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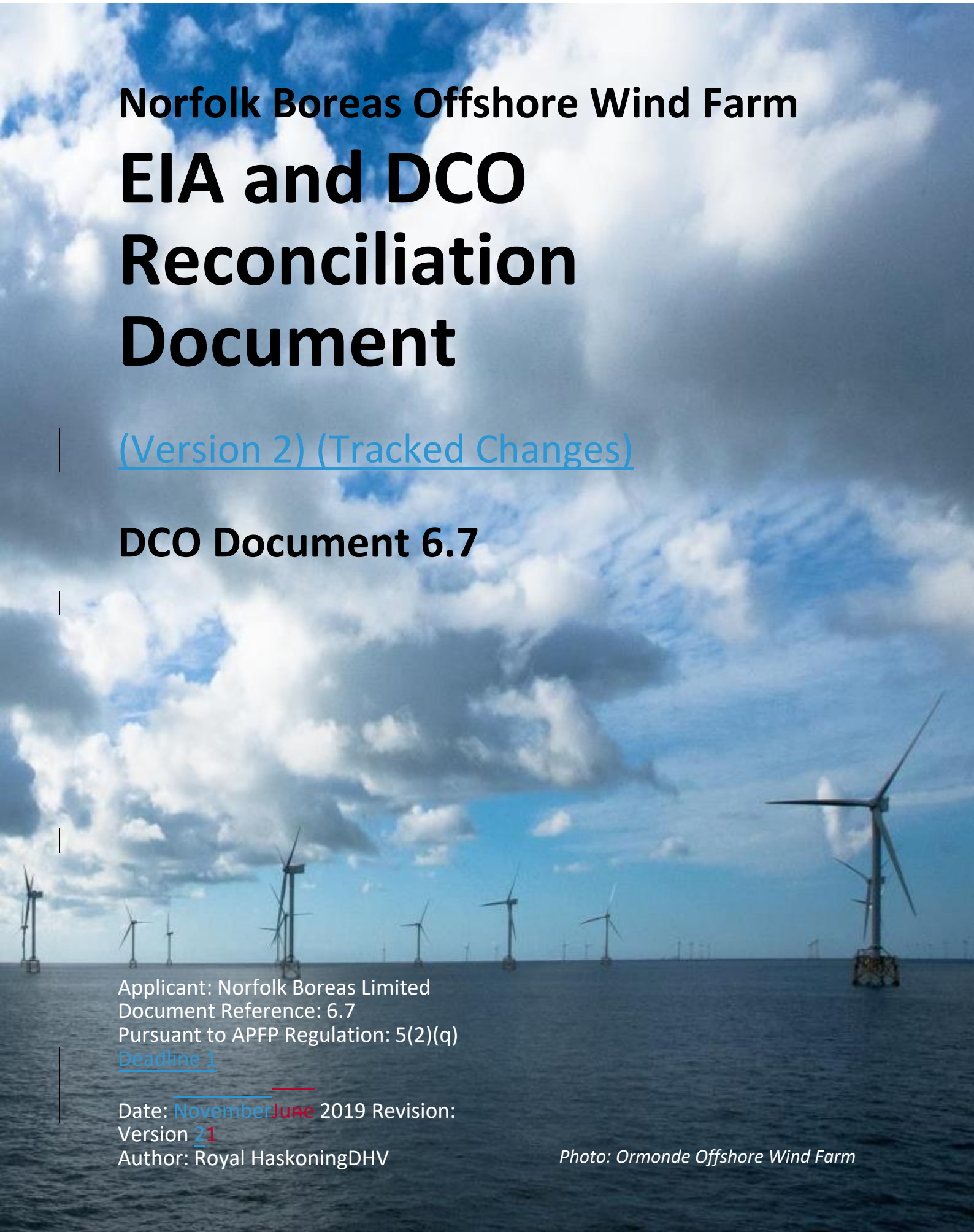

Norfolk Boreas Offshore Wind Farm

EIA and DCO Reconciliation Document

(Version 2) (Tracked Changes)

DCO Document 6.7

Applicant: Norfolk Boreas Limited
Document Reference: 6.7
Pursuant to APFP Regulation: 5(2)(q)
Deadline 1

Date: NovemberJune 2019 Revision: Version 21
Author: Royal HaskoningDHV

Photo: Ormonde Offshore Wind Farm

Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
12/03/2019	01D	First draft for Norfolk Boreas Limited and legal review	DT	JT VR	AD
23/03/2019	02D	Norfolk Boreas Limited review	DT	JL/AD/VR	
29/03/2019	03D	Third draft for Norfolk Boreas Limited review and MMO review	DT	VR	JL
16/05/2019	01F	Final version for DCO submission	DT	VR	JL
19/11/2019	02F	Updated version for Deadline 1	DT	JL/VR	JL

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Glossary of Acronyms

DCO	Development Consent Order
DML	Deemed Marine Licence
EIA	Environmental Impact Assessment
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
MW	Megawatt
SAC	Special Area of Conservation

Glossary of Terminology

Array cables	Cables which link wind turbine to wind turbine, and wind turbine to offshore electrical platforms.
Export cables	Cables that transmit power from an offshore electrical platform to the onshore project substation
Interconnector cables	Offshore cables which link offshore electrical platforms within the Norfolk Boreas site
Landfall	Where the offshore cables come ashore at Happisburgh South
Norfolk Boreas site	The Norfolk Boreas wind farm boundary. Located offshore, this will contain all the wind farm array.
Offshore cable corridor	The corridor of seabed from the Norfolk Boreas site to the landfall site within which the offshore export cables will be located.
Offshore electrical platform	A fixed structure located within the Norfolk Boreas site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a suitable form for export to shore.
Offshore project area	The area including the Norfolk Boreas site, project interconnector search area and offshore cable corridor.
Offshore service platform	A platform to house workers offshore and/or provide helicopter refuelling facilities. An accommodation vessel may be used as an alternative for housing workers.
Project interconnector cable	Offshore cables which would link either turbines or an offshore electrical platform in the Norfolk Boreas site with an offshore electrical platform in one of the Norfolk Vanguard OWF sites.
Project interconnector search area	The area within which project interconnector cables would be installed.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
The Applicant	Norfolk Boreas Limited
The Norfolk Vanguard OWF sites	Term used exclusively to refer to the two distinct offshore wind farm areas, Norfolk Vanguard East and Norfolk Vanguard West (also termed NV East and NV West) which will contain the Norfolk Vanguard arrays.
The project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.

1 INTRODUCTION

1. This document has been produced to provide the rationale behind the offshore parameters which have been included within the draft Norfolk Boreas Development Consent Order (DCO) and the Deemed Marine Licences (DMLs) and to demonstrate how these parameters have been assessed within the Environmental Impact Assessment (EIA). The document aims to provide confirmation that the "worst case scenario" as assessed within the EIA has been adequately secured within the DCO and DMLs.

2. For many of the parameters secured within the DCO it is clear that the same values have been assessed within the ES, for example the maximum~~minimum~~ number of turbines which is 180. This~~gap between turbines of 720m~~ is secured by R~~r~~equirement ~~2~~3(1~~d~~) in Schedule 1 of the DCO. This figure is presented throughout the ES, examples include: Chapter 5 project description, Table 5.3; Chapter 10 benthic and intertidal ecology section 10.8.1.2 and Chapter 15 Shipping and Navigation, Table 15.11; etc. However, due to the fact that the DMLs are defined by a group of assets and the EIA takes a geographical approach to assessing impacts (further information is provided in section 3.3), values for other parameters, such as the maximum quantities of cable protection, are not so easily cross referenced between the two.

