

East Anglia TWO Offshore Windfarm

Appendix 24.2

Archaeology and Cultural Heritage Cumulative Impact Assessment with the Proposed East Anglia ONE North Project

Environmental Statement Volume 3

Applicant: East Anglia TWO Limited
Document Reference: 6.3.24.2
SPR Reference: EA2-DWF-ENV-REP-IBR-000916_002 Rev 01
Pursuant to APFP Regulation: 5(2)(a)

Author: Royal HaskoningDHV
Date October 2019
Revision: Version 1

Revision Summary

Rev	Date	Prepared by	Checked by	Approved by
01	08/10/2019	Paolo Pizzolla	Julie Bolton	Helen Walker

Description of Revisions

Rev	Page	Section	Description
01	n/a	n/a	Final for Submission

Table of Contents

24.2 Archaeology and Cultural Heritage Cumulative Impact Assessment with the proposed East Anglia ONE North Project	1
24.2.1 Introduction	1
24.2.2 Construction Scenarios Realistic Worst Case	1
24.2.3 Cumulative Impact Assessment during Construction	12
24.2.4 Cumulative Impact Assessment during Operation	18
24.2.5 Summary	20

Appendix 24.2 is supported by the tables listed below.

Table Number	Title
Table A24.2.1	Scenario 1 Realistic Worst Case Assumptions
Table A24.2.2	Scenario 2 Realistic Worst Case Assumptions
Table A24.2.3	Summary of scenario 1 and scenario 2 realistic Worst Case Assumptions

Glossary of Acronyms

AIS	Air Insulated Switchgear
CCS	Construction Consolidation Sites
CIA	Cumulative Impact Assessment
DCO	Development Consent Order
ES	Environmental Statement
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HE	Historic England
LVIA	Landscape and Visual Impact Assessment
MW	Megawatt
NGET	National Grid Electricity Transmission
OLEMS	Outline Landscape and Ecological Management Strategy
oLMP	Outline Landscape Mitigation Plan
PEIR	Preliminary Environmental Information Report
ZTV	Zone of Theoretical Visibility

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
HDD temporary working area	Temporary compounds which will contain laydown, storage and work areas for HDD drilling works.
Jointing bay	Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers within the onshore cable route housing electrical earthing links.
Mitigation areas	Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.
National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North project Development Consent Order but will be National Grid owned assets.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North project Development Consent Order.

Offshore cable corridor	This is the area which will contain the offshore export cables between offshore electrical platforms and landfall.
Offshore development area	The East Anglia ONE North windfarm site and offshore cable corridor (up to Mean High Water Springs).
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore cable corridor	The corridor within which the onshore cable route will be located.
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.
Onshore substation	The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Transition bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

This page is intentionally blank

24.2 Archaeology and Cultural Heritage Cumulative Impact Assessment with the proposed East Anglia ONE North Project

24.2.1 Introduction

1. This appendix covers the Cumulative Impact Assessment (CIA) of the proposed East Anglia TWO project with the proposed East Anglia ONE North project in relation to archaeology and cultural heritage.
2. The East Anglia ONE North offshore windfarm project (the proposed East Anglia ONE North project) is also in the application phase. The proposed East Anglia ONE North project has a separate Development Consent Order (DCO) which has been submitted at the same time as the proposed East Anglia TWO project. The two projects share the same landfall location and onshore cable corridor and the two onshore substations are co-located, and connect into the same National Grid substation.
3. The proposed East Anglia TWO project CIA for archaeology and cultural heritage will therefore initially consider the cumulative impact with only the East Anglia ONE North project against two different construction scenarios (i.e. construction of the two projects simultaneously and sequentially). The realistic worst case scenario of each impact is then carried through to the main body of the CIA which considers other developments which have been screened into the CIA.
4. For a more detailed description of the CIA please refer to **Chapter 5 EIA Methodology**.

24.2.2 Construction Scenarios Realistic Worst Case

5. This appendix considers the proposed East Anglia TWO project and the proposed East Anglia ONE North project under two construction scenarios:
 - Scenario 1 - the proposed East Anglia TWO project and proposed East Anglia ONE North project are built simultaneously; and
 - Scenario 2 - the proposed East Anglia TWO project and the proposed East Anglia ONE North project are built sequentially.

6. As discussed in **section 24.2.1**, the realistic worst case (based on the assessment of these two construction scenarios) for each impact is then carried through to the wider CIA which considers other developments, projects or plans which have been screened into the CIA for the proposed East Anglia TWO project.
7. It should be noted that the operational phase impacts on archaeology and cultural heritage will be the same irrespective of the construction scenario. Therefore, operational impacts identified in scenario 1 will be the same as those for scenario 2.
8. Embedded and additional mitigation measures for the proposed East Anglia TWO project and proposed East Anglia ONE North project will be the same. These are detailed in **Chapter 24 Archaeology and Cultural Heritage**.

