East Anglia TWO Offshore Windfarm

Chapter 27

Human Health

Preliminary Environmental Information
Volume 1
Document Reference – EA2-DEVWF-ENV-REP-IBR-000822

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Revision Summary					
Rev	**Date**	**Document Status**	**Prepared by**	**Checked by**	**Approved by**
01	11/01/2019	For Issue	Paolo Pizzolla	Julia Bolton	Helen Walker

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

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Glossary of Acronyms

AC	Alternating Current
AHAH	Access to Health Assets and Hazards
ALARP	As Low As Reasonably Practicable
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Areas
AQO	Air Quality Objective
CoCP	Code of Construction Practice
CCS	Construction Consolidation Site
CIA	Cumulative Impact Assessment
CMS	Construction Method Statement
COMAH	Control of Major Accident Hazards
CTMP	Construction Traffic Management Plan
dB(A)	A-weighted Decibels
DC	Direct Current
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DTI	Department of Trade and Industry
EEA	European Economic Area
EIA	Environmental Impact Assessment
ELF	Extremely Low Frequency
EMF	Electromagnetic field
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
GHz	Gigahertz
ha	Hectares
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HPA	Health Protection Agency
HVAC	High Voltage Alternating Current
Hz	Hertz
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEMA	Institute of Environmental Management and Assessment
IMD	Index of Multiple Deprivation
IPC	Infrastructure Planning Commission
JSNA	Joint Strategic Needs Assessment
km	Kilometres

LEP	Local Enterprise Partnership
LSOA	Lower Super Output Area
NEET	Not in Education or Employment
NPS	National Policy Statement
NRPB	National Radiological Protection Board
ONS	Office of National Statistics
PEIR	Preliminary Environmental Information Report
PHE	Public Health England
PID	Public Information Day
PM	Particulate Matter
PPG	Pollution Prevention Guidance
PRoW	Public Rights of Way
SAGE	Stakeholder Advisory Group on Extremely Low Frequency Electric and Magnetic Fields
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
µT	Microteslas
V	Volts
V/m	Volts per metre
WHO	World Health Organisation

Glossary of Terminology

Applicant	East Anglia TWO Limited.
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	Area containing all onshore and offshore infrastructure, transmission works, construction consolidation sites, and mitigation areas.
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.
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 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 where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mitigation areas	Areas captured within the Development Area specifically for mitigating expected or anticipated impacts.
National Grid infrastructure	A National Grid substation, connection to the existing electricity pylons and National Grid overhead line realignment works 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 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 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 required to connect the proposed East Anglia TWO project to the national electricity grid.
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 and two fibre optic cables.
Proposed onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, 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 infrastructure associated with the proposed East Anglia TWO project from landfall to grid connection.
Onshore substation	The East Anglia TWO substation and all of the electrical equipment within in.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia TWO project.
Onshore study area	All onshore areas being considered for the placement of onshore infrastructure or temporary construction consolidation sites. This includes areas being considered for National Grid infrastructure, East Anglia TWO onshore substation, onshore cable corridor and landfall.
Transition bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

27 Human Health

27.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the potential human health effects associated with the proposed East Anglia TWO project.

2. This chapter meets the requirements of the Environmental Impact Assessment (EIA) Regulations 2017 in providing reasoned conclusions for the identification and assessment of any likely significant effects of the proposed East Anglia TWO project on human health. This chapter follows best practice guidance (Cave et al. 2017), in considering health effects with regards to the general population and vulnerable population groups. Populations are considered at both regional and local levels. This chapter was produced by Royal HaskoningDHV in collaboration with Ben Cave Associates.

3. This chapter follows the World Health Organisation (WHO) definition of health as a state of physical, mental and social wellbeing, as well as the absence of disease or infirmity. Similarly, it also considers issues of wellbeing as a state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to their, her or his community.

4. The context of people's lives determines their health. Therefore, both the WHO and Public Health England (PHE) consider that health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants include the social and economic environment, the physical environment, and individual characteristics or behaviours.

5. The focus of the chapter is on community health and wellbeing and not on occupational health and safety. The term 'health' is used to describe 'human health' and 'wellbeing' unless specifically referenced otherwise.

6. This chapter informs and has been informed by other relevant chapters of this PEIR. These include:

- ***Chapter 18 Ground Conditions and Contamination;***
- ***Chapter 19 Air Quality;***
- ***Chapter 20 Water Resources and Flood Risk;***
- ***Chapter 21 Land Use and Agriculture;***
- ***Chapter 25 Noise and Vibration;***

- ***Chapter 26 Traffic and Transport;***
- ***Chapter 29 Landscape and Visual Impact Assessment;*** and
- ***Chapter 30 Tourism, Recreation and Socio-Economics.***

7. This chapter brings together the relevant information on health, including assessing the findings of other chapters within this PEIR in population health terms. This approach aims to assist in identifying proposed East Anglia TWO project factors which may affect human health and wellbeing.

27.2 Consultation

8. Consultation is a key driver of the Environmental Impact Assessment (EIA) process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent.

9. To date, consultation with regards to human health has been undertaken via Expert Topic Group (ETG), described within ***Chapter 5 EIA Methodology***, with meetings held in June 2018, and through the East Anglia TWO Scoping Report (ScottishPower Renewables (SPR) 2017). Feedback received through this process has been considered in preparing the PEIR where appropriate and this chapter will be updated following the next stage of consultation for the final assessment submitted with the Development Consent Order (DCO) application.

10. ***Table 27.1*** shows the consultation responses relevant to human health and splits these responses by document and categorised across health determinants. All responses are given in the context of PHEs Scoping Opinion that, *"there is no body of evidence conclusively linking wind farms with adverse health effects arising from emissions of chemicals. When operational, windfarms should not produce emissions, pollutants, or waste products. Offshore wind farms are located out to sea, away from members of the public, hence the potential for the public to be exposed to any emissions from them is very small."*

Table 27.1 Consultation Responses

Consultee	Date / Document	Comment	Response
Method Statement			
Public Health England	September 2018 / Method Statement	We are pleased to see that the comments we provided during the scoping consultation have been considered within the Human Health Method Statement. We have considered the submitted documentation and can confirm that we are satisfied with the	Methodology is described in ***section 27.4.3.***

Consultee	Date / Document	Comment	Response
		methodology proposed for this chapter and look forward to reviewing the full assessment at a further consultation stage.	
Scoping Report			
Affected Population			
Public Health England	December 2017 / Scoping Response	The ES should clearly identify the development's location and the location and distance from the development of off-site human receptors that may be affected.	This is shown in ***Figure 27.1.***
Suffolk Coast and Heaths AONB Manager Suffolk Destination Management	12/06/2018 / ETG Meeting for Tourism, Recreation, and Socio-Economics	Requested that visitors were considered separately to local populations although accepted that as both are human populations the pathway from determinant sources to impacts would be similar. Raised that the impact assessment must consider the disparity of wider benefits and local impacts, particularly relating to onshore infrastructure	In response to this, the potential impacts to local populations has been considered in ***section 27.6.1*** and potential impacts to visitors have been considered in ***Chapter 30 Tourism, Recreation and Socio-Economics*** In combination, this chapter and ***Chapter 30 Tourism, Recreation and Socio-Economics*** cover all potential population effects.
Air Quality			
Public Health England	December 2017 / Scoping Response	When considering a baseline (of existing air quality) and in the assessment and future monitoring of impacts these: Should include consideration of impacts on existing areas of poor air quality e.g. Existing or proposed local authority Air Quality Management Areas (AQMAs) Should include modelling using appropriate meteorological data (i.e. come from the nearest suitable meteorological station and include a range of years and worst case conditions) Should include modelling taking into account local topography	The assessment of human health is based on ***Chapter 19 Air Quality*** which considers these aspects. This is included in ***section 27.6.1.2.*** Considering the comments from PHE in relation to the low risk posed by offshore wind development, it would be disproportionate to conduct a second assessment.

Consultee	Date / Document	Comment	Response
The Planning Inspectorate	December 2017 / Scoping Response	The inspectorate agrees that this can be scoped out during operation	This is included only during construction in ***section 27.6.1***.
Baseline			
The Planning Inspectorate	December 2017 / Scoping Response	The methodology for determining the baseline should be set out in the ES and agreed with relevant consultees.	The baseline is set out in ***section 27.5.***
Construction Impacts			
Public Health England	December 2017 / Scoping Response	Construction and decommissioning will be associated with vehicle movements and cumulative impacts should be accounted for.	The assessment of human health is based on ***Chapter 26 Traffic and Transport*** which considers these aspects. This is included in ***section 27.6.1.5.***
Public Health England	December 2017 / Scoping Response	Significant impacts are unlikely to arise from installations which employ Best Available Techniques and which meet regulatory requirements concerning emission limits and design parameters.	Relevant emissions are considered in the following chapters: • ***Chapter 18 Ground Conditions and Contamination*** • ***Chapter 19 Air Quality*** • ***Chapter 25 Noise and Vibration;*** and • ***Chapter 26 Traffic and Transport*** Human health impacts based on these chapters are included in ***section 27.6***
Public Health England	December 2017 / Scoping Response	Within the EIA PHE would expect to see information about how the promoter would respond to accidents with potential off-site emissions.	This is included in: • ***Chapter 18 Ground Conditions and Contamination;*** and • ***Chapter 20 Water Resources and Flood Risk.***
Contaminated Land and Land Quality			
Public Health England	December 2017 / Scoping Response	We would expect the promoter to provide details of any hazardous contamination present on site	This is included in: • ***Chapter 18 Ground Conditions and Contamination;*** and

Consultee	Date / Document	Comment	Response
		(including ground gas) as part of the site condition report.	• ***Chapter 21 Land Use.***
Control of Major Accident Hazards (COMAH) Regulations			
Public Health England	December 2017 / Scoping Response	The EIA should include consideration of the COMAH Regulations.	The COMAH regulations require COMAH establishments to "Take all necessary measures to prevent major accidents involving dangerous substances." As noted by PHE, the construction and operation of an offshore wind farm is unlikely to include dangerous substances. Therefore, this aspect is not included in the human health assessment.
Electro Magnetic Fields (EMF)			
The Planning Inspectorate	December 2017 / Scoping Response	The inspectorate agrees that this can be scoped out during construction and decommissioning	This is included only during operation ***section 27.6.2.***
Public Health England	December 2017 / Scoping Response	In respect of electromagnetic fields, compliance with the ICNIRP guidelines should be highlighted.	This is included only during operation ***section 27.6.2.***
Suffolk County Council & Suffolk Coastal District Council	December 2017 / Scoping Response	The cabling route and all power lines connections which may generate an Electro-magnetic radiation field and potentially impact on members of the public shall be comprehensively assessed and the details should be provided.	This is included only during operation ***section 27.6.2.***
Employees			
The Planning Inspectorate	December 2017 / Scoping Response	The Inspectorate requires that impacts relevant to the health of employees during construction, operation and decommissioning should be included in the assessment.	This will be included for both construction, and operation, ***section 27.6.1*** and ***27.6.2*** respectively. It is assumed that risks during decommissioning will be similar to construction but cannot be assessed so far in advance.
Suffolk County Council &	December 2017 /	A health and safety risk analysis for site workers and members of the public should be provided for the	This chapter provides an assessment of health effects to the public in ***section 27.6.***