3. The Norfolk Boreas project could be constructed as a single phase or in two phases, therefore the DCO has been drafted with five separate DMLs as follows:

   - Schedule 9 Generation under phase 1;
   - Schedule 10 Generation under phase 2;
   - Schedule 11 Transmission under phase 1;
   - Schedule 12 Transmission under phase 2; and
   - Schedule 13 Project interconnector (could only be installed in a single phase).

4. Including separate DMLs for generation assets and transmission assets (and interconnector assets where relevant) is an approach which has been used in other offshore wind farm Development Consent Orders such as East Anglia ONE, Rampion and East Anglia THREE.

5. The Norfolk Boreas EIA considers two Scenarios, Scenario 1 where Norfolk Vanguard proceeds to construction and Scenario 2 where Norfolk Vanguard does not proceed to construction (see sections Chapter 5 project description of the Environmental Statement (ES) for further detail). As Schedule 13 is provision for cables which would connect Norfolk Boreas to Norfolk Vanguard (see section Table 3.1) this schedule could only be used under Scenario 1.

6. The Norfolk Boreas offshore EIA chapters generally adopt~~s~~ a geographical approach for the assessment with most of the offshore chapters establishing a baseline and assessing impacts using the following geographical areas (shown in **Figure 1.**):

- The Norfolk Boreas site;
- The offshore cable corridor; and
- The project interconnector search area.

7. Cables within Schedules 11, 12 and 13 would span two or more of these areas. Therefore, a direct comparison of the parameters for the different assets cannot be made with the parameters assessed for a specific area within the EIA.

8. This document provides an explanation of how the possible electrical solutions have all been captured within the DMLs and how they have been assessed within the EIA.

9. This document focuses on those parameters and values which are less easily cross referenced and thus contains the following:

- A description of three different High Voltage Direct Current (HVDC) electrical solutions being considered for the project;
- A description of the structure of the DMLs;
- A summary of how the offshore EIA has been undertaken;
- A section that describes those parameters which are easily transferable between the DMLs and the EIA and those which are not; and
- The document then concludes with a **Table that reconciles the main parameters within the DCO and DMLs and illustrates that the maxima which has been assessed within the EIAs worst case scenarios is secured within the draft DCO**.

10. This document was updated at Deadline 1 (25th November 2019) of the Norfolk Boreas Examination to reflect a commitment, made as result of consultation with Natural England to reduce the amount of cable protection that could be placed within the Haisborough Hammond and Winterton Special Area of Conservation (SAC). The Application was made with a commitment to limit the amount of cable protection within the SAC to 10% of the cable length. Following submission of the application a commitment was made to reduce cable protection in the SAC further, to 5% of the cable length. The draft DCO and supporting documents were also updated.

2 ELECTRICAL SOLUTIONS

11. In order to understand the quantities for offshore parameters which have been included within the DCO and DMLs it is important to understand the different electrical solutions which are being considered for the Norfolk Boreas project. Following consultation with stakeholders Norfolk Boreas Limited took the decision to commit to a High Voltage Direct Current electrical solution for transmitting power from the wind farm to the onshore project substation. The decision was taken as there are many environmental benefits to this option (see Chapter 4 Site Selection and Assessment of Alternatives of the Norfolk Boreas ES (document reference 6.1.4) for further detail).

12. Section 5.4.12 in Chapter 5 Project description of the ES describes in detail the three HVDC electrical solutions which are being considered for the Norfolk Boreas project. Table 2.2 provides a breakdown of what infrastructure would be required under each solution. Figure 2 to Figure 4 provide graphical representation to aid these descriptions. These are for illustrative purposes only and in no way represent the actual array layouts being considered for the Norfolk Boreas project.[1]

Table 2.1 Infrastructure Parameters for HVDC Export Solutions

HVDC export solution covering both the Norfolk Vanguard and Norfolk Boreas projects	Norfolk Boreas specific infrastructure requirements
Solution (a)* • 2 x 900MW platforms located within Norfolk Boreas; and • 2 x 900MW platforms located within Norfolk Vanguard	• 2 electrical platforms; • 1 pair of HVDC interconnector cables connecting the two electrical platforms located within the Norfolk Boreas site, • 1 HVAC interconnector cable connecting the electrical platforms located within the Norfolk Boreas site, • 2 pairs of HVDC export cables connecting the electrical platforms within the Norfolk Boreas site to landfall at Happisburgh South. Illustrated in Figure 2
Solution (b) • 2 x 1,200MW electrical platforms in Norfolk Vanguard; and • 1 x 1,200MW electrical platform in Norfolk Boreas	• 1 electrical platform; • 1 pair of HVDC project interconnector cables connecting the electrical platform in Norfolk Boreas to an electrical platform in Norfolk Vanguard East, • 1 HVAC project interconnector cable connecting the electrical platform in Norfolk Boreas with an electrical platform in Norfolk Vanguard East. • 8 HVAC cables connecting turbines located in the southern part of the Norfolk Boreas site to the electrical platform in Norfolk Vanguard East • 1 pair of HVDC export cables connecting the electrical platform within the Norfolk Boreas site to landfall at Happisburgh South. Illustrated in Figure 3

[1] It should be noted that any services platform used for accommodation and helicopter services is excluded from this consideration as they have no electrical infrastructure function.

HVDC export solution covering both the Norfolk Vanguard and Norfolk Boreas projects	Norfolk Boreas specific infrastructure requirements
Solution (c)* • 1 x 1,800MW electrical platform in Norfolk Vanguard; and • 1 x 1,800MW electrical platform in Norfolk Boreas	• 1 electrical platform; • 1 pair of HVDC project interconnector cables connecting the electrical platform in Norfolk Boreas with an electrical platform in Norfolk Vanguard West. • 1 HVAC project interconnector cable connecting the electrical platform in Norfolk Boreas with an electrical platform in Norfolk Vanguard West. • 1 pair of HVDC export cables connecting the electrical platform within the Norfolk Boreas site to landfall at Happisburgh South. Illustrated in Figure 4

* A variation of solution (c) is also being considered. Electrically this variant would be similar to solution (c) but in terms of physical infrastructure would be more similar to solution (a). In terms of the EIA it would be entirely within the design envelope assessed.

13. Under the three different electrical solutions different quantities of cabling would be required. Where DC cables are used a pair of cables would be installed in a single trench, for example 500km of HVDC export cables would be installed within 250km of cable trench. For interconnector cables where a pair of DC cables is used, and a single AC cable is used the DC cables would be installed within a single trench and the AC cable would also be installed in a single trench therefore the amount of trenching is two thirds of the cable length. Table 2.2 presents the maximum amount of cable and cable trenching required for each electrical solution.

Table 2.2 Maximum length of cable trenching required for the different electrical solutions

Cable type	Solution a)	Solution b)	Solution c)
Array cables	600km	600km	600km
Export Cables	250km *(500km of cable in 250km of trench)*	125km *(250km of cable in 125km of trench)*	125km *(250km of cable in 125km of trench)*
Interconnector cables	60km *(90 km of cable within 60km of trench)*	0km	0km
Project interconnector cables	0km	78 (117km of cable in 78km of trench)	120km (180km in 120km of trench)
Total	**910km** *(1190 of cable within 910km of trench)*	**877km** *(967 of cable within 877km of trench)*	**845km** *(1030 of cable within 845km of trench)*

14. As shown in Table 2.2 the maximum amount of offshore cabling that would be required to construct Norfolk Boreas would be 1,190km of cable installed within 910km of cable trench. This would occur under electrical solution a) illustrated in Figure 2.

3 RELATIONSHIP BETWEEN THE DMLs AND THE EIA

3.1 DML and EIA structures

15. It is important to demonstrate the worst case parameters assessed within the EIA are fully represented and captured within the DCO and DMLs. To do this an understanding of the structure of the DCO and DMLs is required.

