East Anglia ONE North Offshore Windfarm

Appendix 18.2

Ground Conditions and Contamination Cumulative Impact Assessment with the Proposed East Anglia TWO Project

Environmental Statement
Volume 3

Applicant: East Anglia ONE North Limited
Document Reference: 6.3.18.2
SPR Reference: EA1N-DWF-ENV-REP-IBR-000355_002 Rev 01
Pursuant to AFP 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	Ian Mackay	Helen Walker

Description of Revisions			
Rev	**Page**	**Section**	**Description**
01	n/a	n/a	Final for Submission

Table of Contents

Appendix 18.2 is supported by the tables listed below.

Table Number	Title
Table A18.1	Scenario 1 Realistic Worst Case Assumptions
Table A18.2	Scenario 2 Realistic Worst Case Assumptions
Table A18.3	Summary of Scenario 1 and Scenario 2 Realistic Worst Case Assumptions

Glossary of Acronyms

AIS	Automated Identification System
CCS	Construction Consolidation Sites
CIA	Cumulative Impact Assessment
DCO	Development Consent Order
ES	Environmental Statement
HDD	Horizontal Directional Drilling
MMP	Materials Management Plan
SPA	Special Protection Areas
SPR	ScottishPower Renewables
SSSI	Sites of Special Scientific Interest

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds which will contain laydown, storage and work areas for onshore construction works. The HDD construction compound will also be referred to as a construction consolidation site.
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.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
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 regular 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 overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
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.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
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 preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre–planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.

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.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia ONE North project.
Transition Bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

18.2 Cumulative Impact Assessment with the proposed East Anglia TWO Project

18.1 Introduction

1. This appendix covers the Cumulative Impact Assessment (CIA) of the proposed East Anglia ONE North project with the proposed East Anglia TWO project in relation to ground conditions and contamination.

2. The East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application phase. The proposed East Anglia TWO project has a separate Development Consent Order (DCO) which has been submitted at the same time as the proposed East Anglia ONE North 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 ground conditions and contamination proposed East Anglia ONE North project CIA will therefore initially consider the cumulative impact with only the East Anglia TWO 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***.

18.2 Construction Scenarios Realistic Worst Case Parameters

5. This appendix considers the proposed East Anglia ONE North project and the proposed East Anglia TWO project under two construction scenarios:

   - Scenario 1 - the proposed East Anglia ONE North project and proposed East Anglia TWO project are built simultaneously; and
   - Scenario 2 - the proposed East Anglia ONE North project and the proposed East Anglia TWO project are constructed sequentially.

6. As discussed in ***section 18.1***, 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 ONE North project.

7. It should be noted that the operational phase impacts on ground conditions and contamination 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 ONE North project and proposed East Anglia TWO project will be the same. These are detailed in ***Chapter 18 Ground Conditions and Contamination.***

18.2.1 Scenario 1

9. ***Table A18.1*** presents the realistic worst case parameters of scenario 1. In this instance, the proposed East Anglia ONE North project and proposed East Anglia TWO project are built simultaneously. Areas provided for onshore infrastructure are maximum footprints with indicative dimensions provided in brackets.

Table A18.1 Scenario 1 Realistic Worst Case

Impact	Parameter	Notes
Construction		
Impacts related to the landfall	Horizontal Directional Drilling (HDD) temporary working area: 13,300m^2 (70m x 190m) Transition bay temporary working area (for 4 transition bays): 3,108m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS) (x1): 14,080m^2 (88m x 160m)	
Impacts related to the onshore cable route	Onshore cable route: 581,824m^2 (9,091m x 64m) Jointing bay temporary working area: 570m^2 (30.6m x 18.6m). Total for 76 jointing bays: 43,320m^2 (570m^2 x 76) HDD (retained as an option to cross SPA / SSSI): Entrance pit temporary working area (x1): 12,250m^2 (175m x 70m) Exit pit temporary working area (x1): 5,250m^2 (175m x 30m) Onshore cable route large CCS (1): 33,000m^2 (165m x 200m). Onshore cable route medium CCS (2): 28,160m^2 total (88m x 160m per each medium CCS)	