Consultee	Date / Document	Comment	Response
Suffolk Coastal District Council	Scoping Response	constructional and operational phases of the works.	Health risk of workers is included in ***Chapter 18 Ground Conditions and Contamination*.** An initial human health risk assessment for various users was considered in the development of the Conceptual Site Model in ***Chapter 21 Land Use*** and is presented in ***Appendix 18.1***. The effects to human health are considered in ***section 18.4.2*** and impacts addressed in ***section 18.6.1.1*.**
Inter-relationships			
The Planning Inspectorate	December 2017 / Scoping Response	The ES should ensure that where reliance is placed on other aspect assessments in the ES those assessments do assess risk to human health if significant effects are likely.	This chapter follows best practice (Cave *et al*. 2017) as promoted by IEMA. The assessment in ***section 27.6*** follows the methodology in ***section 27.4.3*** that clearly shows the relationship with other chapters and assessments.
Perception of Risk			
Public Health England	December 2017 / Scoping Response	There is evidence that, in some cases, perception of risk may have a greater impact on health than the hazard itself. A 2009 report[1], jointly published by Liverpool John Moores University and the HPA, examined health risk perception and environmental problems using a number of case studies. As a point to consider, the report suggested: "Estimation of community anxiety and stress should be included as part of every risk or impact assessment of proposed plans that involve a potential environmental hazard. This is true even when the physical health risks may be negligible." PHE supports the inclusion of this information within EIAs as good practice.	Local community perception of the onshore construction and the risks that this may pose is managed through the Evidence Plan Process. This includes public information days and inclusion of public concerns in to the planning process. A summary of this process will be included in the Environmental Statement. The report that PHE reference has been reviewed and is found to refer to projects with significant emissions or environmental impacts. As such it is not directly applicable to the construction and operation of

[1] Available from: http://www.cph.org.uk/wp-content/uploads/2012/08/health-risk-perception-and-environmental-problems--summary-report.pdf

Consultee	Date / Document	Comment	Response
			an offshore wind farm or its onshore infrastructure due to the low risk to human health from emissions noted by PHE. Therefore, this will not be included in the health review.
Proportionality			
Public Health England	December 2017 / Scoping Response	Any assessments undertaken to inform the ES should be proportionate to the potential impacts of the proposal.	So as to be proportionate, this Human Health chapter provides a qualitative assessment based on evidence from supporting chapters and scientific literature.
Waste			
Public Health England	December 2017 / Scoping Response	The EIA should demonstrate compliance with the waste hierarchy.	This is included in ***Chapter 18 Ground Conditions and Contamination.***
Water			
Public Health England	December 2017 / Scoping Response	When considering a baseline (of existing water quality) and in the assessment and future monitoring of impacts these: Should include assessment of potential impacts on human health and not focus solely on ecological impacts Should identify and consider all routes by which emissions may lead to population exposure (e.g. surface watercourses; recreational waters; sewers; geological routes etc.) Should assess the potential off-site effects of emissions to groundwater (e.g. on aquifers used for drinking water) and surface water (used for drinking water abstraction) in terms of the potential for population exposure Should include consideration of potential impacts on recreational users (e.g. from fishing, canoeing etc) alongside assessment of potential exposure via drinking water	An assessment of health risk due to emissions to water quality will be developed qualitatively and informed by assessments for: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** and • ***Chapter 20 Water Resources and Flood Risk.*** Considering the comments from PHE in relation to the low risk posed by offshore wind development, it would be disproportionate to conduct a second assessment.

11. Ongoing public consultation has been conducted through a series of Public Information Days (PIDs) and Public Meetings. PIDs have been held throughout Suffolk in November 2017, March 2018, and June / July 2018 with further events planned in 2019. A series of stakeholder engagement events were also undertaken in October 2018 as part of consultation phase 3.5. These events were held to inform the public of potential changes to the onshore substation location. This consultation aims to ensure that community concerns are well understood and that site specific issues can be taken into account, where practicable. Consultation phases are explained further in ***Chapter 5 EIA Methodology***.

12. ***Table 27.2*** shows public consultation feedback pertaining to human health. Consultation phases are explained further in ***Chapter 4 Site Selection and Assessment of Alternatives.*** Full details of the proposed East Anglia TWO project consultation process will be presented in the Consultation Report, which will be submitted as part of the DCO application.

Table 27.2 Public Consultation Responses Relevant to Human Health

Topic	Response / where addressed in the PEI
Phase 1	
• None	-
Phase 2	
• Concerns over health and health related to noise impacts	Assessment of noise related health impacts given in ***section 27.6.1.1*** and ***Chapter 25 Noise and Vibration***
Phase 3	
• Stress and anxiety-related health impacts of local community • Impacts of EMF on human health	Assessment of potential stress impacts are given in ***section 27.6.*** Assessment of EMFs given in ***section 27.6.3.2***
Phase 3.5	
• Disruption and distress • Impacts of EMF on human health • Concerns over impact of EMF on pacemakers, concern that areas would be out of bounds • Cardiovascular disease associated with background noise causing stress • Increased demand on NHS services	Assessment of potential stress impacts are given in ***section 27.6.*** Assessment of EMFs given in ***section 27.6.3.2*** Potential impacts to access to services are assessed in ***section 27.6.1.5***.

27.3 Scope

27.3.1 Spatial Scope

27.3.1.1 Study Areas

13. The onshore infrastructure for the proposed East Anglia TWO project will include the following elements:

- Landfall location including cable ducts and transition bays;
- Onshore cable corridor which includes the cable trenches, construction consolidation sites (CCS), haul road and spoil storage areas;
- East Anglia TWO substation (onshore substation); and
- National Grid substation and connection infrastructure.

14. A full description of the above infrastructure is provided in ***Chapter 6 Project Description***.

15. For the PEIR, a proposed onshore development area has been identified (shown on ***Figure 28.1*** and ***Figure 28.2***). This area will be subject to further refinement post-PEI, as a result of ongoing site selection, however for the purposes of this assessment this is unlikely to change on an area level.

16. The proposed East Anglia TWO project will make landfall north of Thorpeness which is within the Suffolk Coastal District. The onshore cable route then travels for approximately 9km through agricultural fields, crosses the B1122 Aldeburgh Road and passes immediately south of Coldfair Green and through the woodland belt.

17. The following geographic area classifications have been used:

- Site-specific;
- Local (Suffolk Coastal District);
- Regional (Suffolk County);
- National (England); and
- International.

18. The ‘site specific’ level considers localised effects with reference to routine statistics collected for Lower Super Output Areas (LSOAs), see ***section 27.5*** on the baseline collection. Specific consideration is given to the following three most representative LSOAs as shown in ***Figure 28.1***:

- Suffolk Coastal 004A (representative of the population at landfall, and some of the onshore cable route); and

- Suffolk Coastal 003A and 003E (representative of population either side of the onshore cable route, onshore substation and National Grid substation).

19. Within the study areas the assessment defines five population groups (described below). Defining these population groups allows a structured and consistent discussion in both the assessment and the cumulative assessment. Six of these population groups are geographically defined, the remaining four are defined in relation to reasons that a population may be sensitive, other than due to proximity.

20. The study areas used in other chapters of this PEIR are of relevance, but do not necessarily define the boundaries of potential health effects. Consequently, this human health chapter uses study areas to broadly define representative population groups rather than to set boundaries on the extent of potential effects.

27.3.1.2 Geographic Population Groups

21. Five population groups have been selected based on the geographic study areas:

- The population near landfall (site-specific);
- The population along the onshore cable route and near the onshore substations (site-specific);
- The population of Suffolk Coastal District (local);
- The population of Suffolk county (regional); and
- The population of England and beyond the borders of England (national and international).

27.3.1.3 Potentially Vulnerable Groups

22. In addition, four further population groups are defined in relation to their potential sensitivity to changes associated with the proposed East Anglia TWO project (beneficial or adverse):

- Children and young people;
- Older people (over 65 years old);
- People with existing poor health (physical and mental health); and
- People living in deprivation, including those on low incomes.

23. These groups are intentionally broadly defined to facilitate a consistent discussion across health issues and as a basis to considering cumulative

effects. The assessment section discusses detail relevant to particular health issues. People falling into more than one group may be especially sensitive.

27.3.1.4 Temporal Scope

24. The temporal scope has been defined as follows:

- 'Very short term' relates to effects measured in hours, days or weeks (e.g. effects associated with cable laying activity past a particular dwelling);
- 'Short term' relates to effects measured in months (e.g. requirements of the overall construction stage, such as workforce use of accommodation);
- 'Medium term' relates to effects measured in years (e.g. local employment during construction); and
- 'Long term' relates to effects measured in decades (e.g. the operational stage).

27.3.2 Topic Scope

25. The scope of issues considered by this human health chapter has been informed by the proposed East Anglia TWO project Scoping Report (SPR 2017) and has taken into account the Planning Inspectorate Scoping Opinion (The Planning Inspectorate 2017), and has been developed in response to the EIA Regulations 2017. Public Health England have been consulted on the methodology and agreed that it is appropriate for the assessment.

26. Following the Scoping Opinion, the scope of the human health chapter focuses on the onshore infrastructure associated with the proposed East Anglia TWO project. Following the principles outlined in ***section 27.4.3.3*** (factors relating to likelihood) and ***section 27.4.3.4*** (factors relating to significance), the following potential effects to human health have been scoped out of further consideration:

- Potential Offshore Health Effects Scoped Out:
  - PHE note that operational windfarms should not produce emissions, pollutants, or waste products;
  - Landscape and visual impacts due to offshore wind turbines within the 35km limit of visual significance identified in Department of Trade and Industry (DTI) guidance[2] are not expected to have significant appreciable or significant effects on human health;
  - The potential for the offshore wind farm, or its support vessels, to pose a hazard to shipping and/or aviation are not expected to have significant

[2] '*Guidance on the Assessment of the Impact of Offshore Windfarms'* produced by the Department for Trade and Industry (DTI)

appreciable or significant effects on human health (see ***Chapter 14 Shipping and Navigation***);

- The presence of cable laying and support vessels close to the shore due to temporary nature of such activities;
- The potential for bathing waters to be affected by sedimentation and/or fuel spills associated with the horizontal drilling of the cable route at the landfall due to the small quantities of sediment and low probability of occurrence (see ***Chapter 8 Water and Sediment Quality***); and
- Effects due to the subsequent development of port facilities (this will be considered under a separate application).

- Potential Onshore Health Effects Scoped Out:
  - The effects resulting from manufacturing of the elements of the offshore wind farm. This is because:
    - The supply chain for the proposed East Anglia TWO project has not been developed at this point so the health effects arising cannot be determined; and
    - Manufacturing would be subject to relevant health assessments by the relevant companies and covered by its own health and safety and public health legislation and standards;
  - The potential for negative health or social effects due to the workforce because:
    - Workers are likely to be UK based;
    - Workers will be of working age and in good health;
    - In-migrant workers would be distributed across Suffolk in existing rental accommodation (such as hotels); and
    - It is expected that migrant workers would return to their homes over the weekend;
    - Effects on local services because resident workers would continue to use their own registered GP; and
    - A high standard of workforce conduct is mandated by the ScottishPower Renewables.