16. The DMLs (Schedules 9 to 13 of the DCO) of the Norfolk Boreas project have been drafted on an asset or group of assets basis. Table 3.1 details which pieces of infrastructure are included within its associated DML. The requirements contained in Schedule 1 of the Norfolk Boreas DCO secure the overall totals which must not be exceeded by the combined DMLs (Schedules 9 to 13).

Table 3.1 Structure of the DMLs and Content

DML	Infrastructure included within Schedule
Schedule 9 and 10 - Generation assets	• Wind turbines and their foundations; • A service platform and foundation; • Meteorological and ocean monitoring equipment and their foundations; and • Array cables and associated cable protection.
Schedule 11 and 12 – Transmission assets	• Offshore electrical platforms and their foundations; • Interconnector cables between offshore electrical platforms within the Norfolk Boreas site and their associated cable protection; and • Export cables and associated cable protection
Schedule 13 - Project Interconnector assets	• Project interconnector cables between an electrical platform in the Norfolk Boreas site and an electrical platform in one of the Norfolk Vanguard OWF sites.

17. The EIA is generally structured to assess impacts using a geographical approach as outlined in Table 3.2. The three geographical areas are shown in **Figure 1.**

Table 3.2 Structure of the EIA and content

Area for assessment	Infrastructure included within EIA
Norfolk Boreas site	• Turbines and their foundations; • Offshore electrical platforms; • A service platform; • Meteorological and ocean monitoring instruments and their foundations; • Array cables and associated cable protection; • Interconnector cables (cables between offshore electrical platforms within the Norfolk Boreas site); or • Sections of project interconnector cables located within the Norfolk Boreas site*; and • Sections of the export cables which would be located within the Norfolk Boreas site.
Offshore Cable corridor	• The section of the export cables that would be located within the offshore cable corridor

Area for assessment	Infrastructure included within EIA
Project interconnector search area	• The sections of project interconnector cables (linking either turbines or electrical platforms within the Norfolk Boreas site to an electrical platform within the Norfolk Vanguard OWF sites) located within the project interconnector search area.

* Each of the electrical solutions described in section 2 would only ever require either interconnector cables or project interconnector cables but never both.

3.2 Where DCO and EIA directly compare

18. Under all of the electrical solutions presented in section 2 infrastructure supporting the array such as wind turbines, a service platform, meteorological and ocean monitoring equipment would be located within the Norfolk Boreas site. This is secured through Schedules 9 and 10 of the DCO and therefore the parameters included within these DMLs are easily reconciled with the parameters assessed within the EIA. Table 3.3 demonstrates how the parameters used in both of these DMLs and the EIA are reconciled.

Table 3.3 reconciliation of parameters used in Schedule 9 and 10 and assessed within the Norfolk Boreas site

Parameter	Included within the DCO	Included within the ES
In relation to a wind turbine generator, each foundation must not have a seabed footprint area (excluding scour protection) of greater than	1,963m^2 Secured in Schedules 1 Requirement 6(2) and Schedules 9 and 10 Condition 4(2)	Assessed construction impact 1A Chapter 8 Marine Geology, Oceanography and Physical processes
In relation to a meteorological mast, each foundation must not have a seabed footprint area (excluding scour protection) of greater than	314m^2 Secured in Schedules 1 Requirement 7(2) and Schedules 9 and 10 Condition 5(2)	Assessed in operation impact 1 in Chapter 8 Marine Geology, Oceanographer and Physical processes
In relation to the offshore electrical platform(s), the foundations must not have a combined seabed footprint area (excluding scour protection)	15,000m^2 Secured in Schedule 1 Requirement 8(2) and Schedules 11 and 12 Condition 1(c)	Assessed in operation impact 1 in Chapter 8 Marine Geology, Oceanographer and Physical processes
In relation to the service platform, the foundation must not have a seabed footprint area (excluding scour protection) of greater than	7,500 Secured in Schedule 1 Requirement 9 (2) and Schedules 9 and 10 Condition 6(2)	Assessed in operation impact 1 in Chapter 8 Marine Geology, Oceanographer and Physical processes
Total amount of scour protection for the offshore electrical platforms	35,000m^2 Secured in Schedules 11 and 12 Condition 3(b)	35,000m^2 see operation impact 10.1 in chapter 10 of the ES
Total amount of disposal for drill arisings in connection with any [electrical platform] foundation drilling	14,137m^3 Secured in Schedules 11 and 12 Condition 3(d)	14,137m^3 Assessed in construction impact 1B of Chapter 8 Marine Geology, Oceanographer and Physical processes
Maximum length of array cables	600km secured in Schedules 1 Requirement and Schedules 9 and 10 Condition 3	Chapter 8 Marine Geology, Oceanographer and Physical processes Table 8.16 construction impact 5.

3.3 Where DMLs and EIA are not easily reconcilable

19. The parameters around offshore cable installation are not so easily aligned between DMLs and EIA. For example, Schedule 13 has to account for project interconnector cables under solution b) and solution c). These are both shown in Figure 5. The DML for the project interconnector (Schedule 13) allows for 180km of cables to be installed within 120km of cable trenching. This amount of cabling would only be required for solution c). Under Solution c) 80km of this cable trenching would be located within the offshore cable corridor and 40km would be located within the Norfolk Boreas site.

20. The worst case scenario assessed within the ES for impacts resulting from cable installation within the project interconnector search area, as shown in Figure 6, would be installation of up to 92km worth of cabling which would occur under Scenario b).

21. Without having the detail, it would be easy to assume that the EIA should assess 120km worth of cable trenching within the project interconnector search area. However, under solution c~~b~~) a maximum of 80km of trenching would occur within the project interconnector search area with the remaining 40km occurring within the Norfolk Boreas site (see Figure 75). The EIA allows for this by assessing up to 60km of cable trench within the assessment of impacts within the Norfolk Boreas site, due to installation of the interconnector cables (see Figure 7) and the 92km stated above and shown in Figure 6). It should be noted that either interconnector cables or project interconnector cables would be installed but never both.

22. As illustrated in Table 3.4, if the DMLs were taken in isolation they would allow for 2,560km of offshore cable to be installed. However as defined in Requirement 5 (1) of Schedule 1 of the DCO "*The total length of the cables must not exceed **1190 kilometres within 910** kilometres of cable trench*"

Table 3.4 Maximum length of cable allowed for within the DMLs if taken in isolation

Cable type	Combined across Sch 9 and 10	Combined across Sch 11 and 12	Sch 13
Array cables	1200km	0km	0km
Export cables	0km	1,000km	0km
Interconnector cables	0km	180km	0km
Project interconnector cables	0km	0km	180km
Grand Total	**2,560km**		
Requirement 5 (1) of Schedule 1 the DCO	*The total length of the cables must not exceed 1190 kilometres within **910 kilometres** of cable trench*		

23. Table 3.5 illustrates that the total amount of cable installation assessed within the EIA exceeds that which would actually be required under any of the electrical

solutions shown in Table 2.2, i.e. the maximum required would be 910km worth of cable trenching and the EIA assesses a combined 1,002km of cable trenching (Table 3.5). The reason for this is the fact that the EIA needs to account for the three different electrical solutions and the fact that different electrical solutions would have different worst case scenarios within the different project areas.

24. The DCO has been drafted to only secure what is required for the project however the EIA assesses a greater amount. This is illustrated in Table 2.2 and Table 3.5,

Table 3.5 Maximum length of cable trenching required in the different parts of the offshore project area. This covers the worst case that could occur under any of the electrical solutions.

