East Anglia TWO Offshore Windfarm

Appendix 20.2

Water Resources and Flood Risk Cumulative Impact Assessment with the Proposed East Anglia ONE North Project

Environmental Statement
Volume 3

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Glossary of Acronyms

AIS	Air Insulated Switchgear
CCS	Construction Consolidation Sites
CIA	Cumulative Impact Assessment
DCO	Development Consent Order
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
MW	Megawatts

Glossary of Terminology

Applicant	East Anglia TWO 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 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 TWO project	The proposed project consisting of up to 75 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 TWO 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.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
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 TWO 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 TWO project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia TWO 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 TWO 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 TWO 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 TWO project.
Transition Bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

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20.2 Water Resources and Flood Risk Cumulative Impact Assessment with the Proposed East Anglia ONE North Project

20.1 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 water resources and flood risk.

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 water resources and flood risk will therefore initially consider the cumulative impact with only the proposed 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***.

20.2 Construction Scenarios Realistic Worst Case Parameters

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 constructed sequentially.

6. As discussed in ***section 20.1***, 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 water resources and flood risk 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 20 Water Resources and Flood Risk***

20.2.1 Scenario 1

9. ***Table A20.2.1*** 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 A20.2.1 Scenario 1 Realistic Worst Case

Impact	Parameter	Notes
Construction		
Impacts related to the landfall	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).	

Impact	Parameter	Notes
	Onshore cable route medium CCS (2): 28,160m^2 total (88m x 160m per each medium CCS) 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)	To provide a worst case, this impact assessment assumes that 100% of the onshore substations footprint will be impermeable. However, in reality, the onshore substations design will include impermeable surfaces where appropriate.
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)	To provide a worst case, this impact assessment assumes that 100% of the National Grid substation footprint will be impermeable. However, in reality, the National Grid substation design will include impermeable surfaces where appropriate. AIS technology is assessed as the worst case due to a larger footprint. Further detail regarding GIS technology is provided ***Chapter 6 Project Description***.

Impact	Parameter	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		
Impacts related to the landfall	4 transition bays will be installed underground, each with an operational volume of 227m^3 Each bay will be buried to a depth of 1.8m, with a basal depth of 3m No above ground infrastructure	
Impacts related to the onshore cable route	76 jointing bays will be installed underground, each with an operational volume of 77m^3 152 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m^3 No above ground infrastructure	
Impacts related to the onshore substation	Operational footprint (x2): 72,200m^2 (190m x 190m) Substation operational access road: 13,600m^2 (1,700m x 8m)	The operational footprint does not include the additional landscaping footprint.
Impacts related to the National Grid Infrastructure	National Grid operational substation (AIS technology): 44,950m^2 (310m x 145m) Pylon operational footprint (x4): 1,600m^2 (20m x 20m per each permanent pylon) Cable sealing end compound operational footprint: 10,000m^2 (for three sealing end compounds) Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	Four permanent pylons include up to three reconstructed/ relocated pylons and up to one additional new pylon. The operational footprint does not include the additional landscaping footprint. 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***.
Decommissioning		

Impact	Parameter	Notes
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.		

20.2.2 Scenario 2

10. Scenario 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. ***Table A20.2.2*** presents the realistic worst case parameters of scenario 2. Areas provided for onshore infrastructure are maximum footprint 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 impacts 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. Further detail regarding the sequential construction is provided in ***Chapter 5 EIA Methodology***.

Table A20.2.2 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	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)	

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
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 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	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 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	

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
	approximately 87m intervals): 5,231m^2	approximately 87m 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 TWO project. To provide a worst case, this impact assessment assumes that 100% of the onshore substations footprint will be impermeable. However, in reality, the onshore substations design will include impermeable surfaces where appropriate.
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	National Grid infrastructure will be constructed as part of the proposed East Anglia TWO project	To provide a worst case, this impact assessment assumes that 100% of the National Grid substation footprint will be impermeable. However, in reality, the National Grid substation design will include impermeable surfaces where appropriate. 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***.