27.3.2.1 Potential Onshore Health Effects Scoped In

27. The following section sets out the topic scope for health issues that have been assessed in this chapter due to the potential for likely significant effects to human health. These effects will also be considered cumulatively within the proposed East Anglia TWO project and with other projects.

28. The chapter assesses the potential for likely significant health effects to occur during construction and operation as described in ***Table 27.3.***

Table 27.3 Potential Sources of Impact Leading to Potential Health Effects

Potential Source	Potential pathway	Potential Receptor	Relevant PEIR chapter
Construction			
Noise from excavation machinery and associated movements	Temporary inconvenience	Site specific populations or any sensitive groups such as schools or residential homes	***Chapter 25 Noise and Vibration***
Dust generated during construction	Temporary inconvenience or inhalation of particulates	Site specific populations	***Chapter 19 Air Quality***
Exhaust emissions and particulates from machinery		Site specific populations and localised populations within Suffolk County	
Accidental spillage	Emissions to ground or surface water	Site specific populations	***Chapter 18 Ground Conditions and Contamination*** ***Chapter 20 Water Resources and Flood Risk***
Temporary disturbance or obstruction of roads and footpaths due to road transportation of materials and equipment, workforce traffic, and construction areas	Loss of access to green space or diversions to access routes	Site specific populations and localised populations within Suffolk County	***Chapter 30 Tourism, Recreation and Socio-Economics***
	Disruption of access to services and amenities	Site specific populations and localised populations within Suffolk County	***Chapter 26 Traffic and Transport***
Construction and Operation			
Increases in employment and commercial opportunity	Increased wealth in populations	Population of Suffolk County and New Anglia Local Enterprise Partnership (LEP)	***Chapter 30 Tourism, Recreation and Socio-Economics***
Perception of risk	Uncertainty and anxiety of plans and potential impacts.	Populations specific to the indicative onshore substation area and immediate environs.	Detail included in this chapter.
Operation			
Noise from the onshore substation	Long term inconvenience	Site specific population at the onshore substation	***Chapter 25 Noise and Vibration***

Potential Source	Potential pathway	Potential Receptor	Relevant PEIR chapter
Electromagnetic Fields from the underground cables, onshore substation, and National Grid Substation	Interaction with magnetic fields	Site specific population along the onshore cable route and at the onshore substation.	Detail included in this chapter.

27.3.3 Worst Case Scenarios

29. This section identifies the realistic worst case parameters associated with the proposed East Anglia TWO project alone. This includes all onshore infrastructure for the proposed East Anglia TWO project and the National Grid infrastructure that the proposed East Anglia TWO project will require for ultimate connection to national electricity grid.

30. ***Table 27.4*** identifies those realistic worst case parameters of the onshore infrastructure that are relevant to potential impacts on human health during construction, operation and decommissioning phases of the proposed East Anglia TWO project. Please refer to ***Chapter 6 Project Description*** for more detail regarding specific actvities, and their durations, which fall within the construction phase.

Table 27.4 Realistic Worst Case Scenarios

Impact	Parameter	Notes
Construction		
Construction duration	The minimum realistic duration that the onshore works can be completed in, resulting in the highest traffic demand due to the intensity of activities, is 36 months (three years). For the assessment, the worst case phase for construction is considered to be represented by months 1 to 24 (in line with the assessment presented in ***Chapter 26 Traffic and Transport***). This is therefore presented in the assessment within this chapter.	This duration has been used as the realistic onshore construction duration date for the purpose of the assessment of environmental impacts in this PEIR[3]. Vehicle movements have been calculated using this parameter and are detailed further in ***Chapter 26 Traffic and Transport***.
Construction Date	Earliest start of construction 2024.	2024 has been used as the realistic construction start date for the purpose of the

[3] This assumed construction duration has been used for the assessment presented in this PEIR. Any refinement of the programme prior to submission of the DCO will be captured in the Environmental Statement.

Impact	Parameter	Notes
		assessment of environmental impacts in this PEIR[4]. Vehicle movements have been calculated using this parameter and are detailed further in ***Chapter 26 Traffic and Transport***.
Working Hours	Assessment based upon a five day working week. Noting that it is likely that there will be a requirement for Saturday working and Sunday working for critical activities, such as Horizontal Directional Drilling (HDD).	Results in peak traffic generation as vehicle movements associated with transport of employees and deliveries are condensed over five days rather than six.
Impacts related to the landfall	HDD temporary works area: 7,000m^2 (70m x 100m) Transition bay excavation footprint (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall CCS: 18,400m^2 (160m x 115m) Landfall transition bays approximate quantity of spoil material (for 2 transition bays): 454m^3	Landfall to be achieved via HDD. No beach access required.
Impacts related to the onshore cable corridor	Onshore cable route: 287,360m^2 (8,980m x 32m) Jointing bay construction excavation footprint: 570m^2 (30.6m x 18.6m). Total for 36 jointing bays: 20,520m^2 (570m^2 x 36) HDD (retained as an option to cross SPA / SSSI): • Entrance pit CCS (x1): 7,000m^2 (100m x 70m) • Exit pit CCS (x1): 3,000m^2 (100m x 30m) Onshore cable route CCS: 18,400m^2 (160m x 115m). Total for 5 CCS: 92,000m^2 (18,400m^2 x 5) Temporary roads: • Onshore cable route haul road between landfall and Snape Road (4.5m wide with additional 4m for passing places at approximately 87m intervals): 41,376m^2	Onshore cable corridor construction footprint may be located anywhere within the proposed onshore development area. The location strategy for access routes, CCS and jointing bays will be to site them near to field boundaries or roads as far as practical. Two link boxes sit underground beside each jointing bay at a depth of approximately 1.2m. The construction footprint of these is included in the jointing bay construction excavation footprint.

[4] This assumed construction start date has been used for the assessment presented in this PEIR. Any refinement of the programme prior to submission of the DCO will be captured in the Environmental Statement.

Impact	Parameter	Notes
	• Onshore cable route and substation access haul road (9m width): 18,675m^2 • Temporary access road: 23,495m^2 Onshore cable trench approximate quantity of spoil material: 13,321m^3	
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: 12,800m^2 (1,600m x 8m)	Construction access is included above as the onshore cable route and substation access haul road.
Impacts related to the National Grid Infrastructure	National Grid substation CCS: 78,750m^2 (250m x 315m) Permanent footprint (used as CCS during construction): 45,500m^2 (325m x 140m)	Design for the required overhead line (OHL) realignment work (including cable sealing end CCSs and pylon realignment CCS) is currently on going. As more detail is made available, this will be fully assessed and included in the Environmental Statement (ES) and DCO application. However, indicative locations for cable sealing end CCSs and pylon realignment CCS are shown in ***Figure 6.6*** of ***Chapter 6 Project Description***. Construction access is included above as the onshore cable route and substation access haul road. Operational access is included above as the substation operational access road,
Operation		
Impacts related to the onshore substation and National Grid infrastructure	Operational noise from the operation of the onshore substation	No significant noise sources associated with the National Grid infrastructure therefore not considered further.
Impacts relating to traffic	It anticipated that the substation(s) would not be staffed. During the operational phase, vehicle movements would therefore be limited to occasional maintenance visits at the substation and annual routine integrity tests of the onshore cable route.	
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. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. 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. A decommissioning plan will be provided. 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.		

27.3.4 Embedded Mitigation

31. The proposed East Anglia TWO project has committed to a number of techniques and engineering designs/modifications inherent as part of the proposed East Anglia TWO project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the proposed East Anglia TWO project design is a type of primary mitigation and is an inherent aspect of the EIA process. Aspects of this relevant to human health effects are discussed in ***Table 27.5***.

32. A range of different information sources has been considered as part of embedding mitigation into the design of the proposed East Anglia TWO project. These include engineering requirements, feedback from the community and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice. For further details see ***Chapter 6 Project Description*** and ***Chapter 4 Site Selection and Assessment of Alternatives***.

Table 27.5 Embedded Mitigation

Parameter	Mitigation measures embedded into the project design
General	
Site Selection	The proposed East Anglia TWO project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Key design principles from the outset were followed (wherever practical) and further refined during the EIA process. Ones relevant to this chapter include • Avoiding proximity to residential dwellings; and • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures.
Construction	Use of relevant best practice and techniques (including pollution prevention) to avoid or reduce impacts which will affect the proposed onshore development area. See the following assessments: • ***Chapter 8 Water and Sediment Quality;***

Parameter	Mitigation measures embedded into the project design
	• ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 19 Air Quality;*** • ***Chapter 20 Water Resources and Flood Risk*** • ***Chapter 21 Land Use;*** • ***Chapter 25 Noise and Vibration*** • ***Chapter 26 Traffic and Transport;*** and • ***Chapter 29 Landscape and Visual Impact Assessment.***
Perception of risk	Perceptions are influenced by availability of information and engagement in decision making process. The Applicant has implemented a thorough process of community engagement include PIDs and stakeholder engagement. Information from these has informed the design development and updates have been provided to local communities throughout the planning process.
National Grid Substation and Onshore Substation (operational phase)	
Foul Drainage	Foul drainage at the onshore substations will be collected through a mains connection to the existing local authority sewer system (if a suitable connection is available) or collected in a septic tank located within the development boundary and transported off site for disposal at a licensed facility.
Pollution Prevention	All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. All refuelling will take place in a dedicated impermeable area, using a bunded bowser. The refuelling and fuel storage area will be located at least 10m from the nearest watercourse. Biodegradable oils will be used where possible. Spill kits will be available on site at all times. Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency.
EMF	It is The Applicant's policy to only design and install equipment that is compliant with the relevant exposure limits. To ensure this, all of the equipment for the proposed East Anglia TWO project capable of producing EMFs will be assessed in accordance with the provisions of the Government's Code of Practice on Compliance, which is compliant with ICNIRP guidance (ICNIRP 1998).

27.3.5 Monitoring

33. Post-consent, the final detailed design of the proposed East Anglia TWO project and the development of the relevant management plan(s) will refine the worst-case parameters assessed in the EIA. It is recognised that monitoring is an important element in the management and verification of the impacts of the proposed East Anglia TWO project. Outline management plans, across a number of environmental topics, will be submitted with the DCO application. These outline management plans will contain key principles that provide the

framework for any monitoring that could be required. The requirement for and final appropriate design and scope of monitoring will be agreed with the relevant stakeholders and included within the relevant management plan(s), submitted for approval, prior to construction works commencing.

27.4 Assessment Methodology

27.4.1 Guidance

27.4.1.1 Legislation

34. The following legislative context has informed the assessment presented in this chapter.

35. The Health and Safety at Work Act 1974 (HM Government of Great Britain, 1974) places duties on employers to ensure, so far as is reasonably practicable: the health, safety and welfare at work of all their employees; and that persons not in their employment are not exposed to risks to their health or safety as a result of the activities undertaken. In both cases, the requirement for risks to be reduced to As Low As Reasonably Practicable (ALARP) is fundamental and applies to all activities within the scope of the Health and Safety at Work Act 1974.