Cable type	Norfolk Boreas site	Offshore cable corridor	Project interconnector search area
Array cables	600km	0km	0km
Export cables	50km *(25km of cable within 50km of trench)*	200km *(400km of cable within 200km of trench)*	0km
Interconnector cables	60km* *(90km of cable within 60km of trench)*	0km	0km
Project interconnector cables	0km (as 60km of cable is assessed for interconnector cable)	0km	92km (100km within 92km of trench)
Total length of cable	**710km**	**200km**	**92km**
Grand total	**1,002km**		

25. As explained above, due to the different ways in which the Norfolk Boreas project is allocated to the five DMLs and three areas of assessment, it is not always easy to compare the two. Table 3.6 demonstrates how the maximum parameters secured within the DMLs are assessed within the EIA. Table 3.6 shows that the EIA either assesses the maximum parameters secured within the DCO or assesses a greater value than what is secured within the DCO.

Table 3.6. Table of reconciliation (overall limits are highlighted in blue)

		DCO					EIA				
ID	DCO Parameter	Sch 9 and 10 – Generation assets	Sch 11 and 12 – Transmission assets	Sch 13 Project interconnector	Total secured in the DCO	Rationale	Norfolk Boreas site	Offshore cable corridor	Project interconnector search area	Total assessed within EIA	Rationale
1	Removal of material from the seabed required for the construction of Work Nos. 1 to 4B and the disposal Scenario 1 (m^3)	37,817,212 Part 3, 1(d)	7,275,000 Part 3, 1(d)	7,200,000 Part 3, 1(d)	**48,692,212m^3** Secured in Schedule 1 Part 1 (c)	Schedule 9 or 10 • Wind turbine generators 1,767,146m^3 • offshore service platform 37,500m^3 • two meteorological masts 12,566m^3 • Array cable pre sweeping 36,000,000m^3 Schedules 11 and 12 • Offshore electrical platforms 75,000m^3 • Interconnector cables 3,600,000m^3 • Export cables 600,000m^3 (within the offshore cable corridor) • Export cables 3,000,000 within the Norfolk Boreas site Schedule 13 • Project interconnector cable 7,200,000m^3 As either the interconnector or the project interconnector would be required but not both the maximum total of 48,692,212m^3 has been secured with Schedule 1 part 1 of the DCO. This assumes the Worst case Scenario that the project interconnector is required.	45,992,212 Assessed in construction impact 2A Chapter 10 benthic ecology	3,600,000 Assessed in construction impact 2B Chapter 10 benthic ecology	5,520,000 Assessed in construction impact 2C Chapter 10 benthic ecology	**55,112,212m^3**	Norfolk Boreas site includes • WTG Foundations 1,767,146m^3 • Two Electrical platform foundations 75,000m^3 • Two Metmast foundations 12,566m^3 • A Service platform foundation 37,500m^3 • Seabed levelling for array cables 36,000,000m^3 • Seabed levelling for interconnector cables 3,600,000m^3 • Seabed levelling for export cable and cable installation within the Norfolk Boreas site 4,500,000m^3 The Offshore cable corridor includes • Seabed levelling and installation of 200km of export cables 3,600,000m^3 Project interconnector search area • Seabed levelling and installation of 92km of export cables 5,520,000m^3
2	Removal of material from the seabed required for the construction of Work Nos. 1 to 4B and the disposal Scenario 2 (m^3)	37,817,212 Part 3, 1(d)	7,275,000 Part 3, 1(d)	0	**44,417,212m^3** Secured in Schedule 1 Part 1 (c)	This includes Schedules 9 and 10 • Wind turbine generators 1,767,146m^3 • offshore service platform 37,500 m^3 • two meteorological masts 12,566m^3 • Array cable pre sweeping 36,000,000m^3 Schedules 11 and 12 • Offshore electrical platforms 75,000m^3 • Interconnector cables 3,600,000m^3 • Export cables 3,600,000m^3 Under Scenario 2 the project interconnector would not be required but the interconnector would be.	As above	As above	As above	As above	As above
3	Disposal of drill arisings in connection with any foundation drilling (m^3)	399,776 Part 3, 1(f)	14,137 Part 3, 1(f)	0	**413,913** Secured in Schedule 1 Part 1 (e)	See Table 3.3 This includes schedule 9 and 10 • Wind turbine generators 397,608m^3 • offshore service platform 848m^3 • two meteorological masts 1,131m^3 • two LIDAR monopile foundations 189 m^3 Schedules 11 and 12 • Offshore electrical platforms 14,137m^3	**413,913**	0	0	**413,913**	See Table 3.3. This includes: • WTG foundations 397,608m^3 • Two electrical platform foundations 14,137m^3 • Two Metmast foundations 1,131m^3 • A service platform foundation 848m^3 • Two LIDAR foundations 189m^3
4	Offshore cable of installation Scenario 1 (km)	600 Condition 3	590 (which would be within 310 of trenches). Condition 2	180 (which would be within 120 of trenches). Condition 2.	**1190** within **910** of trench Secured in Schedule 1	See Table 2.2 for explanation	710 of trenching	200 of trenching	92 of trenching	**1,002km of trenching**	See Table 3.5 for explanation of calculations. Impacts are caused by the cable trenching process rather than the maximum length of cables installed

		DCO					EIA				
ID	DCO Parameter	Sch 9 and 10 – Generation assets	Sch 11 and 12 – Transmission assets	Sch 13 Project interconnector	Total secured in the DCO	Rationale	Norfolk Boreas site	Offshore cable corridor	Project interconnector search area	Total assessed within EIA	Rationale
					Requirement 5 (1)						
5	Offshore cable of installation Scenario 2 (km)	600 Condition 3	590 (which would be within 310 of trenches). Condition 2	0	**1190** within **910** of trench Secured in Schedule 1 Requirement 5 (1)	As Above	As Above	As Above	As Above	As Above	As Above
6	Total volume of cable protection (m^3)	204,000 Condition 3	9~~10~~3,436 Condition 2	41,000 Condition 2	**3~~3~~21,436** Schedule 1 Requirement (5) (2)	Schedules 11 and 12 include 7~~8~~6,436m^3 of cable protection for the export cable and 17,000m^3 for the interconnector cables. Schedule 13 includes 41,000m^3 for the project interconnector; however, either the interconnector or the project interconnector would be required but never both therefore the maximum allowed for across all DMLs would be 3~~3~~21,436m^3. This assumes the Worst case Scenario that the project interconnector is required.	234,000	73,436	37,000	**344,436**	Norfolk Boreas site includes: • Array cable protection due to unburied cable (10% of total length) 150,000m^3 • Array cable protection approaching turbines 45,000m^3 • Array cable protection at 10 crossings 9,000m^3 • Interconnector cable protection approaching electrical platforms 2,000m^3 • Interconnector cable protection due to unburied cable (10% of total length) 15,000m^3 • Export cable protection on approach to electrical platforms 500m^3 • Export cable protection due to unburied cable within the Norfolk Boreas site (2.5km length per pair of cables) 12,500m^3 Offshore cable corridor includes: • Export cable protection due to unburied export cable (10km length per pair of cables) 50,000m^3 • Export cable protection for crossings (based on 26 crossings) 23,400m^3 • Protection at the landfall HDD exit locations 36m^3 Project interconnector search area includes: • Project Interconnector cable protection - approaching electrical platforms within Norfolk Vanguard, based on eight AC array cables and three further cables (connecting Norfolk Boreas and Norfolk Vanguard electrical platforms) 5,000m^3 • Project Interconnector cable protection due to unburied cable based on 10% of total trench length being unburied 23,000m^3 • Project interconnector cable protection - crossings (based on 10 crossings) 9,000m^3
7	Total area occupied by cable protection (m^2)	400,000 Condition 3	1~~6~~86,086 Condition 2	74,000 Condition 2	**6~~2~~06,086m^2** Schedule 1 Requirement 5 (3)	Schedules 11 and 12 include an~~d~~ area of 1~~3~~52,086m^2 for cable protection for the export cable and 34,000m^2 for the interconnector cables. Schedule 13 includes 74,000m^2 for the project interconnector however either the interconnector or the project interconnector	460,000 Assessed in operation impacts 5A in Chapter 8 Marine Geology,	126,086 Assessed in operation impacts 6 in Chapter 8 Marine Geology,	66,000	**652,086**	Norfolk Boreas site includes: • Array cable protection due to unburied cable (10% of total length) 300,000m^2 • Array cable protection approaching turbines 90,000m^2