24.2.2.1 Scenario 1

9. **Table A24.2.1** presents the realistic worst case parameters of scenario 1. In this instance, the proposed East Anglia TWO project and proposed East Anglia ONE North project are built simultaneously. Areas provided for onshore infrastructure are maximum footprints with indicative dimensions provided in brackets.

Table A24.2.1 Scenario 1 Realistic Worst Case

Impact	Parameter	Notes
Construction		
Impacts related to the landfall	<p>HDD temporary working area: 13,300m² (70m x 190m).</p> <p>Transition bay temporary working area (for 4 transition bays): 3,108m² (37m x 42m).</p> <p>Landfall Construction Consolidation Site (CCS) (x1): 14,080m² (88m x 160m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the establishment and presence of the temporary, surfaced and fenced landfall CCS, HDD temporary works area, associated security and task lighting and the presence of the HDD drilling rig, ducting materials and welfare facilities.</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	
Impacts related to the onshore cable route	Onshore cable route: 581,824m ² (9,091m x 64m).	Refer to Chapter 24 Archaeology and Cultural Heritage section 24.3.3 for

Impact	Parameter	Notes
	<p>Jointing bay temporary working area: 570m² (30.6m x 18.6m). Total for 76 jointing bays: 43,320m² (570m² x 76).</p> <p>HDD (retained as an option to cross SPA / SSSI):</p> <p style="padding-left: 20px;">Entrance pit temporary working area (x1): 12,250m² (175m x 70m).</p> <p style="padding-left: 20px;">Exit pit temporary working area (x1): 5,250m² (175m x 30m).</p> <p>Onshore cable route large CCS (1): 33,000m² (165m x 200m).</p> <p>Onshore cable route medium CCS (2): 28,160m² total (88m x 160m per each medium CCS).</p> <p>Onshore cable route small CCS (2): 12,000m² total (120m x 50m per each small CCS).</p> <p>Total footprint of all onshore cable route CCS: 73,160m².</p> <p>Onshore cable route laydown area: 1,000m².</p> <p>Onshore cable route haul road between landfall and Snape Road (7,331m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 40,435m².</p> <p>Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m².</p> <p>Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m².</p> <p>The effect on the significance of heritage assets, as a result of change in their setting owing to the establishment, presence and activity associated with the temporary, surfaced and fenced CCS, and HDD temporary working areas, and their content of plant, materials and welfare facilities, and the temporary access roads.</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	<p>instances of onshore cable route adopting a narrower width</p>

Impact	Parameter	Notes
Impacts related to the onshore substations	<p>Onshore substation CCS (x2): 34,200m² (190m x 90m per each onshore substation).</p> <p>Permanent footprint (used as CCS during construction) (x2): 72,200m² (190m x 190m per each onshore substation).</p> <p>Substation operational access road: 13,600m² (1,700m x 8m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the establishment and presence of the emerging onshore substations with building heights of up to 15m, electrical infrastructure heights up to 18m (such as shunt reactors, transformers, harmonic filters etc).</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	
Impacts related to the National Grid Infrastructure	<p>National Grid CCS: 23,350m².</p> <p>National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m² (310m x 145m).</p> <p>Temporary pylon/mast temporary working area (x4): 10,000m² (2,500m² per each temporary pylon).</p> <p>Permanent pylon permanent footprint (x4): 1,600m² (400m² per each permanent pylon).</p> <p>Permanent pylon temporary working area (x4): 8,400m² (2,100m² per each permanent pylon).</p> <p>Overhead line realignment temporary working area: 5,000m².</p> <p>Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m² (total for three compounds)</p> <p>Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary working area: 30,000m² (for three compounds)</p> <p>Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m².</p> <p>Permanent access road to sealing end compound: 1,850m² (500m x 3.7m).</p>	<p>AIS technology is assessed as the worst case due to a larger footprint. Further detail regarding GIS technology is provided in Chapter 6 Project Description.</p>

Impact	Parameter	Notes
	<p>The effect on significance of heritage assets, as a result of change in their setting, owing to the establishment and presence of the emerging National Grid substation with Air Insulated Switchgear (AIS) building up to 6m in height, and external equipment to connect to the overhead line of 16m in height.</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	
Operation		
Impacts related to the landfall	No impacts anticipated from landfall infrastructure during the operational phase	
Impacts related to the onshore cable route	<p>76 jointing bays will be installed underground, each with an operational volume of 77m³.</p> <p>152 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m³.</p> <p>No above ground infrastructure.</p>	
Impacts related to the onshore substations	<p>Operational footprint (x2): 72,200m² (190m x 190m).</p> <p>Substation operational access road: 13,600m² (1,700m x 8m).</p> <p>The effect on the significance of heritage assets, as a result of changes in their setting, owing to the presence of the onshore substations with buildings up to 15m in height and electrical infrastructure up to 18m.</p>	The operational footprint does not include the additional landscaping footprint.
Impacts related to the National Grid Infrastructure	<p>National Grid operational substation (Air Insulated Switchgear (AIS) technology): 44,950m² (310m x 145m)</p> <p>Pylon operational footprint (x4): 1,600m² (20m x 20m per each permanent pylon)</p> <p>Cable sealing end compound operational footprint: 10,000m² (for three sealing end compounds)</p> <p>Permanent access road to sealing end compound: 1,850m² (500m x 3.7m)</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence of the National Grid substation with AIS building up to 6m in</p>	<p>Four permanent pylons include up to three reconstructed/relocated pylons and up to one additional new pylon.</p> <p>The operational footprint does not include the additional landscaping footprint.</p> <p>AIS technology is assessed as the worst case due to a larger footprint. Further detail regarding GIS technology is provided in Chapter 6 Project Description.</p>