36. The Control of Major Hazards Regulations 2015 relate to the management of threshold quantities of dangerous substances identified in the regulations.

37. The Health Protection Regulations 2010 came into force to complete the modernised legal framework for health protection in England. Three sets of regulations complement the updated Public Health (Control of Disease) Act 1984, which was substantially amended by the Health and Social Care Act 2008. These are:

- The Health Protection (Notification) Regulations 2010 (SI 2010/659);
- The Health Protection (Local Authority Powers) Regulations 2010 (SI 2010/657); and
- The Health Protection (Part 2A Orders) Regulations 2010 (SI 2010/658).

38. The Clean Air Act (1993) aims to reduce pollution from smoke, grit and dust and gives local authorities powers to designate smoke control areas (HM Government of Great Britain & Northern Ireland, 1993). The Air Quality Standards Regulations 2010 transpose into English law the requirements of Directives 2008/50/EC and 2004/107/EC on ambient air quality.

39. Part III of the Environmental Protection Act 1990 discusses control of emissions (including dust, noise and light) that may be prejudicial to health or a nuisance (HM Government of Great Britain & Northern Ireland 1990).

40. The International Convention for the Prevention of Pollution from Ships (MARPOL) includes regulations aimed at preventing and minimising, both accidental and operational, pollution from ships (International Maritime Organisation 1973).

41. The revised Bathing Water Directive 2006/7/EC safeguards public health and clean bathing waters (European Parliament and Council of the European Union (EU) 2006). Bathing waters are also protected under the Water Framework Directive 2000/60/EC (European Parliament and Council of the European Union 2000).

27.4.1.2 Policy Context

42. National Policy Statements (NPS) produced by the UK Government set the policy context for the development of new energy infrastructure in the UK. ***Table 27.6*** summarises the relevant health provisions of the NPS for Overarching Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011c), which informs the NPS for Renewable Energy (EN-3) (DECC 2011b); and the NPS for Electricity Networks (EN-5) (DECC 2011a). However, EN-5 has been included under EMF due to its specific guidance in this area.

Table 27.6 Review of National Policy Statements with Regards to Health Determinants

Section	Description	Coverage in the assessment
General		
EN-1, 4.10	Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest. It plays a key role in protecting and improving the natural environment, public health and safety, and amenity, for example by attaching conditions to allow developments which would otherwise not be environmentally acceptable to proceed and preventing harmful development which cannot be made acceptable even through conditions. Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health. In considering an application for development	Potential discharges and emissions are considered in: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 19 Air Quality;*** and • ***Chapter 20 Water Resources and Flood Risk.***

Section	Description	Coverage in the assessment
	consent, the Infrastructure Planning Commission (IPC) [*now the Planning Inspectorate and the Secretary of State*] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. It should act to complement but not seek to duplicate them.	
EN-1, 4.13	As described in the relevant sections of this NPS and in the technology- specific NPSs, where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health.	Effects on human beings are considered in: • ***Section 27.6;*** and • ***Chapter 30 Tourism, Recreation and Socio-economics.***
Noise		
EN-1, 4.13	The direct impacts on health may include increased noise. The IPC will want to take account of health concerns when setting requirements relating to a range of impacts such as noise.	***Chapter 25 Noise and Vibration*** considers direct noise impacts.
EN-1, 5.11	The IPC should not grant development consent unless it is satisfied that the proposals will meet the following aims: Avoid significant adverse impacts on health and quality of life from noise; Mitigate and minimise other adverse impacts on health and quality of life from noise; and Where possible, contribute to improvements to health and quality of life through the effective management and control of noise.	Potential noise effects are considered in ***section 27.6.1.1***
EN-1, 5.11	Excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of areas of value such as quiet places and areas with high landscape quality. The Government's policy on noise is set out in the Noise Policy Statement for England. It promotes good health and good quality of life through effective noise management. Similar considerations apply to vibration, which can also cause damage to buildings. In this section, in line with current legislation, references to "noise" below apply equally to assessment of impacts of vibration.	Potential health effects are considered in ***section 27.6.1.1*** and ***section 27.6.3.1***.
Air Quality		

Section	Description	Coverage in the assessment
EN-1, 4.13	The direct impacts on health may include increased air pollution, dust or odour.	***Chapter 19 Air Quality*** considers direct air quality impacts.
EN-1, 4.13	Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refuse consents or require specific mitigation under the Planning Act 2008.	Potential health effects are considered in ***section 27.6.1.2***.
Ground and / or Water Contamination		
EN-1, 4.13	The direct impacts on health may include increased hazardous waste and substances or increased water pollution.	Direct effects are considered in: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 20 Water Resources and Flood Risk***; and • Potential health effects are considered in ***Section 27.6***
EN-1, 5.14	Government policy on hazardous and non-hazardous waste is intended to protect human health and the environment by producing less waste and by using it as a resource wherever possible. Where this is not possible, waste management regulation ensures that waste is disposed of in a way that is least damaging to the environment and to human health.	
EN-1, 5.15	Infrastructure development can have adverse effects on the water environment, including groundwater, inland surface water, transitional waters and coastal waters. During the construction, operation and decommissioning stages, it can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment. There may also be an increased risk of spills and leaks of pollutants to the water environment. These effects could lead to adverse impacts on health or on protected species and habitats and could, in particular, result in surface waters, groundwaters or protected areas failing to meet environmental objectives established under the Water Framework Directive.	
Physical Activity		
EN-1, 4.13	New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to the use of open space for recreation and physical activity.	Effects on populations are considered in: • ***Chapter 30 Tourism, Recreation and Socio-economics***; and • Potential health effects are
EN-1, 5.10	The Government's policy is to ensure there is adequate provision of high quality open space (including green infrastructure) and sports and recreation facilities to meet the needs of local communities. Open spaces, sports and recreational facilities all help to underpin people's quality of life and have a vital role to play in promoting healthy living. Green infrastructure in particular will also play an increasingly	

Section	Description	Coverage in the assessment
	important role in mitigating or adapting to the impacts of climate change.	considered in ***section 27.6.1.4.***
EN-1, 5.10	Applicants will need to consult the local community on their proposals to build on open space, sports or recreational buildings and land. Taking account of the consultations, applicants should consider providing new or additional open space including green infrastructure, sport or recreation facilities, to substitute for any losses as a result of their proposal. Applicants should use any up-to-date local authority assessment or, if there is none, provide an independent assessment to show whether the existing open space, sports and recreational buildings and land is surplus to requirements.	
Journey Times and / or Reduced Access		
EN-1, 4.13	The direct impacts on health may include increased traffic.	Direct effects are considered in ***Chapter 26 Traffic and Transport***. Potential health effects are considered in ***section 27.6.1.5***.
EN-1, 4.13	New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to transport or key public services.	
Employment		
EN-1, 4.2	To consider the potential effects, including benefits, of a proposal for a project, the IPC will find it helpful if the applicant sets out information on the likely significant social and economic effects of the development, and shows how any likely significant negative effects would be avoided or mitigated. This information could include matters such as employment, equality, community cohesion and well-being.	Employment is considered in ***Chapter 30 Tourism, Recreation, and Socio-economics.*** Potential health effects are considered in ***section 27.6.2.1***.
Electromagnetic Fields (EMF)		
EN-1, 4.13	The direct impacts on health may include increased exposure to radiation.	Potential health effects are considered in ***section 27.6.3.2***. Exposure limits are discussed in ***section 27.4.1.3.1***.
EN-5 2.10	The International Commission on Non-Ionizing Radiation Protection (ICNIRP21) developed health protection guidelines in 1998 for both public and occupational exposure. These are expressed in terms of the induced current density in affected tissues of the body, “basic restrictions”, and in terms of measurable “reference levels” of electric field strength (for electric fields), and magnetic flux density (for magnetic fields).	
EN-5 2.10	The balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease. The Health Protection Agency’s Centre for Radiation, Chemical and Environmental Hazards keeps under review emerging scientific research and/or	

Section	Description	Coverage in the assessment
	studies that may link EMF exposure with various health problems and provides advice to the Department of Health on the possible need for introducing further precautionary measures.	

27.4.1.3 Guidance

43. Planning Practice Guidance on Environmental Impact Assessment (EIA) (Ministry of Housing, Communities & Local Government 2017) explains the requirements of the Town and Country Planning (EIA) Regulations 2017. The guidance does not provide any additional information in relation to defining, scoping or assessing 'population and human health'. Regard has therefore been given to the advice provided in the Institute of Environmental Management and Assessment (IEMA), 2017: Health in Environmental Assessment, a primer for a proportionate approach (Cave et al. 2017a). PHE has also issued a briefing note on health in EIA for local public health teams (Cave et al. 2017b).

44. The approach to assessing health in EIA has also been informed by relevant UK guidance on Health Impact Assessment (HIA). In England, there is no overarching guidance for HIA. However, generic principles are evident in specialist guidance such as that by the Department of Health in relation to HIA of government policy (Department of Health 2010), or that by the London Healthy Urban Development Unit in relation to urban planning (NHS Healthy Urban Development Unit 2015). The HIA guidance is used as useful contextual guidance in the production of this PEIR chapter which is intended to provide reasoned conclusions for the identification and assessment of any likely significant effects of the proposed East Anglia TWO project on human health in compliance with the EIA Regulations 2017.

45. Guidance published by the World Bank Group (World Bank Group 2015) advises that community health and safety hazards specific to wind energy include blade or ice throw, aviation impacts, marine navigation, electromagnetic interference and radiation, public access, and abnormal load transportation. Due to the proposed East Anglia TWO project being located 31km from the coast (see ***Chapter 6 Project Description***), blade or ice throw and aviation issues are unlikely to be a concern for local populations to the proposed onshore development area. Marine navigation is considered in ***Chapter 14 Shipping and Navigation***. Abnormal loads are considered in ***Chapter 26 Traffic and Transport***.

46. PHE released guidance in 2013 regarding the health effects of exposure to electric and magnetic fields; this guidance has been used to consider the effects of EMFs in ***section 27.6.3.2***. (PHE 2013a; 2013b).

47. In March 2004, the National Radiological Protection Board, NRPB (now part of PHE), published advice on limiting public exposure to EMFs. The advice was based on an extensive review of the science and a public consultation on its website, and recommended the adoption in the UK of the EMF exposure guidelines published by the International Commission on Non-ionizing Radiation Protection (ICNIRP). The ICNIRP guidelines are based on the avoidance of known adverse effects of exposure to EMF at frequencies up to 300 GHz (gigahertz), which includes static magnetic fields and 50 Hz electric and magnetic fields associated with electricity transmission (McKinlay et al. 2004).

48. This human health assessment has had regard to the precautionary findings of the UK Stakeholder Advisory Group on Extremely Low Frequency Electric and Magnetic Fields (SAGE). SAGE was initiated by National Grid and was adopted by the Department of Health in order to provide advice to the Government (Stakeholder Advisory Group on ELF EMFs 2010).