		DCO					EIA				
ID	DCO Parameter	Sch 9 and 10 – Generation assets	Sch 11 and 12 – Transmission assets	Sch 13 Project interconnector	Total secured in the DCO	Rationale	Norfolk Boreas site	Offshore cable corridor	Project interconnector search area	Total assessed within EIA	Rationale
						would be required but never both therefore the maximum allowed for across all DMLs would be that which has been assessed in the EIA which is 602~~6~~,086m^2. This assumes the Worst case Scenario that the project interconnector is required.	Oceanographer and Physical processes and operation impact 2A Chapter 10 benthic ecology	Oceanographer and Physical processes and operation impact 2B Chapter 10 benthic ecology			• Array cable protection at 10 crossings 10,000m^2 • Interconnector cable protection approaching electrical platforms 4,000m^2 • Interconnector cable protection due to unburied cable (10% of total length) 30,000m^2 • Export cable protection on approach to electrical platforms 1,000m^2 • Export cable protection due to unburied cable within the Norfolk Boreas site (2.5km length per pair of cables) 25,000m^2 Offshore cable corridor includes: • Export cable protection due to unburied export cable (20km length per pair of cables) 200,000m^2 • Export cable protection for crossings (based on 26 crossings) 26,000m^2 • Protection at the landfall HDD exit locations 86m^2 Project interconnector search area includes: • Project Interconnector cable protection - approaching electrical platforms within Norfolk Vanguard, based on eight AC array cables and three further cables (connecting Norfolk Boreas and Norfolk Vanguard electrical platforms) 10,000m^2 • Project Interconnector cable protection due to unburied cable based on 10% of total trench length being unburied 46,000m^2 • Project interconnector cable protection - crossings (based on 10 crossings) 10,000m^2
8	The total volume of scour protection for the wind turbine generators, service platform, meteorological masts, offshore electrical platforms and LIDAR measurement buoys (m^3)	27,269,513 Condition 8(g)	100,000 Condition (3)(b)	0	**27,369,513** Schedule 1 Requirement 11	See Table 3.3 This includes schedule 9 and 10 • Wind turbine generators 27,143,361m^3 • Offshore service platform 50,000m^3 • Two meteorological masts 75,398m^3 • Two LIDAR monopile foundations 754m^3 Schedules 11 and 12 • Offshore electrical platforms 100,000m^3					The volume of scour ~~cable~~ protection is not directly assessed in the ES as the key parameter is the area of habitat (see ID 9) that would be lost as a result of the cable protection
9	The total area occupied by scour protection for the wind turbine generators, service platform, meteorological masts, offshore electrical platforms and LIDAR measurement buoys (m^2)	5,453,903 Condition 8(g)	20,000 Condition (3)(b)	0	**5,473,903** Schedule 1 Requirement 11	See Table 3.3 This includes schedule 9 and 10 • Wind turbine generators 5,428,672m^2 • Offshore service platform 10,000m^2 • Two meteorological masts 15,800m^2 • Two LIDAR monopile foundations 151m^2 Schedules 11 and 12 • Offshore electrical platforms 20,000m^2	5,725,532	0	0	**5,725,532**	Table 3.3 describes what is assessed within the EIA and where. Within the EIA, it is the total footprint of the foundation and the scour protection that is assessed. Therefore both the footprint of the foundation and the scour protection are included in the 5,725,532m^2.

4 CONCLUSION

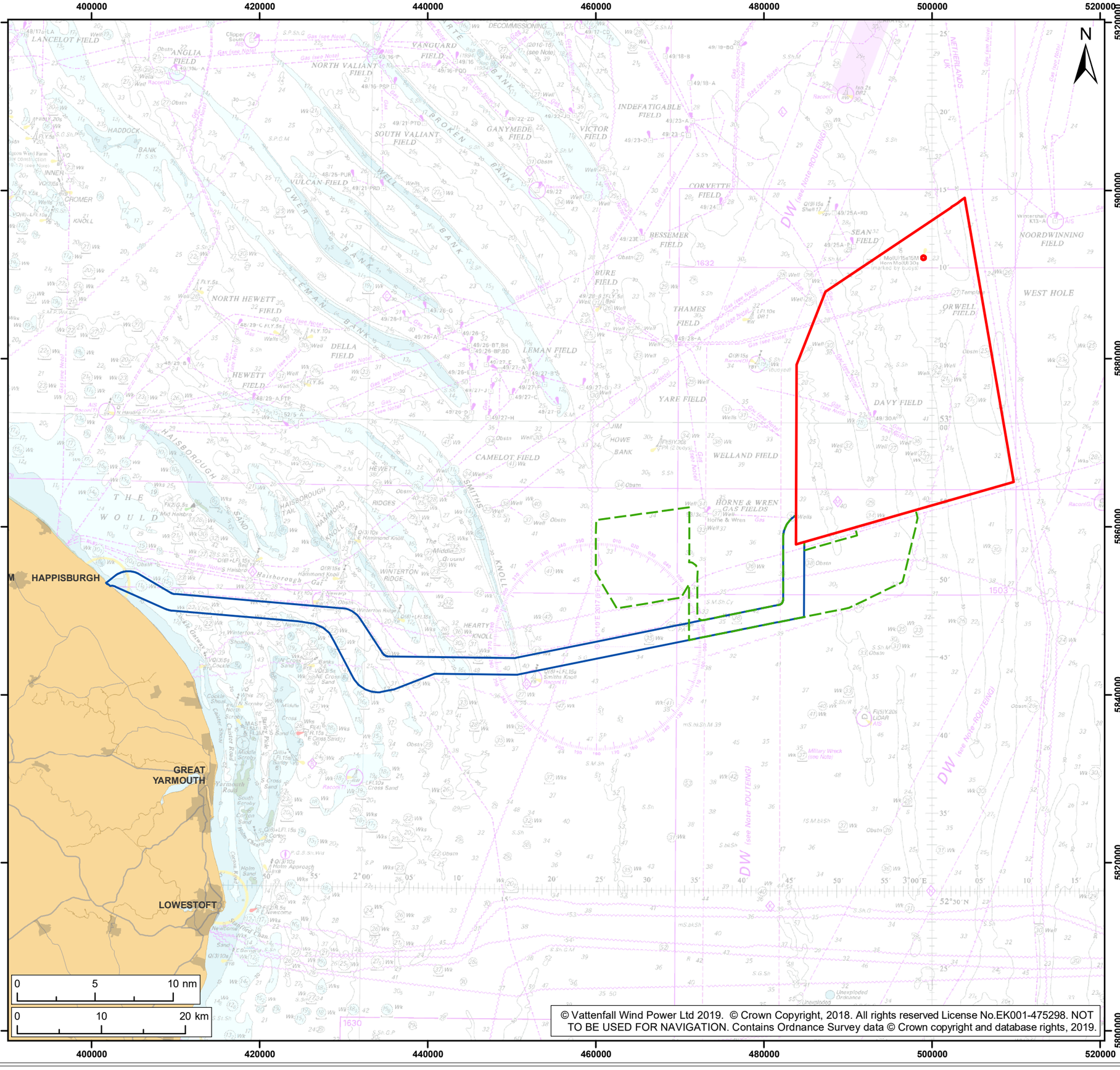
26. The Norfolk Boreas project and DCO have been developed using a multidisciplinary approach with the engineering team and EIA team working closely together to ensure the EIA worst case scenarios reflect the maximum design parameters within each of the design scenarios and electrical design solutions. In turn the EIA and engineering teams have worked closely with the legal to team to ensure the DCO, whilst following the presentational legal requirements, also reflects the WCS parameters assessed within the EIA and the engineering requirements for the project.