Impact	Parameter	Notes
	Onshore cable route small CCS (2): 12,000m^2 total (120m x 50m per each small CCS) Total footprint of all onshore cable route CCS: 73,160m^2 Onshore cable route laydown area: 1,000m^2 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): 40,435m^2 Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m^2 Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m^2	
Impacts related to the onshore substations	Onshore substation CCS (x2): 34,200m^2 (190m x 90m per each onshore substation) Permanent footprint (used as CCS during construction) (x2): 72,200m^2 (190m x 190m per each onshore substation) Substation operational access road: 13,600m^2 (1,700m x 8m)	
Impacts related to the National Grid Infrastructure	National Grid CCS: 23,350m^2 National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m^2 (310m x 145m) Temporary pylon/mast temporary working area (x4): 10,000m^2 (2,500m^2 per each temporary pylon) Permanent pylon permanent footprint (x4): 1,600m^2 (400m^2 per each permanent pylon) Permanent pylon temporary working area (x4): 8,400m^2 (2,100m^2 per each permanent pylon) Overhead line realignment temporary working area: 5,000m^2 Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m^2 (total for three compounds) Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary	Automatic Information System (AIS) technology is assessed as the worst case due to a larger footprint. Futher detail regarding GIS technology is provided in ***Chapter 6 Project Description***.

Impact	Parameter	Notes
	working area: 30,000m^2 (for three compounds) Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m^2 Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	
Operation		
Operational phase ground conditions and contamination impacts have been scoped out as detailed in the Scoping Report (SPR 2017).		
Decommissioning		
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 *in situ* 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.		

18.2.2 Scenario 2

10. Scenario 2, and ***Table A18.2*** represents the realistic worst case scenario in the eventuality that the proposed East Anglia ONE North project and proposed East Anglia TWO project are constructed sequentially. Areas provided for onshore infrastructure are maximum footprints with indicative dimensions provided in brackets.

11. Under scenario 2, either the proposed East Anglia ONE North project or the proposed East Anglia TWO 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 ONE North project being constructed first. However, in the eventuality that the proposed East Anglia TWO project is constructed first, the impacts presented would be the same.

12. Further detail regarding the sequential construction is provided in ***Chapter 5 EIA Methodology***.

Table A18.2 Scenario 2 Realistic Worst Case Assumptions

Impact	Proposed East Anglia ONE North Project Parameters	Proposed East Anglia TWO Project Parameters (on the assumption that the proposed East Anglia ONE North project is post-construction)	Notes
Construction			
Impacts related to the landfall	HDD temporary working area: 7,000m^2 (70m x 100m) Transition bay temporary working area (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS) (x1): 7,040m^2 (88m x 80m)	HDD temporary working area: 7,000m^2 (70m x 100m) Transition bay temporary working area (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS) (x1): 7,040m^2 (88m x 80m)	
Impacts related to the onshore cable route	Onshore cable route: 290,912m^2 (9,091m x 32m) Jointing bay temporary working area: 570m^2 (30.6m x 18.6m). Total for 38 jointing bays: 21,660m^2 (570m^2 x 38) HDD (retained as an option to cross SPA / SSSI): Entrance pit temporary working area (x1): 6,300m^2 (90m x 70m) Exit pit temporary working area (x1): 2,700m^2 (90m x 30m) Onshore cable route large CCS (1): 16,500m^2 (165m x 100m). Onshore cable route medium CCS (2): 14,080m^2 total (88m x 80m per each medium CCS) Onshore cable route small CCS (2): 6,000m^2 total (60m x 50m per each small CCS) Total footprint of all onshore cable route CCS: 36,580m^2 Onshore cable route laydown area: 1,000m^2 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	Onshore cable route: 290,912m^2 (9,091m x 32m) Jointing bay temporary working area: 570m^2 (30.6m x 18.6m). Total for 38 jointing bays: 21,660m^2 (570m^2 x 38) HDD (retained as an option to cross SPA / SSSI): Entrance pit temporary working area (x1): 6,300m^2 (90m x 70m) Exit pit temporary working area (x1): 2,700m^2 (90m x 30m) Onshore cable route large CCS (1): 16,500m^2 (165m x 100m). Onshore cable route medium CCS (2): 14,080m^2 total (88m x 80m per each medium CCS) Onshore cable route small CCS (2): 6,000m^2 total (60m x 50m per each small CCS) Total footprint of all onshore cable route CCS: 36,580m^2 Onshore cable route laydown area: 1,000m^2 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	