27.4.1.3.1EMF Exposure Limits

49. In March 2004, the NRPB provided new advice to the Government, replacing previous advice from 1993, and recommending the adoption in the UK of guidelines published in 1998 by the ICNIRP (ICNIRP 1998). The Government subsequently adopted this recommendation, saying that limits for public exposures should be applied in the terms of the 1999 EU Recommendation (EU Council 1999). For static fields, the limits that apply are likewise those given in the 1999 EU Recommendation, in this case derived from 1994 ICNIRP guidelines. ***Table 27.7*** summarises the recommended values.

Table 27.7 Recommended Values for Power Frequencies

Public exposure level	Electric Fields	Magnetic Fields
Power frequency		
Basic restriction (induced current density in central nervous system)	2mA/m2	
Reference level (external unperturbed field)	5,000V/m	100μT
Field corresponding to the basic restriction	9,000V/m	360μT
Static		
Basic restriction	None	40,000 μT

50. In recommending these levels, the NRPB considered the evidence for all suggested effects of EMFs. It concluded that the evidence for effects on the nervous system of currents induced by the fields was sufficient to justify setting exposure limits, and this is the basis of their quantitative recommendations (NRPB 2004). It concluded that the evidence for effects at lower fields, for example the evidence relating to childhood leukaemia (discussed further in ***Appendix 27.1***), was not sufficient to justify setting exposure limits, but was sufficient to justify recommending that the Government consider possible precautionary actions. Precautionary measures are considered in more detail below.

51. The EMF guidelines are documented in NPS EN-5 and practical details of their application are explained in the Code of Practice, 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice' published by the Department of Energy and Climate Change (DECC 2012). It is the electricity industry's policy to comply with the Government guidelines on EMF, and this Code of Practice forms an integral part of this policy.

52. The ICNIRP guidelines (ICNIRP 1998) are set so as to prevent external exposure to EMFs that could cause currents to be induced in the body large enough to cause effects on nerves, with a substantial safety margin. These induced currents can be expressed as a current density and it is on current density that the guidelines are based. The ICNIRP guidelines recommend that the general public are not exposed to levels of EMFs able to cause a current density of more than 2mA/m^2 within the human central nervous system. This recommendation is described as the "basic restriction". The external fields that have to be applied to the body to cause this current density have to be calculated by numerical dosimetry, since in-vivo measurements of current density are not practical.

53. The ICNIRP guidelines also contain "reference levels". For the public, the reference level for electric fields is 5kV/m, and the reference level for magnetic fields is 100µT. The 1999 EU Recommendation (EU Council 1999) uses the same values as ICNIRP (ICNIRP 1998).

54. In the ICNIRP guidelines and the EU Recommendation, the actual limit is the basic restriction. The reference levels are not limits, but are guides to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

55. The Code of Practice on compliance (DECC 2012) endorses this approach and gives the values of field corresponding to the basic restriction, stating:

> "*The 1998 ICNIRP exposure guidelines specify a basic restriction for the public which is that the induced current density in the central nervous system should not exceed 2mA m^{-2}. The Health Protection Agency specify that this induced current density equates to uniform unperturbed fields of 360μT for magnetic fields and 9.0kV m^{-1} for electric fields. Where the field is not uniform, more detailed investigation is needed. Accordingly, these are the field levels with which overhead power lines (which produce essentially uniform fields near ground level) shall comply where necessary. For other equipment, such as underground cables, which produce non-uniform fields, the equivalent figures will never be lower but may be higher and will need establishing on a case-by-case basis in accordance with the procedures specified by HPA. Further explanation of basic restrictions, reference levels etc is given by the Health Protection Agency.*"

56. The Code of Practice (DECC 2012) also specifies the land uses where exposure is deemed to be for potentially a significant period of time and therefore where the public guidelines apply. These land uses are, broadly, residential uses and schools.

57. Therefore, if the EMFs produced by an item of equipment are lower than 9kV/m and 360μT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with PHE recommendations and Government policy. If the fields are greater than these values, the equipment is still compliant with Government policy if the land use falls outside the residential and other uses specified in the Code of Practice (DECC 2012) and it may still be compliant if the fields are non-uniform.

27.4.1.4 Health Priorities

58. Health priorities from the Joint Health and Wellbeing Strategy for Suffolk (Suffolk County Council 2016) and the Suffolk Joint Strategic Needs Assessment (JSNA) (Suffolk Health and Wellbeing Board and Suffolk County Council 2015) have informed this human health assessment.

59. The Joint Health and Wellbeing Strategy for Suffolk outlines the following outcomes as aims:

- Outcome 1: Every child has the best start in life;
- Outcome 2: Improving independent life for people with physical and learning disabilities;

- Outcome 3: Older people in Suffolk have a good quality of life; and
- Outcome 4: People in Suffolk have the opportunity to improve their mental health and wellbeing.

60. These outcomes are to be achieved through specific priorities for each one, with four cross cutting themes across all the outcomes; resilience for the communities, embedded prevention, addressing inequalities and health and care integration. The following priorities have the potential to be impacted by the proposed East Anglia TWO project:

- "*Physical and emotional health*" of children may be affected by noise, disturbance or air pollutants if these impacts are found to be significant. This may also be affected if access to playing fields or public rights of way are significantly affected by the proposed East Anglia TWO project;
- "*A good environment in which to live*" for older people as well as "*healthy living*" may be affected by noise, disturbance or air pollutants if these are found to be significant, as well as by any disruption to public spaces or rights or way;
- "*Improving outcomes for people with disabilities who have complex needs through working together effectively*" may be affected by potential traffic disturbance impacting on ability to access GPs, care homes, or households; and
- "*Early intervention and prevention including primary care mental health services*" to improve mental health and well-being may also be affected by traffic disruption and noise pollution.

61. Both the strategy and the JSNA highlight areas that may be affected by the proposed East Anglia TWO project. Young children and older people may be sensitive to noise and vibration impacts, especially at night when trying to sleep. The significance of potential impact sources is covered in ***Chapter 25 Noise and Vibration***.

62. Similarly, families with young children and the carers of the elderly may be impacted by traffic disturbances if they cannot easily reach facilities such as GPs, care homes, or day care. The significance of potential impact sources is covered in ***Chapter 26 Traffic and Transport***.

63. The districts that the proposed East Anglia TWO project interacts with have plentiful open space and public rights of ways which facilitate enjoyment of the open space. Reducing access to this may reduce people's ability or enthusiasm to undertake exercise and so maintain their health. The significance of potential

impact sources is covered in ***Chapter 30 Tourism, Recreation and Socio-Economics***.

64. However, the proposed East Anglia TWO project may also have positive impacts in relation to the priority areas. For example, an increase in local employment and training opportunities may provide skills for young people and income for households with children under five. In the long term, ensuring energy security through renewable generation may reduce electricity bills and allow more older people to afford sufficient energy throughout the winter.

27.4.2 Data Sources

65. There are no specific guidelines for the assessment of health impacts. The NPS EN-1 states that where a proposed project has an effect on human beings, the EIA should assess these effects for each element of that project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate.

66. Data sources relating to human health receptors are presented in the following chapters:

- ***Chapter 18 Ground Conditions and Contamination;***
- ***Chapter 19 Air Quality;***
- ***Chapter 20 Water Resources and Flood Risk;***
- ***Chapter 21 Land Use;***
- ***Chapter 25 Noise and Vibration;***
- ***Chapter 26 Traffic and Transport;***
- ***Chapter 29 Landscape and Visual Impact Assessment;*** and
- ***Chapter 30 Tourism, Recreation and Socio-Economics***.

67. This human health assessment is also informed by the following evidence sources, relevant data for which is summarised in the sections below:

- Scientific literature;
- Baseline conditions;
- Health priorities
- Project-specific consultation responses; and
- Policy context.

68. The review of evidence sources has been structured using the following seven themes that cut across the scope of construction, operational and decommissioning effects of the proposed East Anglia TWO project:

- Noise;
- Air quality;
- Ground and/or water contamination;
- Physical activity;
- Journey times and/or reduced access;
- Employment; and
- EMF.

27.4.2.1 Scientific Literature

69. An evidence base of publicly available information has been used to support the scoping and assessment conclusions of this human health chapter. Evidence statements have been extracted from a review of abstracts and full articles published in English on PubMed from the past five years. The review is not exhaustive and aims to provide a summary only of the key issues relevant to the scope of this assessment. This is provided in ***Appendix 27.1***.

27.4.2.2 Baseline Conditions

70. Health Profiles (Public Health England 2017a), Health Assets Profiles (Public Health England 2017b) from PHE and Wider Determinants of Health (Public Health England 2017c) from PHE have informed the local, regional and national baseline for assessment.

71. Office of National Statistics (ONS) and Nomis official labour market statistics (Nomis 2017) have also informed the baseline. Whilst more recent statistics have been collected for some socio-economic variables, the 2011 census is considered an appropriate baseline for use in this chapter as it provides consistent comparative data across the population groups used in the assessment. Details of the statistics used are provided in ***Appendix 28.2***.

72. The Index of Multiple Deprivation (IMD) 2015 has been consulted and referenced as appropriate, including sub-domains and underlying indicators (Department of Communities and Local Government 2015).

73. Data sources are provided in ***Table 27.8*** below.

Table 27.8 Data Sources Features

Data	Year	Coverage	Confidence	URL Link
Children living in low income families	2015	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/children%20in%20low%20income%20families#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/10101/age/169/sex/4
Child obesity in Year 6 of school	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/childhood%20obesity#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90323/age/201/sex/4
GCSEs achieved (5A* - C including English and Maths)	2015/ 2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/GCSE%20attainment#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92199/age/175/sex/4
Current smokers as a proportion of the population	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/smokers#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92304/age/168/sex/4
Levels of breastfeeding initiation	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/breastfeeding#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/20201/age/1/sex/2
Life expectancy for women (at birth) &	2014-2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/life%20expectancy#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90366/age/1/sex/2
Life expectancy for men (at birth)	2014-2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/life%20expectancy#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90366/age/1/sex/1
Rate of alcohol-related harm hospital stays (narrow) – per	2016/ 2017	County and District	High	Public Health England Public Health Profiles

Data	Year	Coverage	Confidence	URL Link
100,000 of the population				https://fingertips.phe.org.uk/search/alcohol%20related%20harm#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/91414/age/1/sex/4
Emergency Hospital Admissions for Intentional Self-Harm – per 100,000 of the population	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/self%20harm#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/21001/age/1/sex/4
Rate of smoking related deaths	2014-2016	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/smoking%20mortality#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/113/age/202/sex/4
Estimated levels of adult excess weight	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/adult%20excess%20weight#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/93088/age/168/sex/4
Estimated levels of adult smoking	2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/adult%20smoking#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92443/age/168/sex/4
The rate of people killed and seriously injured on roads (per 100,000 of the population)	2014-2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/killed%20and%20seriously%20injured%20on%20roads#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11001/age/1/sex/4
Rate of statutory homelessness (per 1,000 households)	2015/ 2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/statutory%20homelessness#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11501/age/-1/sex/-1
Rate of violent crime (including sexual violence) per 1,000 of the population	2016/ 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/rate%20of%20violent%20crime#page/3