Impact	Parameter	Notes
	height, and external equipment to connect to the overhead line of 16m in height.	
Decommissioning		
<p>No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left <i>in situ</i> or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.</p>		

24.2.2.2 Scenario 2

10. Scenario 2, and **Table A24.2.2**, represents the realistic worst case scenario in the eventuality that the proposed East Anglia TWO project and proposed East Anglia ONE North project are built sequentially. It is intended that the construction of the proposed East Anglia TWO project will be progressed prior to commencing construction of the proposed East Anglia ONE North project. Areas provided for onshore infrastructure are maximum footprints with indicative dimensions provided in brackets.
11. Under scenario 2, either the proposed East Anglia TWO project or the proposed East Anglia ONE North project could be constructed first. However, there will be no difference in impact regardless of which project is constructed first. The CIA presented in this ES is presented using the intended development strategy of the proposed East Anglia TWO project being constructed first. However, in the eventuality that the proposed East Anglia ONE North project is constructed first, the impacts presented would be the same.

Table A24.2.2 Scenario 2 Realistic Worst Case

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
Construction			
Impacts related to the landfall	<p>HDD temporary working area: 7,000m² (70m x 100m).</p> <p>Transition bay temporary working area (for 2 transition bays): 1,554m² (37m x 42m).</p> <p>Landfall Construction Consolidation Site (CCS) (x1): 7,040m² (88m x 80m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the establishment and presence of the temporary, surfaced and fenced landfall CCS, HDD temporary works area, associated security and task lighting and the presence of the HDD drilling rig, ducting materials and welfare facilities.</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	<p>HDD temporary working area: 7,000m² (70m x 100m).</p> <p>Transition bay temporary working area (for 2 transition bays): 1,554m² (37m x 42m).</p> <p>Landfall Construction Consolidation Site (CCS) (x1): 7,040m² (88m x 80m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence of the temporary, surfaced and fenced landfall CCS, HDD temporary works area, associated security and task lighting and the presence of the HDD drilling rig, ducting materials and welfare facilities</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	
Impacts related to the onshore cable route	<p>Onshore cable route: 290,912m² (9,091m x 32m).</p> <p>Jointing bay temporary working area: 570m² (30.6m x 18.6m). Total for 38 jointing bays: 21,660m² (570m² x 38).</p> <p>HDD (retained as an option to cross SPA / SSSI):</p> <p>Entrance pit temporary working area (x1): 6,300m² (90m x 70m).</p> <p>Exit pit temporary working area (x1): 2,700m² (90m x 30m).</p>	<p>Onshore cable route: 290,912m² (9,091m x 32m).</p> <p>Jointing bay temporary working area: 570m² (30.6m x 18.6m). Total for 38 jointing bays: 21,660m² (570m² x 38).</p> <p>HDD (retained as an option to cross SPA / SSSI):</p> <p>Entrance pit temporary working area (x1): 6,300m² (90m x 70m).</p> <p>Exit pit temporary working area (x1): 2,700m² (90m x 30m).</p>	Refer to Chapter 24 Archaeology and Cultural Heritage section 24.3.3 for instances of onshore cable route adopting a narrower width.

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
	<p>Onshore cable route large CCS (1): 16,500m² (165m x 100m).</p> <p>Onshore cable route medium CCS (2): 14,080m² total (88m x 80m per each medium CCS).</p> <p>Onshore cable route small CCS (2): 6,000m² total (60m x 50m per each small CCS).</p> <p>Total footprint of all onshore cable route CCS: 36,580m².</p> <p>Onshore cable route laydown area: 1,000m².</p> <p>Onshore cable route haul road between landfall and Snape Road (7,331m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 40,435m².</p> <p>Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m².</p> <p>Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m².</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the establishment, presence and activity associated with the temporary, surfaced and fenced CCS, and HDD temporary working areas, and their content of plant, materials and welfare facilities, and the temporary access roads.</p> <p>See Chapter 25 Noise and Vibration for further details</p>	<p>Onshore cable route large CCS (1): 16,500m² (165m x 100m).</p> <p>Onshore cable route medium CCS (2): 14,080m² total (88m x 80m per each medium CCS).</p> <p>Onshore cable route small CCS (2): 6,000m² total (60m x 50m per each small CCS).</p> <p>Total footprint of all onshore cable route CCS: 36,580m².</p> <p>Onshore cable route laydown area: 1,000m².</p> <p>Onshore cable route haul road between landfall and Snape Road (7,331m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 40,435m².</p> <p>Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m².</p> <p>Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m².</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence and activity associated with the temporary, surfaced and fenced CCS, and HDD temporary working areas, and their content of plant, materials and welfare facilities, and the temporary access roads.</p> <p>See Chapter 25 Noise and Vibration for further details</p>	