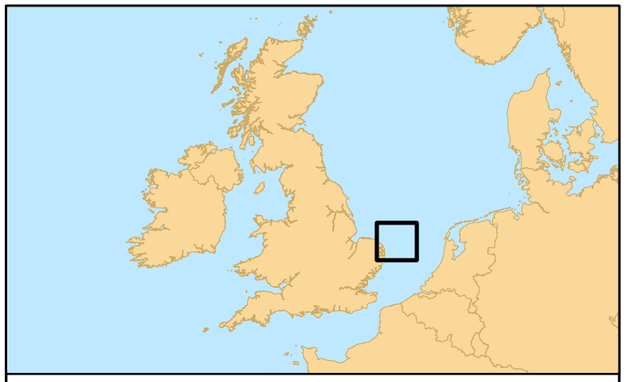
27. It is recognised that the position is multi-layered and therefore complex, however the development team is confident that the DCO parameters are coordinated, conservative and consistent with the parameters used in the EIA assessments.

28. This document outlines how parameters for the three electrical solutions have been secured within the DCO / DMLs and how these parameters have been assessed within the EIA. The document demonstrates that the EIA assesses parameters which at least equate to, if not exceed those secured within the DCO.

5 FIGURES

This section contains all figures referenced within the report.





Legend:

- Norfolk Boreas site
- Offshore cable corridor
- Project interconnector search area

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title: Offshore project areas

Figure: 1 | Drawing No: PB5640-007-003-001

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	29/03/2019	JT	DT	A3	1:450,000
01	19/03/2019	LB	DT	A3	1:450,000

Co-ordinate system: ETRS 1989 UTM Zone 31N **EPSG:** 25831

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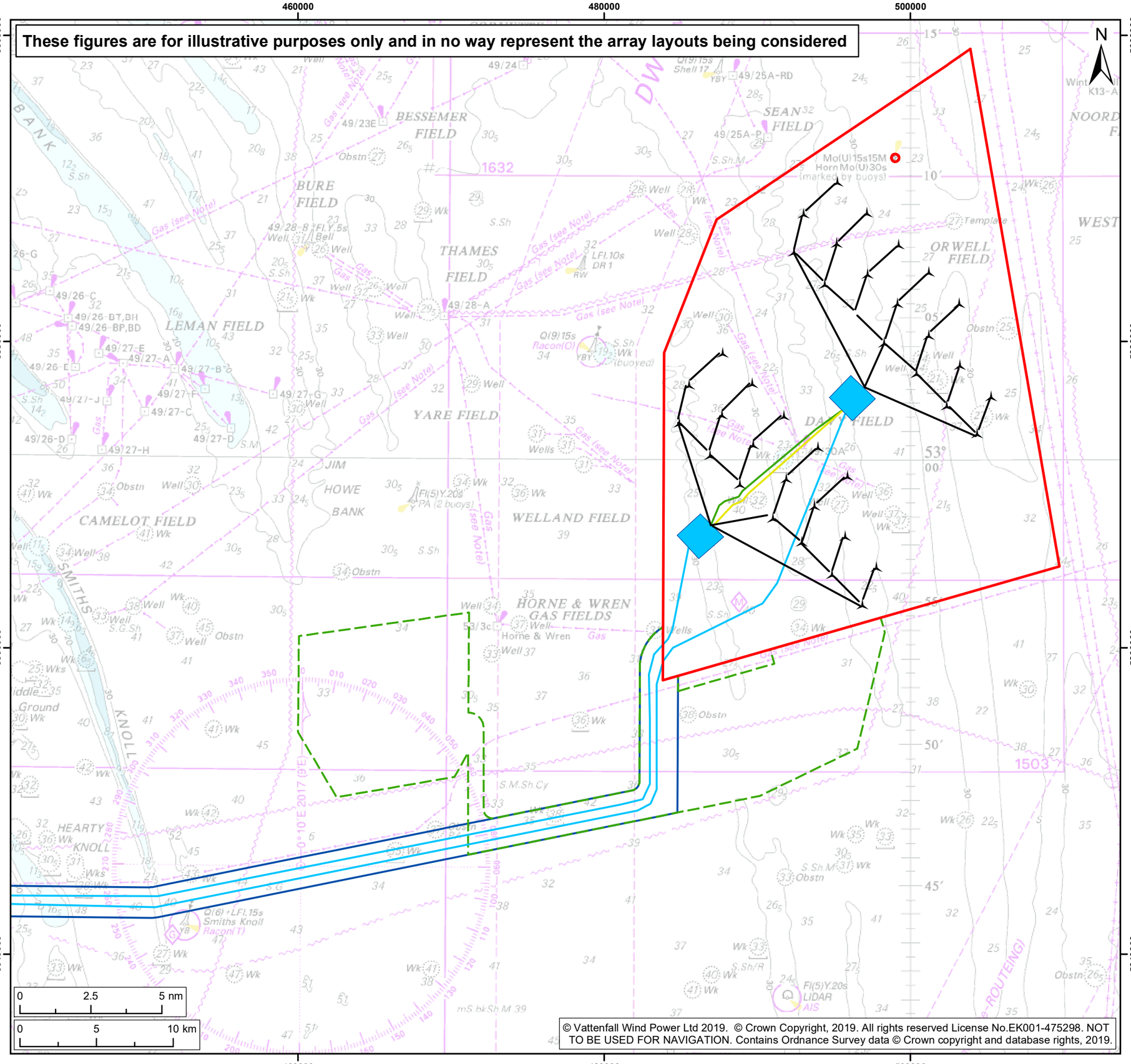

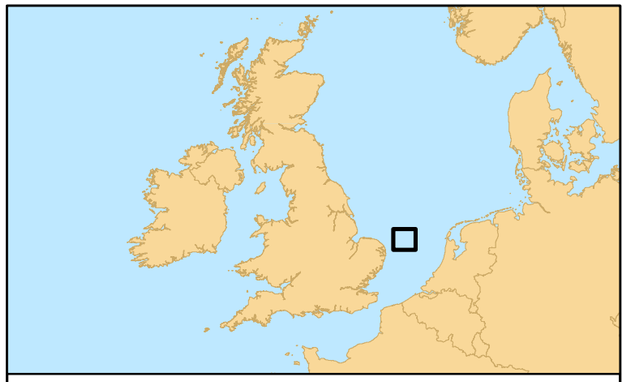

Legend:

- Norfolk Boreas site
- Offshore cable corridor
- Project interconnector search area
- Electrical platforms
- Turbines
- Array cables
- Export cables

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title: Electrical Solution a (infrastructure consented for Norfolk Boreas only)

Figure: 2 | Drawing No: PB5640-007-003-002

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: ETRS 1989 UTM Zone 31N **EPSG:** 25831

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Legend:

- Norfolk Boreas site
- Offshore cable corridor
- Project interconnector search area
- Electrical platforms
- Norfolk Vanguard site
- Vanguard Infrastructure
- Turbines
- Array cables
- Export cables

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title:

Electrical Solution b

Figure: 3 | Drawing No: PB5640-007-003-003

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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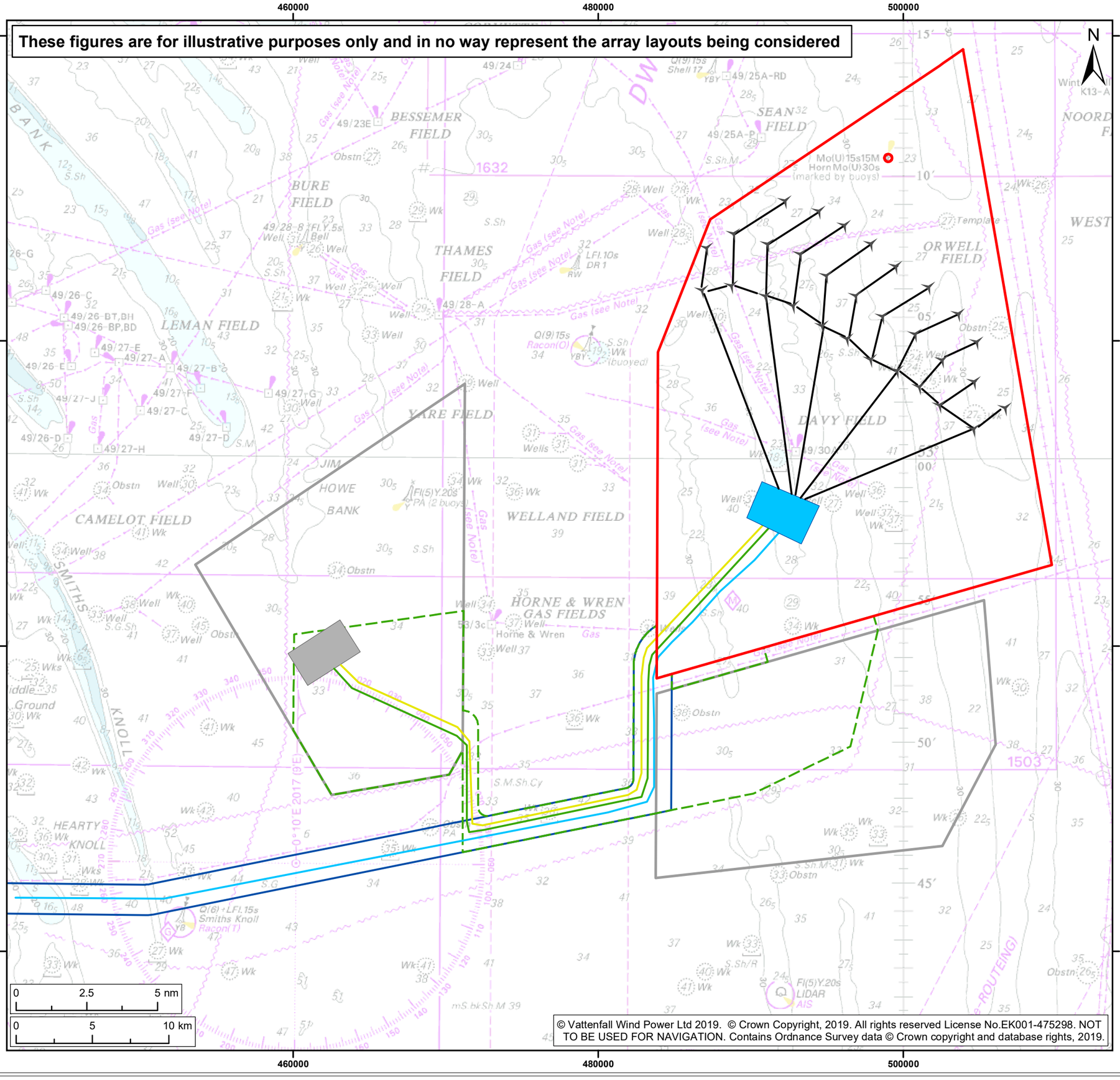

Legend:

- Norfolk Boreas site
- Offshore cable corridor
- Project interconnector search area
- Electrical platforms
- Norfolk Vanguard site
- Vanguard Infrastructure
- Turbines
- Array cables
- Export cables

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title: Electrical Solution c

Figure: 4 | Drawing No: PB5640-007-003-004

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Co-ordinate system: ETRS 1989 UTM Zone 31N **EPSG:** 25831

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Legend:

- Norfolk Boreas site
- Offshore cable corridor
- Project interconnector search area
- Norfolk Vanguard site
- Vanguard Infrastructure

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Other infrastructure

- Cable (active)[1]
- Pipeline (active)[2]
- Crossing location

[1] KisOrca, 2018.
[2] Oil & Gas UK Ltd, 2019.

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title:

Project Interconnector cable parameters for Schedule 13

Figure: 5 | Drawing No: PB5640-007-003-005

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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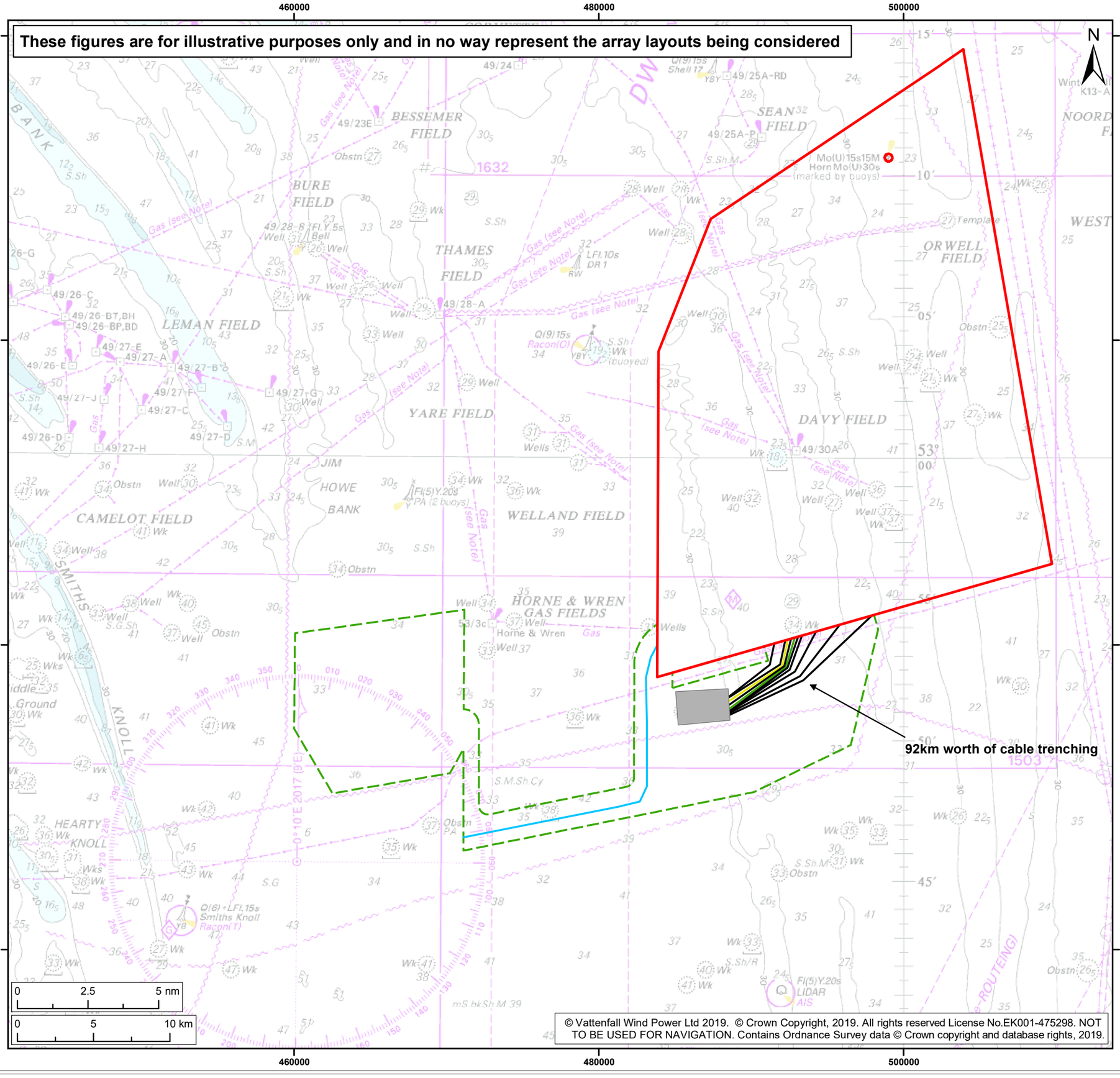