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
	breaker) compounds permanent footprint: 10,000 m^2 (total for three compounds) 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			
Impacts related to the landfall	2 transition bays will be installed underground, each with an operational volume of 227m^3 Each bay will be buried to a depth of 1.8m, with a basal depth of 3m No above ground infrastructure	2 transition bays will be installed underground, each with an operational volume of 227m^3 Each bay will be buried to a depth of 1.8m, with a basal depth of 3m No above ground infrastructure	
Impacts related to the onshore cable route	38 jointing bays will be installed underground, each with an operational volume of 77m^3 76 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m^3 No above ground infrastructure	38 jointing bays will be installed underground, each with an operational volume of 77m^3 76 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m^3 No above ground infrastructure	
Impacts related to the onshore substation	Operational footprint: 36,100m^2 (190m x 190m)	Operational footprint: 36,100m^2 (190m x 190m)	The operational footprint does not include the additional

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
	Substation operational access road: 13,600m^2 (1,700m x 8m)		landscaping footprint. Substation operational access road will be constructed as part of the proposed East Anglia TWO project
Impacts related to the National Grid Infrastructure	National Grid operational substation (AIS technology): 44,950m^2 (310m x 145m) Pylon operational footprint (x4): 1,600m^2 (20m x 20m per each permanent pylon) Cable sealing end compound operational footprint: 10,000m^2 (for three sealing end compounds) Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	National Grid infrastructure will be constructed as part of the proposed East Anglia TWO project	Four permanent pylons include up to three reconstructed/ relocated pylons and up to one additional new pylon. The operational footprint does not include the additional landscaping footprint. 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***.
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.		

20.3 Cumulative Impact Assessment During Construction

12. The following sections discuss which of the two construction scenarios detailed in ***section 20.1*** will be the realistic worst case in terms of impacts to water resources and flood risk.

20.3.1 Cumulative Impact 1: Direct Disturbance of Surface Water Bodies

13. Under scenario 1, the temporary dams and culvert on the Hundred River will remain in place for the same amount of time as they would for the construction of the proposed East Anglia TWO project alone, whilst both projects are constructed concurrently (*Error! Reference source not found.*). This means that the impacts resulting from this activity will be identical to those described for the proposed East Anglia TWO project alone in ***section 20.6.1.1*** of ***Chapter 20 Water Resources and Flood Risk***.

14. Under scenario 2, the temporary dams and culvert will be removed following construction of East Anglia TWO, assuming East Anglia TWO is constructed first, and the channel will be reinstated. A new set of temporary dams and a temporary culvert will then be installed in a similar location as part of the proposed East Anglia ONE North project. This is likely to occur several years after the initial period of disturbance, and the river and its associated habitats could either be still recovering or may have only recently recovered. This includes impacts to local ecology; habitat suitable for species such as water vole, aquatic plants and invertebrates and fish may be lost or diminished during the first stage of works. Sensitive breeding and feeding habitats may take several years to recover and therefore the installation of dams and a culvert during this crucial period of recovery would prevent local ecology from recovering effectively and may cause detrimental effects to the overall restoration of habitat.

15. As a result, the magnitude of the effect resulting from the proposed East Anglia TWO and East Anglia ONE North projects being constructed sequentially has the potential to increase. This means that scenario 2 is considered to be the worst case for this impact. However, the lack of geomorphological diversity observed in the system suggests that any impacts are likely to be highly localised and of low magnitude. The residual impact is therefore considered to remain as **minor adverse** following completion of both the proposed East Anglia TWO and East Anglia ONE North projects.

20.3.2 Cumulative Impact 2: Increased Sediment Supply

16. Under scenario 1, a larger proportion of each surface water catchment will be disturbed when compared to the construction of the proposed East Anglia TWO project alone (***Table A20.2.3****Error! Reference source not found.*).

Table A20.2.3 Estimated Maximum Area of Disturbed Ground in Each Water Receptor

Receptor	East Anglia TWO		Scenario 1	
	m^2	%	m^2	%
Coastal fringe	64,200	15.65	109,000	26.60
Hundred River	242,800	0.93	451,900	1.74
Leiston Beck	83,500	0.52	168,100	1.05
Friston Watercourse	250,700	4.16	260,200	0.16
Groundwater	642,000	0.04	989,200	0.07

17. This could potentially increase the pre-mitigation magnitude of the effect on each catchment:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment;
- Hundred River: The effect will increase from low to medium magnitude;
- Leiston Beck: The effect will increase from negligible to low magnitude;
- Friston Watercourse: The effect will increase from low to medium magnitude; and
- Groundwater: This will remain as no impact due to the lack of a mechanism for increased sediment supply to impact upon groundwater.

18. However, the mitigation measures, described in detail in ***sections 20.3.3*** and ***20.6.1.2*** of ***Chapter 20 Water Resources and Flood Risk***, are considered to be effective regardless of the scale of disturbance and will result in negligible impacts on each catchment. The residual impacts are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck and Friston Watercourse under scenario 1.