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
	regarding noise and vibration levels during construction.	regarding noise and vibration levels during construction.	
Impacts related to the onshore substation	<p>Onshore substation CCS: 17,100m² (190m x 90m).</p> <p>Permanent footprint (used as CCS during construction): 36,100m² (190m x 190m).</p> <p>Substation operational access road: 13,600m² (1,700m x 8m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the establishment and presence of the emerging onshore substation with building height up to 15m, electrical infrastructure height up to 18m (such as shunt reactors, transformers, harmonic filters etc).</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	<p>Onshore substation CCS: 17,100m² (190m x 90m).</p> <p>Permanent footprint (used as CCS during construction): 36,100m² (190m x 190m).</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence of the emerging onshore substation with building height up to 15m, electrical infrastructure height up to 18m (such as shunt reactors, transformers, harmonic filters etc).</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>	Substation operational access road will be constructed as part of the proposed East Anglia TWO project
Impacts related to the National Grid Infrastructure	<p>National Grid CCS: 23,350m²</p> <p>National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m² (310m x 145m)</p> <p>Temporary pylon/mast temporary working area (x4): 10,000m² (2,500m² per each temporary pylon)</p> <p>Permanent pylon permanent footprint (x4): 1,600m² (400m² per each permanent pylon)</p> <p>Permanent pylon temporary working area (x4): 8,400m² (2,100m² per each permanent pylon)</p>	National Grid infrastructure will be constructed as part of the proposed East Anglia TWO project	

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
	<p>Overhead line realignment temporary working area: 5,000m²</p> <p>Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m² (total for three compounds)</p> <p>Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary working area: 30,000m² (for three compounds)</p> <p>Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m²</p> <p>Permanent access road to sealing end compound: 1,850m² (500m x 3.7m)</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence of the emerging National Grid substation with Air Insulated Switchgear (AIS) building up to 6m in height, and external equipment to connect to the overhead line of 16m in height.</p> <p>.</p> <p>See Chapter 25 Noise and Vibration for further details regarding noise and vibration levels during construction.</p>		

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
Operation			
Impacts related to the landfall	No impacts anticipated from landfall infrastructure during the operational phase		
Impacts related to the onshore cable route	<p>38 jointing bays will be installed underground, each with an operational volume of 77m³</p> <p>76 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m³</p> <p>No above ground infrastructure</p>	<p>38 jointing bays will be installed underground, each with an operational volume of 77m³</p> <p>76 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m³</p> <p>No above ground infrastructure</p>	
Impacts related to the onshore substation	<p>Operational footprint: 36,100m² (190m x 190m)</p> <p>Substation operational access road: 13,600m² (1,700m x 8m)</p> <p>The effect on the significance of heritage assets, as a result of change in their setting, owing to the presence of the onshore substation with buildings up to 15m in height and electrical infrastructure up to 18m</p>	<p>Operational footprint: 36,100m² (190m x 190m)</p> <p>The effect on heritage setting owing to the presence of the onshore substation with buildings up to 15m in height and electrical infrastructure up to 18m</p>	<p>The operational footprint does not include the additional landscaping footprint.</p> <p>Substation operational access road will be constructed as part of the proposed East Anglia TWO project</p>
Impacts related to the National Grid Infrastructure	<p>National Grid operational substation (AIS technology): 44,950m² (310m x 145m)</p> <p>Pylon operational footprint (x4): 1,600m² (20m x 20m per each permanent pylon)</p> <p>Cable sealing end compound operational footprint: 10,000m² (for three sealing end compounds)</p> <p>Permanent access road to sealing end compound: 1,850m² (500m x 3.7m)</p> <p>The effect on the significance of heritage assets, as a</p>	<p>National Grid infrastructure will be constructed as part of the proposed East Anglia TWO project</p>	<p>Four permanent pylons include up to three reconstructed/relocated pylons and up to one additional new pylon.</p> <p>The operational footprint does not include the additional landscaping footprint.</p>

Impact	Proposed East Anglia TWO Project Parameters	Proposed East Anglia ONE North Project Parameters (on the assumption that the proposed East Anglia TWO project is post-construction)	Notes
	result of change in their setting, owing to the presence of the National Grid substation with Air Insulated Substation (AIS) building up to 6m in height, and external equipment to connect to the overhead line of 16m in height.		
Decommissioning			
<p>No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left <i>in situ</i> or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.</p>			