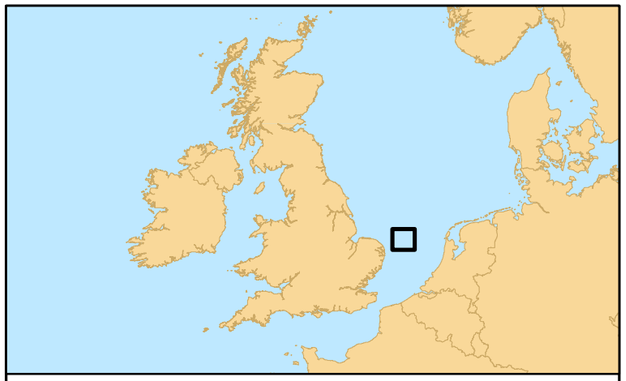

Legend:

- Norfolk Boreas site
- Project interconnector search area
- Vanguard Infrastructure
- Array cables
- Export cables

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Project:	Report:
Norfolk Boreas	Reconciliation Document

Title:

The project interconnector search area Worst case scenario for the EIA (electrical solution b)

Figure: 6 | Drawing No: PB5640-007-003-006

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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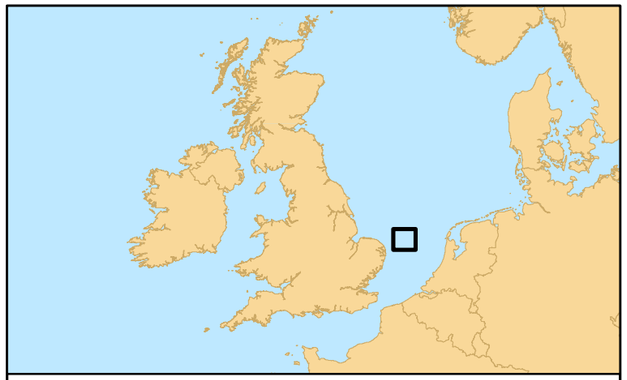

Legend:

- Norfolk Boreas site
- Electrical platforms
- Turbines
- Array cables
- Export cables

Interconnector cables

- HVAC interconnector
- HVDC pair interconnector

Project: Norfolk Boreas	Report: Reconciliation Document

Title:

The Norfolk Boreas site
Worst case Scenario for the EIA
(electrical solution a)

Figure: 7 | Drawing No: PB5640-007-003-007

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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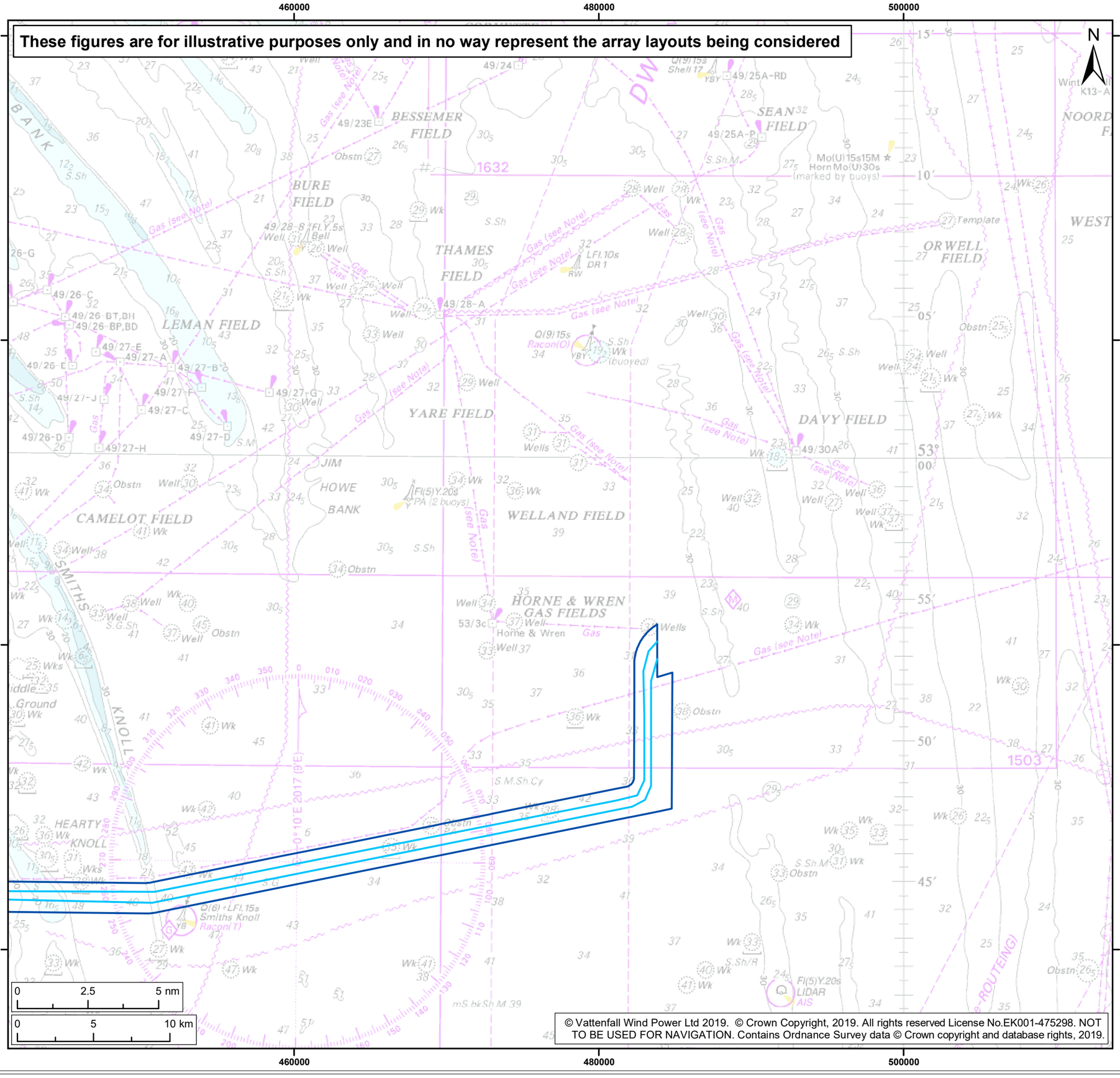

Legend:

- Offshore cable corridor
- Export cables

Project: Norfolk Boreas	Report: Reconciliation Document

Title:

The offshore cable corridor
Worst case scenario for the EIA
(electrical solution a)

Figure: 8 | Drawing No: PB5640-007-003-008

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: ETRS 1989 UTM Zone 31N **EPSG:** 25831

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