19. Under scenario 2, the worst case area of disturbance will be no greater than for the East Anglia TWO project alone, but the worst case duration of the impact will be increased. The longer duration of construction activities means that there is potential for sediment to be supplied to the surface drainage network for a longer period of time (with areas along the cable corridor being disturbed twice), which could therefore result in a greater magnitude of impact. This could potentially increase the pre-mitigation magnitude of the effect on each catchment:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment;
- Hundred River: The effect will increase from low to medium magnitude;
- Leiston Beck: The effect will increase from negligible to low magnitude;

- Friston Watercourse: The effect will increase from low to medium magnitude; and
- Groundwater: This will remain as no impact due to the lack of a mechanism for increased sediment supply to impact upon groundwater.

20. However, the mitigation measures described in detail in ***sections 20.3.3*** and ***20.6.1.2*** of ***Chapter 20 Water Resources and Flood Risk***, are considered to be effective in preventing an increase in sediment supply regardless of the overall duration of disturbance and will result in negligible impacts on each catchment. The residual impacts are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck and Friston Watercourse under scenario 2.

21. Following application of proposed mitigation measures, there is therefore no difference in the residual impacts resulting from either scenario.

20.3.3 Cumulative Impact 3: Accidental Release of Contaminants

22. As stated in ***section 20.6.1.3*** of ***Chapter 20 Water Resources and Flood Risk,*** the risk of the accidental release of contaminants is likely to be proportionate to the scale of construction activities (and hence disturbed ground) in each receptor. The increased proportion of construction activities described in ***Table A20.2.3*** for scenario 1 will therefore result in the following magnitude of effect:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment.
- Hundred River: The effect will increase from low to medium magnitude.
- Leiston Beck: The effect will increase from negligible to low magnitude.
- Friston Watercourse: The effect will increase from low to medium magnitude.
- Groundwater: The impact will remain negligible.

23. The mitigation measures outlined in ***sections 20.3.3*** and ***20.6.1.3*** of ***Chapter 20 Water Resources and Flood Risk***, will result in negligible impacts on the Hundred River, Leiston Beck and Friston Watercourse, because they will also be scaled proportionately alongside the proposed East Anglia TWO project. The residual impacts under scenario 1 are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck, Friston Watercourse and underlying groundwater.

24. Under scenario 2, the worst case area of disturbance will be broadly the same as it would be for the proposed East Anglia TWO project alone but the duration of activities will be increased. The increased duration of construction activities means that there is a greater risk that contaminants could be accidentally released at some point during the construction period and could therefore

increase the pre-mitigation magnitude of the impact on each catchment, as set out for scenario 1 above.

25. However, the mitigation measures described in detail in ***sections 20.3.3*** and ***20.6.1.2*** of ***Chapter 20 Water Resources and Flood Risk,*** are considered to be effective in preventing the accidental release of contaminants regardless of the overall duration of construction activities and will result in negligible impacts on each catchment. The residual impacts are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck and Friston Watercourse under scenario 2.

26. Following application of mitigation measures, there is therefore no difference in the residual impacts resulting from either scenario.

20.3.4 Cumulative Impact 4: Changes to Surface Water Runoff and Flood Risk

27. The scale of changes to surface water runoff and flood risk is also likely to be proportionate to the scale of construction activities in each receptor. The increased proportion of construction activities described in ***Table A20.2.3*** for scenario 1 will therefore result in the following magnitude of effect:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment.
- Hundred River: The effect will increase from low to medium magnitude.
- Leiston Beck: The effect will increase from negligible to low magnitude.
- Friston Watercourse: The effect will increase from low to medium magnitude.
- Groundwater: The impact will remain negligible.

28. However, the mitigation measures described in detail in ***section 20.3.3*** of ***Chapter 20 Water Resources and Flood Risk*** are considered to be effective regardless of the scale of disturbance and will result in an impact of negligible magnitude. The residual impacts are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck, Friston Watercourse and the underlying groundwater.

29. The duration of impact will be increased under scenario 2, but the worst case area of disturbance will be no greater than it would be for the proposed East Anglia TWO project alone. This means that the impacts resulting from this activity will be identical to those described in ***Chapter 20 Water Resources and Flood Risk, section 20.6.1.4,*** for the proposed East Anglia TWO project.

30. Following application of mitigation measures, there is therefore no difference in the residual impacts resulting from either scenario.