24.2.3 Cumulative Impact Assessment during Construction

24.2.3.1 Cumulative Impact 1: Direct Physical Impact on (Permanent Change to) Buried Archaeological Remains

12. Cumulative direct impacts on buried archaeological remains arising as a result of groundworks associated with either the proposed East Anglia TWO project and proposed East Anglia ONE North project overlapping or where a particular site or feature (asset) is present across the footprint of both the proposed East Anglia TWO project and proposed East Anglia ONE North projects (in which invasive groundworks are anticipated to take place).
13. Although the worst case parameters with respect to the total area disturbed as a result of groundworks differ between the scenarios, it is assumed that all works will be confined within the same physical footprint regardless of the scenario taken forward. As such, although some parameters outlined in scenario 2 seemingly exceed those under scenario 1 (e.g. maximum construction corridor width), groundworks undertaken as part of the proposed East Anglia ONE North project under scenario 2 will include some areas of ground already disturbed as part of the proposed East Anglia TWO project. On this basis, both scenarios are

considered to be equal with respect to direct (physical) impact on buried archaeological remains.

14. The combined construction works of both the proposed East Anglia TWO project and the proposed East Anglia ONE North project necessarily result in a greater area of disturbance than the proposed East Anglia TWO project alone assessment (considered in **section 24.6.1.1** of **Chapter 24 Archaeology and Cultural Heritage**). It thereby follows that the effects of the proposed East Anglia TWO project and proposed East Anglia ONE North projects combined have the potential to impact a greater number or extent of buried archaeological remains or features (assets) than would occur as a result of the proposed East Anglia TWO project alone. In addition, it is also acknowledged that the ability to mitigate impact by means of avoidance (i.e. preservation *in situ* through the application of micrositing) is further reduced due to the greater land take (area of disturbance) with the combined construction works of both projects.
 15. Nonetheless, the impact assessment as presented in this chapter assumes that activities associated with construction may theoretically occur anywhere within the onshore development area. On this basis, cumulative direct impacts of the proposed East Anglia TWO project on buried archaeological remains with the proposed East Anglia ONE North project will be broadly in line with those outlined in **section 24.6.1.1** of **Chapter 24 Archaeology and Cultural Heritage** for the proposed East Anglia TWO project alone (which considers potential impacts within the onshore development area as a whole). Based on current available data, only HA3 (**Figure 24.3**) has been identified intersecting the parameters of the East Anglia TWO onshore substation, East Anglia ONE North onshore substation and National Grid substation footprints, with AAA9 identified as intersecting the East Anglia ONE North onshore substation and National Grid substation footprints.
 16. Although the ability to avoid sub-surface archaeological remains is considered to be reduced (albeit still possible) with the construction works of both projects, with the application of this and other site specific / additional mitigation (as outlined in **section 24.3.3.1 and 24.6.1.1.2** of **Chapter 24 Archaeology and Cultural Heritage**), the residual impact magnitude and significance of effect will still be reduced or offset to levels considered non-significant in EIA terms (i.e. anticipated to be no worse than a **minor adverse** significance of effect).
- 24.2.3.2 Cumulative Impact 2: Direct Impact on (Permanent Change to) Above Ground Archaeological Remains and Heritage Assets e.g. historic earthworks (including Historic Landscape Character); and built heritage (buildings, structures etc.)
17. Cumulative direct impacts on above ground archaeological remains and heritage assets may occur where groundworks associated with either the proposed East

- Anglia TWO project or proposed East Anglia ONE North project overlap or where a particular site or feature is present across the footprint of both the proposed East Anglia TWO or proposed East Anglia ONE North projects (in which invasive groundworks are anticipated to take place).
18. As discussed with respect to Cumulative Impact 1 (**section 24.2.3.1**), it is assumed that all works will be confined within the same physical footprint regardless of the scenario taken forward. On this basis, both scenarios are considered to be equal with respect to direct (physical) impact on above ground archaeological remains and heritage assets.
 19. The combined construction works of both the proposed East Anglia TWO project and the proposed East Anglia ONE North project result in a greater area of disturbance than the proposed East Anglia TWO project alone (considered in **Chapter 24 Archaeology and Cultural Heritage section 24.6.1.2**). It thereby follows that the effects of the proposed East Anglia TWO and proposed East Anglia ONE North projects combined have the potential to impact a greater number or a larger extent of above ground archaeological remains or heritage assets than would occur as a result of the proposed East Anglia TWO project alone.
 20. However, as outlined above in relation to Cumulative Impact 1 (**section 24.2.3.1**), the impact assessment as presented in this chapter assumes that activities associated with construction may theoretically occur anywhere within the onshore development area. On this basis, cumulative direct impacts on above ground archaeological remains and heritage assets with the proposed East Anglia ONE North project will be broadly in line with those outlined in **section 24.6.1.2** of **Chapter 24 Archaeology and Cultural Heritage** for the proposed East Anglia TWO project alone (which considers potential impacts within the onshore development area as a whole). Based on current available data, no features considered to represent above ground archaeological remains and heritage assets have been identified within the parameters of the East Anglia TWO onshore substation, East Anglia ONE North onshore substation and National Grid substation footprints.
 21. With the application of embedded and site specific / additional mitigation (as outlined in **sections 24.3.3** and **24.6.1.2.2** of **Chapter 24 Archaeology and Cultural Heritage**) the residual impact magnitude and significance of effect will be reduced or offset to levels considered non-significant in EIA terms (i.e. anticipated be no worse than a **minor adverse** significance of effect).