Data	Year	Coverage	Confidence	URL Link
				/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11202/age/1/sex/4
Rates of long term unemployment	August 2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/unemployment#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/734/age/204/sex/4
Rate of early deaths (under 75) from cardiovascular diseases – per 1,000 of the population	2014-2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/cardiovascular#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/40401/age/163/sex/4
Rate of early deaths (under 75) from cancer – per 1,000 of the population	2014-2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/cancer#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/40501/age/163/sex/4
Annual Mean Concentration of human-made fine particulate matter	2016	District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/particulate%20matter#page/1/gid/1/pat/6/par/E12000006/ati/101/are/E07000205/iid/92924/age/-1/sex/-1
State of Suffolk Report	2015	County	High	Suffolk Joint Strategic Needs Assessment https://www.healthysuffolk.org.uk/uploads/2015-State-of-Suffolk-Exec-Summary-Interactive.pdf
Suffolk Joint Health and Wellbeing Strategy	2012	County	High	https://www.healthysuffolk.org.uk/uploads/Joint-Health-and-Wellbeing-Strategy-for-2016-2019.pdf
Percentage of physically active adults	2016/2017	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/population%20active#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/93014/age/298/sex/4
Sports club membership: % of population 16+	2015/2016	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/sports%20club%20membership#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92619/age/164/sex/4

Data	Year	Coverage	Confidence	URL Link
Utilisation of outdoor space for exercise/health reasons	2015-2016	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/outdoor%20space%20for%20exercise#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11601/age/164/sex/4
Population density	2010	District, County and Country	High	Office for National Statistics https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationdensitytables

27.4.3 Impact Assessment Methodology

27.4.3.1 General Approach

74. This section sets out the methods for providing reasoned conclusions for the identification and assessment of any likely significant effects of the proposed East Anglia TWO project on human health (as required by the EIA Regulations 2017). This methodology was submitted to PHE in August 2018 (Royal HaskoningDHV 2018). The Environmental Hazards and Emergencies Department, on behalf of PHE, agreed to all aspects of the methodology on 19 September 2018 (see ***Table 27.1***).

75. Consistent with the objective of EIA (as set out in EIA Directive 2014/52/EC), the methods identify effects that provide, or are contrary to providing, a high level of protection to human health. This includes reasoned conclusions in relation to health protection, health improvement and/or improving services.

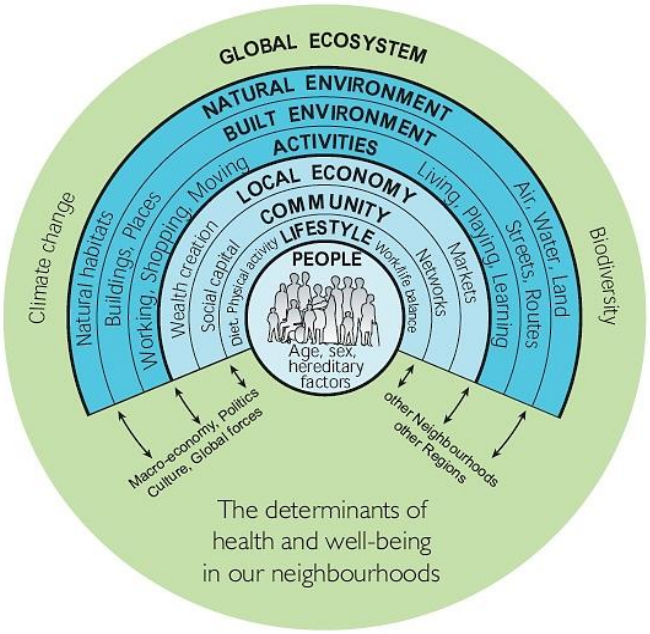

Plate 27.1 Wider Determinants of Health (Source: Based on the Dahlgren and Whitehead (1991) diagram as amended by Barton and Grant (2006) and advised by Cave et al. (2017))

76. The methods provide a framework to identify (at both scoping and assessment):

- The 'likelihood' of the proposed East Anglia TWO project having an effect on health; and
- If an effect is likely, whether it may be 'significant' in the terms of the EIA regulations.

77. Effects are considered with regards the general population and vulnerable groups. Populations are considered at regional and local levels.

78. In line with best practice guidance from the WHO (WHO 2012) and PHE (PHE 2017c), "health determinants" (***Plate 27.1***) are considered to understand effects of human health and wellbeing. The methodology uses emerging best practice published by the IEMA in line with the 'Health in Environmental Impact Assessment: A Primer for a Proportionate Approach' (Cave et al. 2017a).

27.4.3.2 Health Determinants

79. Human health can be influenced by a wide variety of direct and indirect factors, from controllable factors such as lifestyle to uncontrollable factors such as genetics. The influences and effects can be wide-ranging and are likely to vary between individuals. In determining 'physical, mental and social wellbeing', external contributory factors, known as 'determinants', are considered. Determinants are a reflection of a mix of influences from an individual's society and environment.

80. The 'wider determinants of health' model is used to conceptualise how human health spans environmental, social and economic aspects. This is illustrated in ***Plate 27.1***.

81. Influences that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility, and exposure.

27.4.3.3 Likelihood

82. The first issue to consider in scoping or assessment is the likelihood of the proposed East Anglia TWO project having an effect. A likely effect should be both plausible and probable.

83. Plausible relates to there being a relevant source, pathway and receptor (see discussion of health pathways below).

84. Probable relates to a qualitative judgement to exclude those effects that could only occur under certain very rare conditions, except where these relate to the projects vulnerability to major accidents or disasters (as required by Part 1 paragraph 4(4) EIA Regulation 2017)[5].

85. The term 'health pathways' describe how a specific activity of the proposed East Anglia TWO project could change a determinant of health and potentially result in a change in health outcomes (an effect). Health pathways are considered with regards the source, pathway, and impact as follows:

- A 'source' represents an activity or factor that could affect the health outcomes of a receptor population;
- A 'pathway' describes the method or route by which the 'source' could affect the 'receptor' (either causation or association); and
- A 'receptor' is the recipient of an effect from the 'source', via the 'pathway'.

86. ***Table 27.9*** shows how the Source-Pathway-Receptor model can be used to identify plausible health effects. Only plausible health effects are considered within the assessment.

[5] ***Chapter 6 Project Description*** includes a section on Major Hazards and Disasters. This finds that there are no causal pathways between the project and major accidents.

Table 27.9 Use of a Source-Pathway-Receptor Model to Identify Plausible Health Effects

Source	Pathway	Receptor	Plausible health effect?	Rationale
×	✓	✓	No	There is not a clear source from where a potential health effect could originate.
✓	×	✓	No	The source of a potential health effect lacks a means of transmission to a population.
✓	✓	×	No	Receptors that would be sensitive and vulnerable to the health effect are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean an effect is a likely significant effect; the probability of the effect should be qualitatively considered and a professional judgement reached on the significance of effects that are considered likely.

27.4.3.4 Significance

87. A determination of significance is required for compliance with the EIA Regulations 2017 when a potential effect of the proposed East Anglia TWO project is likely (or relates to the project's vulnerability to major accidents or disasters).

88. The determination of significance has two stages:

- Firstly, the sensitivity of the receptor affected, and the magnitude of the plausible health effect upon it are characterised. This establishes whether there is a relevant population and a relevant change in health outcomes to consider; and
- Secondly, a professional judgement is made as to whether or not the change in a population's health is significant. This judgement is based on the collection and presentation of data to evidence reasoned conclusions.

89. The final significance is provided based on a comparison of a number of factors following clear guiding questions, as set out below. This is a variation from the general approach set out in ***Chapter 5 EIA Methodology*** so as to be more relevant to impacts to human health and is as described in the Human Health Method Statement (Royal HaskoningDHV 2018). PHE have been consulted and agree that this approach is appropriate for the assessment of significance for human health.

27.4.3.4.1Sensitivity

90. ***Table 27.10*** sets out factors characterising sensitivity for human health. The table informs the professional judgement on scoring high, medium, low or negligible sensitivity. In line with best practice, a formulaic matrix approach to determining sensitivity has been avoided. The 'higher' and 'lower' sensitivity characterisations represent instructive positions on a spectrum that would also include more extreme, as well as intermediate, positions. Most situations have a mix of higher and lower characterising factors so a balanced expert view of sensitivity is taken.

Table 27.10 Factors Characterising Population Sensitivity (Cave et al. 2017a)

	Inequalities	Deprivation	Health status	Life stage	Outlook
Higher sensitivity	High levels of inequalities or inequities.	High levels of overall deprivation or a high level of deprivation for a relevant sub-domain of the indices of multiple deprivation. High levels of poor access to financial, social or political resources.	High levels of poor health and/or disability (particularly multiple or complex long-term health conditions). High reliance on (or low capacity in) healthcare facilities, staff or resources.	Presence of dependants (particularly the elderly or children), pregnant women, shift workers or the economically inactive.	Strong views or high degrees of uncertainty led about a development. Population may anticipate risks to their health and thus be affected by not only actual changes, but also by the possibility of change.
Lower sensitivity	Low levels of inequalities or inequities.	Low levels of overall deprivation or a low level of deprivation for a relevant sub-domain of the indices of multiple deprivation. Good access to financial, social or political resources.	Low levels of poor health and/or low levels of disability. Low reliance on (or high capacity in) healthcare facilities, staff or resources.	Predominantly a working age population in steady good quality employment.	No indication that strong views are held about a development. People are well informed of the issues and potential effects.

91. The assessment characterises the relevant populations for each health issue. For each category, the text sets out detail on the one or more relevant factors from ***Table 27.10*** that informed the score.

27.4.3.4.2Magnitude

92. ***Table 27.11*** sets out factors characterising magnitude for human health. The table informs the professional judgement on assigning scoring of large, medium, small or negligible magnitude. In line with best practice a formulaic matrix approach to determining magnitude has been avoided. The 'larger' and 'smaller' magnitude characterisations represent instructive positions on a spectrum that would also include more extreme, as well as intermediate, positions.

Table 27.11 Factors Characterising Magnitude (Cave et al. 2017a)

	Severity	Extent	Frequency	Reversibility	Exposure
Larger magnitude	Large change in the risk of developing a new health condition (or injury) or in the progression of an existing condition. Large change in symptoms, quality of life or day-to-day functioning. Large change in inequalities.	Most members of the relevant population affected or vulnerable. Substantial population displacement or influx.	Continuous or daily effects with chronic (long term) changes in health outcomes.	Permanent change in health outcomes once change ceases. Intergenerational effects.	A low (or high) concentration over a long time, or a high concentration over a short time. Low (or high) exposure to a large population or high exposure to a small population. A high degree of resource sharing with the development.
Smaller magnitude	Small change in the risk of developing a new health condition (or injury) or in the progression of an existing condition. Small change in symptoms, quality of life or day-to-day functioning. Small change in inequalities.	Few members of the relevant population. Little change in population.	Monthly or yearly affects with acute (short term) changes in health outcomes.	Change in health outcomes reverses once change ceases. No intergenerational effects.	A low concentration over a short time. Low exposure to a small population. A low degree of resource sharing with the development.