20.4 Cumulative Impacts Assessment during Operation

31. Operational impacts on water resources and flood risk will be the same irrespective of construction scenario.

20.4.1 Cumulative Impact 1: Changes to Surface Water Runoff, Groundwater Flows and Flood Risk

32. The magnitude of the effect associated with changes to surface water runoff, groundwater flows and flood risk has been assumed to be proportional to the area of the permanent onshore infrastructure in each catchment (***Chapter 20 Water Resources and Flood Risk, section 20.6.2.1*** and ***Appendix 20.3 Flood Risk Assessment***). In terms of cumulative impact with the proposed East Anglia TWO and East Anglia ONE North projects, a larger proportion of each surface water catchment will contain permanent onshore infrastructure in comparison to the proposed East Anglia TWO project alone (***Table A20.2.4).***

Table A20.2.4 Maximum Area of Permanent Onshore Infrastructure in Each Water Receptor

Receptor	East Anglia TWO		East Anglia TWO and East Anglia ONE North	
	m^2	%	m^2	%
Coastal fringe	2,200	0.54	2,700	0.67
Hundred River	10,000	0.04	21,800	0.08
Leiston Beck	4,000	0.02	7,800	0.05
Friston Watercourse	96,600	1.60	147,600	2.45
Groundwater	112,800	0.01	179,900	0.01

33. This could potentially increase the pre-mitigation magnitude of the effect on each catchment:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment.
- Hundred River: The effect will increase from negligible to low magnitude.
- Leiston Beck: The effect will increase from negligible to low magnitude.
- Friston Watercourse: The effect will increase from low to medium magnitude.
- Groundwater: The impact will remain negligible.

34. However, the embedded mitigation measures, described in detail in ***section 20.3.3*** of ***Chapter 20 Water Resources and Flood Risk***, are considered to be effective regardless of the scale of permanent onshore infrastructure and will ensure that the magnitude of the effect is no greater than low. With the use of a

specialist drainage contractor to reinstate field drainage, the residual impacts are considered to be **minor adverse** for the Hundred River, Leiston Beck, Friston Watercourse catchments (although attenuation measures at the substation location will deliver a degree of betterment over existing run off characteristics to downstream receptors in Friston Watercourse) and the underlying groundwater.

35. Following application of mitigation measures, there is therefore no difference in the residual impacts resulting from either scenario.

20.4.2 Cumulative Impact 2: Supply of Fine Sediment and Other Contaminants

36. The scale of changes to the supply of fine sediment and other contaminants is also likely to be proportional to the scale of the permanent onshore infrastructure in each receptor (***section 20.6.2.2*** of ***Chapter 20 Water Resources and Flood Risk***). The increased proportion of permanent infrastructure described in *Error! Reference source not found.* will therefore result in the following magnitude of effect:

- Coastal fringe: This will remain as no impact due to the lack of permanent surface water receptors in the catchment.
- Hundred River: The effect will increase from negligible to low magnitude.
- Leiston Beck: The effect will increase from negligible to low magnitude.
- Friston Watercourse: The effect will increase from negligible to low magnitude.
- Groundwater: The impact will remain negligible.

37. The mitigation measures described in ***section 20.6.2.2*** of ***Chapter 20 Water Resources and Flood Risk,*** will reduce the magnitude of the effect to negligible. The residual impacts are therefore considered to be **minor adverse** for the Hundred River, Leiston Beck, Friston Watercourse catchments (although attenuation measures at the substation location will deliver a degree of betterment over existing run off characteristics to downstream receptors in Friston Watercourse) and the underlying groundwater.

38. Following application of mitigation measures, there is therefore no difference in the residual impacts resulting from either scenario.

20.5 Summary

39. ***Table A20.2.5*** 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 water resources.

Table A20.2.5 Summary of Scenario 1 and Scenario 2 Realistic Worst Case Assumptions

Impact	Worst Case	Notes
Impacts related to direct disturbance of surface water bodies (construction)	Scenario 2	Impacts for scenario 1 are identical to the proposed East Anglia TWO project alone. Scenario 2 will result in greater magnitude due to projects being constructed in succession.
Impacts related to increased sediment supply (construction)	N/A	Following mitigation, the potential impacts are considered to be minor adverse for both scenarios.
Impacts related to release of contaminants (construction)	N/A	Following mitigation, the potential impacts are considered to be minor adverse for both scenarios.
Impacts related to changes to surface water runoff and flood risk (construction)	N/A	Following mitigation, the potential impacts are considered to be minor adverse for both scenarios.
Impacts related to changes to surface water runoff, groundwater flows and flood risk (operation)	N/A	Following mitigation, the potential impacts will be the same for both scenarios.
Impacts related to supply of fine sediment and other contaminants (operation)	N/A	Following mitigation, the potential impacts will be the same for both scenarios.

40. This demonstrates that there are no appreciable differences between the worst case impacts resulting from either scenario for the majority of potential impacts on water resources and flood risk receptors. However, impacts resulting from the direct disturbance of the Hundred River are likely to be greatest under scenario 2. Construction scenario 2 therefore creates a realistic worst case in terms of impacts to water resources and flood risk and will be carried through into the wider CIA with other developments, see ***section 20.7*** in ***Chapter 20 Water Resources and Flood Risk.***