24.2.3.3 Cumulative Impact 3: Indirect (non-physical) Impact resulting from change in the Setting of Heritage Assets (both Designated and Non-Designated)

22. Cumulative indirect impacts resulting from change in the setting of heritage assets arising as a result of the proposed East Anglia TWO project with the proposed East Anglia ONE North project during construction may occur where the construction activities associated with the proposed East Anglia TWO and proposed East Anglia ONE North projects combine to give rise to a change in conditions (e.g. sight, sound, any dust created, and even smell) which may indirectly impact heritage assets and their settings. This impact may occur cumulatively in a concurrent manner under scenario 1 (i.e. impacts resulting from a change in the setting of heritage assets as a result of the concurrent construction of both the proposed East Anglia TWO and proposed East Anglia ONE North projects combined) or sequentially under scenario 2 (i.e. increased longevity of impacts associated with change in setting as a result of the sequential construction of the proposed projects).
23. As part of the heritage settings study (**Appendix 24.7**) it has been concluded that only changes in setting due to the operation of the proposed East Anglia TWO and proposed East Anglia ONE North projects would be of sufficient duration to merit detailed assessment, so construction and decommissioning impacts were not subject to detailed assessed. The heritage settings assessment (**Appendix 24.3, section 3.8** and **Appendix 24.7**) was informed by site visits to understand how the proposed developments would potentially change the setting of each asset and whether these changes would impact on the significance of the asset. Any changes in setting due to construction activities were considered to be temporary and of sufficiently short duration that they would not give rise to material harm. Given that scenario 1 accounts for the concurrent construction of the proposed East Anglia TWO and proposed East Anglia ONE North projects, the impacts resulting from the concurrent construction of the proposed East Anglia TWO and proposed East Anglia ONE North projects are also likely to be temporary and of sufficiently short duration that they would not give rise to material harm. As such, cumulative indirect impacts upon the setting of heritage assets under scenario 1 will be as that outlined in **section 24.6.1.3** of **Chapter 24 Archaeology and Cultural Heritage (no impact / no change)**.
24. Scenario 2 requires two separate periods of construction for the proposed East Anglia TWO project and the proposed East Anglia ONE North project and as a result is considered to be the worst case scenario on the basis that impacts upon the historic landscape and temporary change to the setting of heritage assets as a result of the proposed East Anglia TWO project and the proposed East Anglia ONE North project combined will be of greater duration. It is therefore acknowledged that cumulative impacts resulting from a change in the setting of

heritage assets under scenario 2 would be potentially greater than that assessed in relation to the proposed East Anglia TWO project alone or under scenario 1. However, despite the duration of works, it is still considered that construction activities would result in no longer-term change to the setting of heritage assets in a manner which affects their heritage significance, thereby equating to no impact/no change in line with criteria outlined in **section 24.4.3** of **Chapter 24 Archaeology and Cultural Heritage**. Construction works, although of lengthened duration, would still be temporary and of sufficiently short duration that they would not give rise to material harm. As such, cumulative indirect impacts upon the setting of heritage assets under scenario 2 will also be as that outlined in **section 24.6.1.3** of **Chapter 24 Archaeology and Cultural Heritage (no impact / no change)**.

24.2.3.4 Cumulative Impact 4: Impact on Potential Geoarchaeological / Palaeoenvironmental Remains, Potentially Indicative of Former Land Surfaces

25. Cumulative impacts on geoarchaeological / palaeoenvironmental remains arising as a result of the proposed East Anglia TWO project with the proposed East Anglia ONE North project during construction may occur where groundworks associated with either the proposed East Anglia TWO project or the proposed East Anglia ONE North project overlap or where a particular feature or deposit of geoarchaeological interest is present across the footprint of both the proposed East Anglia TWO and proposed East Anglia ONE North projects (in which invasive groundworks are anticipated to take place).
26. As discussed with respect to Cumulative Impact 1 (**section 24.2.3.1**), it is assumed that all works will be confined within the same physical footprint regardless of the scenario taken forward. On this basis, both scenarios are considered to be equal with respect to direct (physical) impact on potential geoarchaeological / palaeoenvironmental remains.
27. The combined construction works of both the proposed East Anglia TWO project and the proposed East Anglia ONE North project necessarily result in a greater area of disturbance than the proposed East Anglia TWO project alone assessment (considered in **Chapter 24 Archaeology and Cultural Heritage section 24.6.1.4**). It thereby follows that the effects of the proposed East Anglia TWO project and the proposed East Anglia ONE North projects combined have the potential to impact a greater extent of geoarchaeological / palaeoenvironmental remains than would occur as a result of the proposed East Anglia TWO project alone.
28. As outlined above, the impact assessment as presented in this chapter assumes that activities associated with construction may theoretically occur anywhere within the onshore development area. On this basis, with regards to the landfall

location and the onshore cable corridor, cumulative direct impacts on potential geoarchaeological / palaeoenvironmental remains with the proposed East Anglia ONE North project will be broadly in line with those outlined in **section 24.6.1.4** of **Chapter 24 Archaeology and Cultural Heritage** for the proposed East Anglia TWO project alone (which considers potential impacts within the onshore development area as a whole).