93. The assessment characterises the relevant changes in health outcomes for each health issue. For each professional judgement on magnitude, the text sets out detail on the one or more relevant factors from ***Table 27.11*** that informed the score.

27.4.3.4.3Judgement Framework for Significance

94. Judgement of significance is made within the context of PHE's statement (***Table 27.1***) that *"significant impacts are unlikely to arise from installations which employ Best Available Techniques and which meet regulatory requirements concerning emission limits and design parameters."*

95. Therefore, a formulaic matrix approach to determining significance has been avoided. This is because attempting to categorise significance from negligible to major would require quantitative data to a level of detail that would be disproportionate to the likely impacts. Therefore, impacts are presented as either not significant or significant. If a health outcome is found to be significant then further assessment will be undertaken to understand the magnitude of significance.

96. Following the general approach described above, a source - pathway - receptor relationship is established followed by a consideration of magnitude and sensitivity. Finally, a professional judgement is made using a framework for reporting (guide questions set out in ***Table 27.12***) on a range of data sources to ensure reasoned and robust conclusions are reached.

Table 27.12 Human Health Guide Questions for Determining Significance (Cave et al. 2017a)

Evidence sources	Guide questions
Scientific literature	Is there a sufficient strength of evidence from sufficiently high quality studies to support an association between the proposed East Anglia TWO project change, a relevant determinant of health and a relevant health outcome? Does the literature indicate thresholds or conditions for effects to occur? Are particular population groups identified as being particularly susceptible?
Baseline conditions	Are relevant sensitivities or inequalities identified in the scientific literature present? Does the baseline indicate that conditions differ from relevant local, regional or national comparators? Are their geographic or population features of the baseline that indicate effects could be amplified?
Health priorities	Have local, regional or national health priorities been set for the relevant determinant of health or health outcome (e.g. in Joint Strategic Needs Assessments or in Health and Wellbeing Strategies)?
Consultation responses	Has a theme of local, regional or national consultation responses related to the relevant determinant of health or health outcome?
Regulatory standards (if appropriate)	Is the change one that would be formally monitored by regulators? Are there regulatory or statutory limit values set for the relevant context? Has EIA modelling predicted change that exceed thresholds from the scientific literature or set by regulators? Are there relevant international advisory guideline limit values (e.g. by the World Health Organisation)?
Policy context	Does local, regional or national government policy raise particular expectations for the relevant proposed East Anglia TWO project change, determinant of health or health outcome (e.g. levels should be as low as reasonably practicable)? Is there a relevant international policy context (e.g. treaties or conventions)?

97. The text of the assessment section provides a structured discussion that responds to each of these questions for each health issue. The discussion provides reasoned conclusions for the professional judgement as to whether in EIA terms an issue is significant, or not. Where appropriate, variation expressed in each evidence source has been reported. This approach is considered proportionate and in line with best practice for the consideration of human health in EIA.

98. Ultimately for human health, a likely significant health effect is one that should be brought to the attention of the determining authority, as the effect of the proposed East Anglia TWO project is judged to provide, or be contrary to providing, a high level of protection to human health. This may include reasoned conclusions in relation to health protection, health improvement and/or improving services.

99. Where significant adverse effects are identified, mitigation has been considered to reduce the significance of such effects. Similarly, enhancements have been considered where significant and proportionate opportunities to benefit population health have been identified. The residual effects represent the output of iterative assessment, taking into consideration the mitigation and enhancement measures.

100. This assessment takes as its starting point the residual effects as assessed and determined in other relevant EIA topic chapters. This includes taking into account relevant embedded and standard good practice mitigation.

27.4.3.5 Population Conclusions

101. A population health approach has been used, as it would be disproportionate to reach conclusions on the potential health outcomes of individuals. To take account of potential inequalities, where appropriate, conclusions on a particular health issue have been reached for more than one population. For example:

- One conclusion for the general population (or for a defined area); and
- A second separate sub-population conclusion for relevant vulnerable group (as a single defined class of sensitivities for that issue).

27.4.4 Cumulative Impact Assessment

102. The human health chapter takes a different approach to the methodology used for the Cumulative Impact Assessment (CIA) described in ***Chapter 5 EIA Methodology***.

103. The cumulative assessment considers the inter-relationships between health effects both from within the proposed East Anglia TWO project together with effects from other projects. These are considered for:

- Project geographies:
  - Landfall;
  - Cable route;
  - Onshore substation;
  - National Grid infrastructure; and
  - Locally, regional, and nationally.
- For the following vulnerable populations:
  - Children and young people;
  - Older people (over 65 years old);
  - People with existing poor health; and
  - People living in deprivation.

104. Firstly, the intra-project cumulative effects are considered. The aim of this is step is to understand if different effects on health determinants from the proposed East Anglia TWO project would cumulatively create a larger health effect, an additive effect. For example, at a particular location within the proposed onshore development area it considers if changes to noise levels, traffic density, and air quality combine to provide a more significant effect than as individual impacts.

105. Secondly the inter-project cumulative effects are considered. As with other chapters, projects are screened for assessment based on a list agreed with relevant stakeholders. Then projects are considered for cumulative effect at different locations and for different vulnerable populations.

27.4.5 Transboundary Impact Assessment

106. The proposed East Anglia TWO project is required to consider the possibility of significant transboundary impacts on other European Economic Area (EEA) member states under the Espoo Convention (see ***Chapter 5 EIA Methodology***). However, the assessment is undertaken using the Rochdale Envelope approach that accepts certain details of the proposed East Anglia TWO project will not be available at early stages of development. The Planning Inspectorate Advice Note 12 Transboundary Impacts and Process (The planning Inspectorate 2018), includes Annex 1, The Inspectorate's long form transboundary screening proforma. This indicates that Transboundary Screening focusses on the impact pathways relating to use of natural resources;

production of waste; pollution and nuisances; risk of accidents; and use of technologies. But primarily focusses on the impact on important environmental areas.

107. Some infrastructure and labour are likely to be procured from other EEA states, particularly with regards elements of the offshore supply chain. Until the procurement process is undertaken it is not possible to estimate what the specific non-UK input would be. Therefore, it is not possible to assess the characteristics outlined in Annex 1 of Advice Note 12 (The Planning Inspectorate 2018).

108. It is unlikely that employment as a result of international procurement would lead to indirect adverse health transboundary effects. Furthermore, the offshore supply chain is likely to originate in EU countries such as Germany, the Netherlands, or Spain. As such, environmental impacts as a result of manufacturing and employment are unlikely to be significant because they would be subject by relevant national regulations derived from EU Directives.

109. The onshore construction elements of the proposed East Anglia TWO project are entirely present within the UK so it is not anticipated that significant direct adverse health effects on neighbouring countries will arise.

110. This approach follows the method statement agreed with PHE. Given the above, transboundary impacts are therefore not considered further within this assessment.

27.5 Existing Environment

27.5.1 General

111. The onshore areas associated with the proposed onshore development area are predominantly rural in nature typified by small villages and hamlets and individual residential properties. The landfall and first, approximately, 3km of the onshore cable route fall within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB). The onshore cable route itself runs to the south of the villages of Aldringham and Knodishall Common, with the onshore substation and National Grid substation being located to the west of Knodishall Common, and to the east of the village of Friston, on agricultural land between them. The nature of the area is rural, with Knodishall Common and Thorpeness containing the largest concentration of residential properties.

112. The primary sources of data used for the existing environment are:

- 2011 Census data (provided by ONS and detailed in ***Appendix 27.2***) for characterisation of site specific populations; and

- Public health statistics from PHE and Annual Population Survey data (from ONS) to characterise populations at a County and District level.

113. The population within these areas has moderate population growth, with the projected growth to 2026 similar to the average for England projected between mid-2016 and mid-2026; 5.9% and 4.5% respectively (ONS 2018).

114. All areas considered above have a higher proportion of retirement-aged people in relation to their working age populations when compared with the national UK averages.

115. Much of the onshore infrastructure is largely routed through agricultural land, but will pass close to built-up areas at Knodishall Common, as well as some individual properties.

116. Individual receptors that are sensitive to potential health effects from the construction phase have been discussed in the other PEIR chapters (such as ***Chapter 19 Air Quality*** and ***Chapter 25 Noise and Vibration***). Sensitive receptors are typically associated with fixed infrastructure such as residential properties, schools, hospitals, footpaths, cycleways etc. This human health chapter considers population group effects, rather than individual receptors.

27.5.1.1 Suffolk County

117. The health of people in Suffolk is varied compared to the England average (***Table 27.13***), but is only worse on two of the parameters listed in ***Table 27.13***[6].

118. The relative deprivation for Suffolk County is shown in ***Plate 27.2***[7] (Suffolk Observatory 2015). This shows that relative deprivation of LSOAs in Suffolk County varies across the county and thus inequality is high.

[6] The colour coding is as follows: Blue = better than the average for England, Orange = there is no statistically significant difference between Suffolk and England, Red = worse than the average for England, White = no statistical comparison possible.
[7] For larger areas, the ONS considers the proportion of LSOAs within the area that lie within each decile. Decile 1 represents the most deprived 10% of LSOAs in England while decile 10 shows the least deprived 10% of areas.

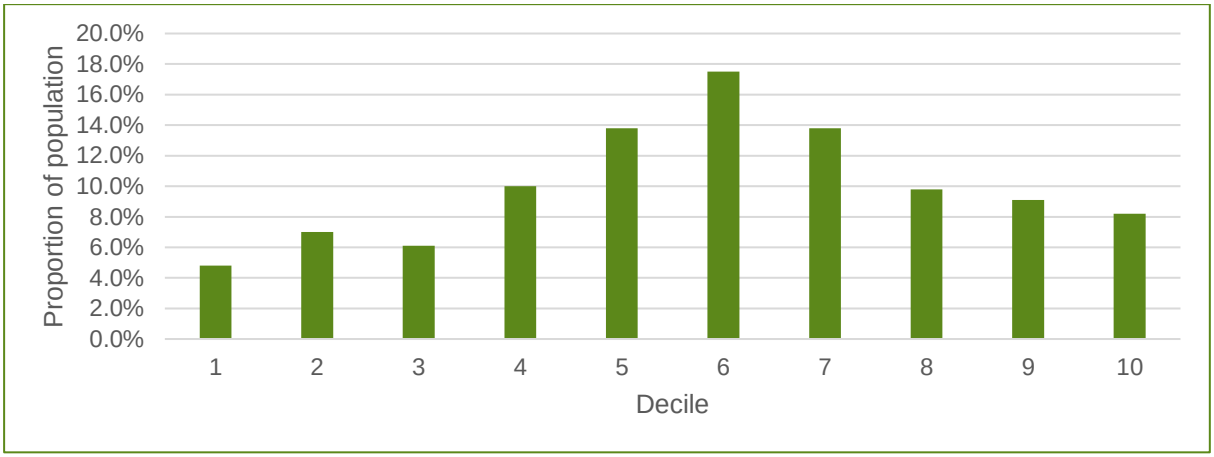

Plate 27.2 Proportion of LSOAs in Suffolk by IMD Decile (Suffolk Observatory 2015)

119. Health priorities in Suffolk are giving children the best start in life, increasing activity levels among all age groups, ensuring older people have a good quality of life, improving mental health and wellbeing and improving independent life for people with physical and learning disabilities.

