farm sites will be maintained. Similarly, a minimum of 500m spacing will be maintained between the wind farm structures and the pipelines passing in proximity to but not within the wind farm sites (i.e., Elgood to Blythe, Blythe to Thames, and Viking to Theddlethorpe).

85. Consultation with the relevant operators will still be necessary with regard to layout design to ensure appropriate pipeline access is maintained, both to pipelines within the wind farm sites and those passing in proximity. Further, close liaison during the construction phase or during periods of major maintenance will be required to ensure any simultaneous operations are managed effectively, and appropriate protocols in this regard should therefore be agreed.

86. On this basis, the impact to the screened in subsea pipelines is assessed to be **tolerable with embedded mitigation**.

8.2.2 Surface Assets

87. The only surface assets screened into the proximity / spacing assessment are Waveney and Blythe, noting that all other surface assets are located in excess of 2.5nm from the wind farm sites.

88. As per Section 8.1.2, Waveney is located 500m from the DEP wind farm site, noting that it aligns with the wind farm site boundary (i.e., the southern extent of the 500m safety zone sits within a concave section of the wind farm site). Based on assessment of long term marine traffic data covering 2019 (see Section 6.2), support vessel activity associated with Waveney does currently occur within the DEP wind farm site, noting the majority of activity is located outside of the array.

89. As per Section 8.1.3, the Blythe asset is located 0.6nm from the DEP wind farm site, and 0.6nm from the existing Dudgeon wind farm. Based on recent AIS activity during May and June 2021 (see Section 6.4) support vessel activity associated with Blythe occurs primarily outside of the DEP wind farm site, noting a minority of tracks were recorded within the site boundary. It should be considered that this activity was associated with the installation of Blythe, and therefore may not be reflective of

operational activity. Consultation with IOG indicated associated vessel activity will likely be MRV based.

90. As discussed in the corresponding assessment of the subsea assets (see Section 8.2.1), large scale operations associated with O&G assets are able to be undertaken in proximity to wind farm structures. However, it must still be ensured that the wind farm layouts facilitate access to the platforms. As per Section 3.2 a final layout will likely not be defined until the post consent stage, where an approval process will be undertaken with MMO via MCA and Trinity House consultation. No structures will be located within the 500m safety zones of O&G assets (noting that the wind farm sites already account for these), and consultation will be ongoing with the relevant operators to ensure appropriate access is maintained.

91. Close liaison will also be necessary during the construction phase or during periods of major maintenance to ensure any simultaneous operations are managed effectively. Appropriate protocols should therefore be agreed.

92. On this basis, given operator consultation is necessary, the impact to the Waveney and Blythe surface assets is assessed to be **tolerable with embedded mitigation**.

9 Summary

93. This assessment has assessed potential marine access issues that may arise in relation to identified key O&G assets as a result of the construction and operation of SEP and DEP. The assessment has primarily been informed via marine traffic data collected within the vicinity of SEP and DEP as part of the NRA (Appendix 13.1 of the ES) process, which has been used to identify the baseline (including in terms of O&G activity) and to assess routeing deviations that may arise following construction of SEP and DEP.

9.1 Risk Ranking

94. Based on the impact assessments within Sections 7.2 and 8.2, the significance of deviation and proximity impacts to each of the key O&G assets assessed is summarised in Table 9.1. These rankings are designed to inform Chapter 16: Petroleum Industry and Other Marine Users.

Table 9.1 Access Impact Assessment Summary

Asset	Significance - Deviations	Significance - Proximity
Bacton-Lancelot Pipeline	No Impact	Tolerable with Embedded Mitigation
Bacton-Shearwater Pipeline	No impact	Tolerable with Mitigation
Blythe	Tolerable with Embedded Mitigation	Tolerable with Embedded Mitigation
Durango	No Impact	Broadly Acceptable
Durango-Waveney Pipeline	No Impact	Tolerable with Embedded Mitigation
Elgood	No Impact	Tolerable with Embedded Mitigation
Elgood-Blythe Pipeline	No Impact	Tolerable with Embedded Mitigation
Excalibur EA	Broadly Acceptable	No Impact
Lancelot A	Broadly Acceptable	No Impact
Thames-Blythe Pipeline	No Impact	Tolerable with Embedded Mitigation
Viking-Theddlethorpe Pipeline	No Impact	Tolerable with Embedded Mitigation
Waveney	Tolerable with Embedded Mitigation	Tolerable with Embedded Mitigation

10 References

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