Impact	Proposed East Anglia ONE North Project Parameters	Proposed East Anglia TWO Project Parameters (on the assumption that the proposed East Anglia ONE North project is post-construction)	Notes
	approximately 90m intervals): 40,435m^2 Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m^2 Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m^2	approximately 90m intervals): 40,435m^2 Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m^2 Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m^2	
Impacts related to the onshore substation	Onshore substation CCS: 17,100m^2 (190m x 90m) Permanent footprint (used as CCS during construction): 36,100m^2 (190m x 190m) Substation operational access road: 13,600m^2 (1,700m x 8m)	Onshore substation CCS: 17,100m^2 (190m x 90m) Permanent footprint (used as CCS during construction): 36,100m^2 (190m x 190m)	Substation operational access road will be constructed as part of the proposed East Anglia ONE North project
Impacts related to the National Grid Infrastructure	National Grid CCS: 23,350m^2 National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m^2 (310m x 145m) Temporary pylon/mast temporary working area (x4): 10,000m^2 (2,500m^2 per each temporary pylon) Permanent pylon permanent footprint (x4): 1,600m^2 (400m^2 per each permanent pylon) Permanent pylon temporary working area (x4): 8,400m^2 (2,100m^2 per each permanent pylon) Overhead line realignment temporary working area: 5,000m^2 Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m^2 (for three compounds)	National Grid infrastructure will be constructed as part of the proposed East Anglia ONE North project	AIS technology is assessed as the worst case due to a larger footprint. Futher detail regarding GIS technology is provided in ***Chapter 6 Project Description***.

Impact	Proposed East Anglia ONE North Project Parameters	Proposed East Anglia TWO Project Parameters (on the assumption that the proposed East Anglia ONE North project is post-construction)	Notes
	Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary working area: 30,000m^2 (for three compounds) Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m^2 Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)		
Operation			
Operational phase ground conditions and contamination impacts have been scoped out as detailed in the Scoping Report (SPR 2017).			
Decommissioning			
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 *in situ* 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.			

18.3 Cumulative Impact Assessment during Construction

18.3.1 Cumulative Impact 1: Impact to Human Health and Land Quality Including Construction Workers and the Public During Any Construction

13. Under scenario 1 or scenario 2 the assessment of impacts does not change. The cumulative effects to human health and land quality are likely to be impacted in the same manner. Under each scenario the proposed works would have the same parameters for construction activity. The works would see an increase in time of the construction period under construction scenario 2 (an estimated three years to six years construction phase). However, given the embedded mitigation measures and considering that any alteration to land quality would be highly

localised it is considered that no cumulative impact effects are likely to occur. The cumulative impact to human health and land quality is therefore considered to remain the same and is of **minor adverse** significance for scenario 1 and **minor adverse** significance for scenario 2.

18.3.2 Cumulative Impact 2: Impact on Groundwater Quality of the Secondary and Principle Aquifers from General Construction Activity

14. Under scenario 2 as there would be separate construction periods (with separate mobilisation, demobilisation, installation of compounds and haul road) there would be a greater likelihood for accidental discharges therefore, scenario 2 is considered the worst case scenario. Given the embedded mitigation measures and considering that any alteration to land quality would be highly localised it is considered that no cumulative impact effects are likely to occur. The cumulative impact to aquifers are therefore considered to remain the same and is of **minor adverse** significance for scenario 1 and **minor adverse** significance for scenario 2.