29. With the application of site specific / additional mitigation (as outlined in **section 24.3.3** and **24.6.1.4.2** of **Chapter 24 Archaeology and Cultural Heritage**) it is considered that any residual impacts and associated significance of any effects will be reduced or offset to levels considered non-significant in EIA terms (i.e. anticipated to be no worse than a **minor adverse** significance of effect).

24.2.3.5 Cumulative Impact 5: Impact to Site Preservation Conditions from Drilling Fluid Breakout or Oil Spills

30. Impact to site preservation conditions arising as a result of potential drilling fluid breakout or oil spills may occur irrespective of construction phasing. On this basis, both scenarios are considered to be equal with respect to this potential impact.
31. As outlined in **section 24.6.1.5** of **Chapter 24 Archaeology and Cultural Heritage**, the embedded application of best practice measures as part of the proposed East Anglia TWO project and anticipated as part of the proposed East Anglia ONE North project will ensure that oil spills associated with transformer filling operations or any drilling fluid breakout during HDD are handled quickly and efficiently, thereby not giving rise to any major leakage (see **section 24.6.1.5** of **Chapter 24 Archaeology and Cultural Heritage** for further detail). The details are to be further provided in the final Code of Construction Practice (CoCP), secured under the requirements of the draft DCO. This will be subject to further consideration and implementation in the post-consent stages, alongside the appointed Principal Contractor(s).
32. The potential for oil spills / drilling fluid to breakout and spread into / 'coat' archaeological deposits, features and materials, thereby causing an adverse impact upon site preservation as a result of the proposed East Anglia TWO and proposed East Anglia ONE North projects combined, has as such been assessed as being of negligible magnitude of impact, resulting in a **negligible adverse** significance of effect as a worst case scenario.

24.2.4 Cumulative Impact Assessment during Operation

33. Operational impacts on archaeology and cultural heritage will be the same irrespective of construction scenario.

24.2.4.1 Cumulative Impact 1: Indirect (non-physical) Impact resulting from a change in the Setting of Heritage Assets (both Designated and Non-Designated)

34. Cumulative indirect impacts upon the setting of heritage assets arising as a result of the proposed East Anglia TWO project with the proposed East Anglia ONE North project may occur during the operational phase due to the combined visibility and presence of above ground project infrastructure.
35. The heritage settings assessment (see **Appendices 24.3 and 24.7**) has been informed by site visits and integration with available Landscape and Visual Impact Assessment (LVIA) tool kits. The assessments include consideration of those heritage assets that may be subject to significant impacts and effects, in EIA terms, as a result of potential changes in their setting due to three different assessments; the proposed East Anglia TWO project alone, the proposed East Anglia ONE North project alone and the proposed East Anglia TWO project and the proposed East Anglia ONE North projects combined. It is the assessment of the latter that informs the cumulative assessment set out below.
36. A total of eight heritage assets (all Listed Buildings) were identified in areas where the operation of onshore infrastructure could lead to material change in the setting of heritage assets. These assets were subject to assessment on the basis that this change in setting could lead to material harm to their significance.
37. The settings study concluded that for the majority (seven out of the eight) of assets assessed, the conclusions reached in **section 24.6.2.1 of Chapter 24 Archaeology and Cultural Heritage** (and further detailed in **Appendix 24.7**) applied equally to all three assessments. As such, in all but one case, cumulative impacts resulting from a change in the setting of heritage assets are the same as those outlined in **section 24.6.2.1 of Chapter 24 Archaeology and Cultural Heritage**.
38. The exception is for the Grade II Listed Woodside Farm (1215744, **Figure 24.2**) where the proximity of the East Anglia ONE North onshore substation relative to the East Anglia TWO onshore substation makes for a material increase in impact. It has been concluded that the presence of the two onshore substations only 300m to the northeast would represent a significant change in the character of the landscape in views looking northeast in the immediate setting of Woodside Farm. The partial loss of rural agricultural landscape character is considered to diminish the contribution that setting makes to the significance of this asset (Woodside Farm) but the magnitude of the impact on the overall heritage

significance is limited. The loss of character would be greater in assessments that include the East Anglia ONE North onshore substation.

39. It is concluded in **Appendix 24.7** that whilst the significance of this heritage asset (Woodside Farm) would largely be retained, the predicted loss would amount to an adverse impact of medium magnitude (less than substantial harm) as a result of the operation of both the proposed East Anglia TWO and ONE North projects combined. Given that this Grade II Listed Building is an asset of medium importance, in the absence of mitigation, the cumulative impact on Woodside Farm is considered to result in an effect of **moderate** significance, therefore significant in EIA terms.
40. The Outline Landscape Mitigation Plan (OLMP), detailed as a section within the Outline Landscape and Ecological Management Strategy (OLEMS), secured under the requirements of the draft DCO and submitted with this DCO application, proposes to reinstate and reinforce field boundaries with hedges in the immediate vicinity of Woodside Farm, reinstating its more enclosed agricultural setting. New woodland will be planted to the north, surrounding the substations on their south and west sides and creating a screen between the farm and the substations. The screening would not in itself be an adverse impact (see **Appendix 24.7** for further detailed discussion).
41. It is considered that this degree of screening would considerably reduce impact on the significance of Woodside Farm, although it is noted that it would take approximately 5-10 years for the screening to become fully effective and therefore the period of significant impact would remain for this temporary duration, with the residual cumulative impact being reduced to low magnitude and **minor** significance, therefore not significant in EIA terms.
42. For all other assets the same outcomes would apply cumulatively as for the conclusions reached in **section 24.6.2.1** of **Chapter 24 Archaeology and Cultural Heritage** (and further detailed in **Appendix 24.7**) for the East Anglia TWO project alone. That is the predicted residual impacts on the heritage significance of heritage assets as a result of changes to their setting due to the proposed East Anglia TWO and East Anglia ONE North projects combined will range from **no impact** to a **moderate adverse** significance of effect (the latter in the case of Little Moor Farm and the Church of St. Mary, Friston).
43. Cumulative impacts resulting from change in the setting of heritage assets as a result of offshore infrastructure have been considered as part of a screening exercise (**Appendix 24.8**), which concluded that no significant adverse effects on onshore heritage assets were anticipated to occur from the presence of the

proposed offshore infrastructure for the East Anglia ONE North and the East Anglia TWO wind farm sites.

24.2.4.2 Cumulative Impact 2: Impacts to Archaeological Site Preservation Conditions, where Present, from Heat Loss from Installed Onshore Cables

44. As outlined in **section 24.6.2.2** of **Chapter 24 Archaeology and Cultural Heritage**, the maximum heat loss from installed onshore cables and subsequent dissipation of heat through the soil will not be determined until the soil structure (thermal properties) and final detailed design are known and confirmed. However, it is expected that any heat dissipation will be localised and confined to the areas immediately surrounding the cables and ducts. Given that the areas within the immediate locality of the cables will have been considered as vulnerable to the impacts of onshore cable installation works, any sub-surface archaeological / geoarchaeological remains (where present) therein will have already been subject to the initial informative stages of mitigation work. On this basis, there will be **no impact / no change** anticipated during operation associated with the heat loss from cables as a result of the proposed East Anglia TWO and East Anglia ONE North projects combined.

24.2.5 Summary

45. **Table A24.2.3** gives an overarching summary of which of the two construction scenarios, detailed above, will be the realistic worst case in terms of impacts relating to archaeology and cultural heritage.

Table A24.2.3 Summary of Scenario 1 and Scenario 2 Realistic Worst Case Assumptions

Impact	Worst Case	Notes
Direct physical impact related to permanent change to buried archaeological remains.	N/A	Both scenarios are considered to be equal with respect to direct (physical) impact on buried archaeological remain. This impact will be broadly the same as for the proposed East Anglia TWO project alone.
Direct (physical) impacts on above ground archaeological remains and heritage assets.	N/A	Both scenarios are considered to be equal with respect to direct (physical) impact on above ground archaeological remains and heritage assets. This impact will be broadly the same as for the proposed East Anglia TWO project alone.
Indirect (non-physical) Impact resulting from change in the Setting of Heritage Assets (designated and non-designated).	Scenario 2	Potentially greater impact due to increased duration of construction under scenario 2.

Impact	Worst Case	Notes
Impact on potential geoarchaeological / palaeoenvironmental remains, potentially indicative of former land surfaces.	N/A	Both scenarios are considered to be equal with respect to direct (physical) impact on potential geoarchaeological / palaeoenvironmental remains. This impact will be broadly the same as for the proposed East Anglia TWO project alone.
Impacts to site preservation conditions from drilling fluid breakout or oil spills.	N/A	Both scenarios are considered to be equal with respect to impacts to site preservation conditions.
Indirect (non-physical) Impact resulting from change in the Setting of Heritage Assets (both Designated and Non-Designated)	N/A	Operation impacts are the same regardless of scenario.
Impacts to archaeological site preservation conditions, where present, from heat loss from installed onshore cables.	N/A	Operation impacts are the same regardless of scenario.

46. Overall, construction scenario 2 creates a realistic worst case in terms of impacts to archaeology and cultural heritage. Therefore, scenario 2 will be carried through into the wider CIA with other developments, see **section 24.7** in **Chapter 24 Archaeology and Cultural Heritage**.

This page is intentionally blank