18.3.3 Cumulative Impact 3: Impact on Groundwater Quality of the Secondary and Principle Aquifers from Trenchless Crossing and Piling Activities

15. Under scenario 1 and scenario 2 the impacts from piling and HDD techniques will remain the same. Given the embedded mitigation measures and considering that the alteration in HDD requirements and piling will likely be limited under the two scenarios the two construction scenarios are considered similar. Therefore, the impact to Secondary and Principle Aquifers will remain the same and is considered to be **minor adverse** significance for scenario 1 and **minor adverse** significance for scenario 2.

18.3.4 Cumulative Impact 4: Impact on Surface Water Quality from Direct and Indirect Release of Contamination to Surface Water Bodies

16. Under scenario 1 and scenario 2 the impacts from accidental release of contaminants during construction via the disturbance of existing potential contaminant sources will remain the same under both scenarios. The avoidance of potential contaminant sources and the proposed embedded mitigation methods would minimise the overall impacts of either scenario.

17. Under scenario 1 and scenario 2 the impacts from piling and HDD will remain the same. Given the embedded mitigation measures, and considering that the alteration in HDD requirements and piling will likely be limited under the two scenarios, the two development scenarios are considered similar. Therefore, the direct and indirect impact to surface water quality from the release of contamination to surface water bodies will remain the same and is considered to have **minor adverse** significance.

18.3.5 Cumulative Impact 5: Impact to Strategic Mineral Resources

18. Under scenario 2 there is an increased impact to strategic mineral resources. Under the worst case scenario (***Table A18.2***) additional area will be utilised and there would be an increase in the potential loss of strategic resource through mineral sterilisation of different areas. With the application of current embedded mitigation, including the requirement for a Materials Management Plan (MMP), as secured under the requirements of the draft DCO, and an assessment of local mineral resource the impact of effect would be reduced. Mitigation within the MMP would be identified once detailed design is completed and the exact nature of the cumulative impacts is known, therefore reducing the impact to **minor adverse** significance (assuming no avoidance).

18.4 Cumulative Impact Assessment during Operation

19. Operational impacts were scoped out of the assessment, as agreed with stakeholders and stated in the Scoping Report (SPR 2017).

18.5 Summary

20. ***Table A18.3*** 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 ground conditions and contamination.

Table A18.3 Summary of Scenario 1 and Scenario 2 Realistic Worst Case Assumptions

Impact	Worst Case	Notes
Impact 1: Impacts to human health, including construction workers and public during construction	N/A	Under scenario 1 or scenario 2 the assessment of impacts does not change. The cumulative effects to human health and land quality are likely to be impacted in the same manner, and is minor adverse
Impact 2: Impacts on groundwater quality of the Secondary and Principle Aquifers from general construction activity	N/A	Cumulative impact remains the same under both scenarios; minor adverse.
Impact 3: Impact on groundwater quality of the Secondary and Principle Aquifers from Trenchless Crossing and Piling Activities	N/A	Cumulative impact remains the same under both scenarios; minor adverse.
Impact 4: Impact on surface water quality from direct and indirect release of contamination to surface water bodies	N/A	Cumulative impact remains the same under both scenarios; minor adverse
Impact 5: Impact to strategic mineral resources	Scenario 2	Under scenario 2 additional area will be utilised and there would be an increase in the potential loss of strategic resource through mineral sterilisation of different areas.

21. Overall, construction scenario 2 creates a realistic worst case in terms of impacts to ground conditions and contamination. Therefore, scenario 2 will be carried through into the wider CIA with other developments, see ***section 18.7*** in ***Chapter 18 Ground Conditions and Contamination.***