Table 27.13 Health of People in Suffolk County

Factor	Suffolk County	Comparison to England average
Health of Children		
Children live in low income families	13.6% (16,975)	Better than England at 16.8%
Child obesity in Year 6 of school	17.2% (1,226)	Better than England 20.0%
Alcohol specific hospital admissions among those under 18 (per 100,000 of the population)	33.4 (152)	No significant difference to England at 34.2
GCSE attainment: 5A*-C including English and Maths	53.8% (3,853)	Worse than England at 57.8%
Smokers as a proportion of the population	14.6%	Better than England at 15.6%
Levels of breastfeeding initiation	77.3% (5,772)	Better than England at 74.5%
Health of Adults		
Life expectancy for women (at birth)	84.2	Better than England at 83.1
Life expectancy for men (at birth)	80.8	Better than England at 79.5
Rate of alcohol-related harm hospital stays (per 100,000 of the population)	568	Better than England at 636
Rate of self-harm hospital stays (per 100,000 of the population)	200.6 (1,396)	Worse than England at 185.3
Rate of smoking related deaths (per 100,000 of the population, aged 35+)	229.0 (3,464)	Better than England at 272.0
Estimated levels of adult excess weight	61.5%	No significant difference to England at 61.3%

Factor	Suffolk County	Comparison to England average
Estimated levels of adult smoking	13.9% (83,263)	No significant difference to England at 14.9%
The rate of people killed and seriously injured on roads (per 100,000 of the population)	34.0 (756)	Better than England at 39.7
Rate of statutory homelessness (rate per 1,000 households)	1.7 (545)	No statistical comparison possible. England at 3.3
Rate of violent crime (including sexual violence) – per 1,000 of the population	19.4 (14,388)	No statistical comparison possible. England at 20.0
Long term unemployment	0.23% (1,025)	No significant difference to England at 0.37%
Rate of early deaths (under 75) from cardiovascular diseases – per 100,000 of the population	61.2 (1,322)	Better than England at 73.5
Rate of early deaths from cancer (0-64)	40.2% (373)	No significant difference to England at 37.0%
The rate of complaints about noise per year 2015/16	4.1	Better than England at 6.3

27.5.1.2 Suffolk Coastal District

120. The health of people in the Suffolk Coastal District is varied compared with the England average, although is only worse for one parameter (***Table 27.14***).

121. The relative deprivation for Suffolk Coastal District is shown in ***Plate 27.3*** (Suffolk Observatory 2015). For larger areas, the ONS considers the proportion of LSOAs within the area that lie within each decile. Decile 1 represents the most deprived 10% of LSOAs in England while decile 10 shows the least deprived 10% of areas. This shows that the majority of LSOAs in Suffolk Coastal are within the 50% least deprived LSOAs in England and that inequality across the district is relatively low.

122. The proposed onshore development area is completely within the Aldeburgh ward where 66.7% of LSOAs are in decile 7 of 10 and 33.3% are in decile 8 of 10 (Suffolk Observatory 2015). This shows that the LSOAs within the vicinity are generally within the 40% least deprived in England.

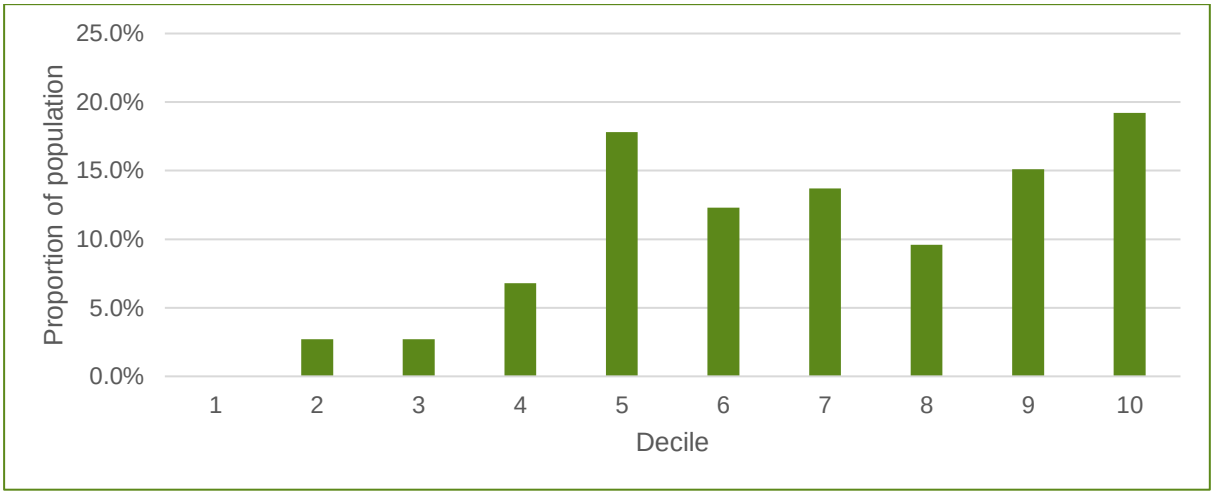

Plate 27.3 Proportion of LSOAs in Suffolk Coastal by IMD Decile (Suffolk Observatory 2015)

Table 27.14 Health of People in the Suffolk Coastal District

Factor	Suffolk Coastal District	Comparison to England average
Health of Children		
Children live in low income families	23.4% (4,090)	Worse than England at 16.8%
Child obesity in Year 6 of school	15.4% (181)	Better than England at 20.0%
Alcohol specific hospital admissions among those under 18 (per 100,000 of the population)	31.5 (23)	No significant difference to England at 34.2
GCSE attainment: 5 A*-C including maths and English	60.2% (738)	No significant difference to England at 57.8%
Smokers as a proportion of the population	12.3%	Better than England at 15.6%
Health of Adults		
Life expectancy for women (at birth)	84.7	Better than England at 83.1
Life expectancy for men (at birth)	81.8	Better than England at 79.5
Rate of alcohol-related harm hospital stays (narrow) – per 100,000 of the population	575	Better than England at 636
Emergency Hospital Admissions for Intentional Self-Harm – per 100,000 of the population	182.7	No significant difference to England at 185.3
Rate of smoking related deaths	Not available	N/A
Estimated levels of adult excess weight	56.0%	No significant difference to England, at 61.3%
Estimated levels of adult smoking	9.3% (9,601)	Better than England 14.9%
The rate of people killed and seriously injured on roads (per 100,000 of the population)	32.0	Better than England at 39.7

Factor	Suffolk Coastal District	Comparison to England average
Rates of sexually transmitted infections and TB	Not available	N/A
Rate of statutory homelessness (per 1,000 households)	0.1 (8)	Lower than England at 2.5
Rate of violent crime (including sexual violence) per 1,000 of the population	12.1 (1,516)	Better than England at 20.0
Rates of long term unemployment	Not available at district level	N/A
Rate of early deaths (under 75) from cardiovascular diseases – per 1,000 of the population	49.4 (201)	Better than England at 73.5
Rate of early deaths (under 75) from cancer – per 1,000 of the population	110.2 (461)	Better than England at 136.8
The rate of complaints about noise per year 2015/16	4.0	Better than England at 6.3

27.5.2 Noise

123. Noise effects are considered at the site-specific level (representative of landfall, onshore cable route, and onshore substation, see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

124. The environmental baseline for noise has been provided in ***Chapter 25 Noise and Vibration***.

125. People who spend extended periods at home may experience greater noise exposure durations than those who are absent during normal working hours (***Table 27.15***).

Table 27.15 Summary of Baseline Relevant to Noise and Air Quality[8]

Project location	Landfall	Proposed onshore development area		Suffolk Coastal	National
Representative LSOA (see ***Figure 27.1***)	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E	Suffolk Coastal average	England average
Households have no adults in employment	56.0%	37.8%	37.4%	10.3%	14.0%

[8] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

Project location	Landfall	Proposed onshore development area		Suffolk Coastal	National
Households include dependent children	10.5%	21.7%	20.5%	32.2%	38.4%
Percentage of population with a long-term health problem or disability (2011 census)	30.9%	29.3%	27.2%	18.5%	17.6%
People aged over 65 years old	50.8%	35.1%	32.5%	26%	17.6%
People report working mainly at or from home	12%	7.4%	7.4%	In 2011 census, 8,232 = 14%	5.4%
Deprivation can increase sensitivity to change					
For overall deprivation[9] where 1 is the most deprived LSOA[10]	23,277	21,985	16,821	240	32,844 LSOAs 326 Districts
Relative deprivation by LSOA or District in England[11]	Amongst the 30% least deprived LSOA	Amongst the 40% least deprived LSOA	Amongst the 50% least deprived LSOA	Amongst the 30% least deprived Districts	n/a

126. The measured indicators that are available for noise effects are not available for smaller areas such as LSOAs. Therefore, the baseline exposure to transport related noise at the regional (County) level, is considered representative of the smaller scale LSOA areas in this region. This indicates that 2.7% of people are exposed to road, rail and air transport noise of 65 decibels (dB(A)) or more, during the daytime, compared to an average of 5.2% in England (PHE 2018a and 2018b).

127. The indicator for night-time exposure to noise is also reported only on a regional (County) level, and indicates that 3.9% of people in Suffolk are exposed to road, rail and air transport noise of 55dB(A) of more during the night-time, compared to an average of 8.0% for England. The most recent Census data available is from 2011 (PHE 2018a and 2018b).

[9] The index of multiple deprivation is comprised of domains for: income; employment; education, skills and training; health deprivation and disability; crime; barriers to housing and services; and living environment.
[10] Ministry of Housing, Communities & Local Government, 2015, English Indices of deprivation 2015. Available at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015
[11] When compared against the other 32,844 LSOAs or 326 Districts respectively.

128. Data from 2015/16 at the local level (***Table 27.14***) indicates a baseline of approximately 4.0 complaints about noise per year per thousand of the population in the Suffolk Coastal District (compared to an estimated value of 5.0 per thousand of the population in England).

27.5.3 Air Quality

129. Air quality effects are expected at the site specific level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

130. As with potential noise disturbance, people who spend extended periods at home (within range of potential effects) may experience greater periods of air pollutant exposure than those who are absent during normal working hours (as described in ***Table 27.15***).

131. The environmental baseline for air quality has been provided in ***Chapter 19 Air Quality***. The assessment concluded that the short term particulate matter (PM_{10}) objective was predicted to be met at all modelled locations.

132. Data from 2015 at the local level indicates a baseline annual mean concentration of human-made fine particulate matter ($PM_{2.5}$), as shown in ***Table 27.16***. In comparison to target thresholds these baselines are well below the UK Air Quality Objectives (AQO) threshold but close to the WHO guide value (Public Health England 2018a and 2018b).

Table 27.16 Summary of Baseline for Air Quality[12]

	Suffolk Coastal	England
Annual mean concentration of human-made fine particulate matter ($PM_{2.5}$)	9.1 µg/m^3	9.3 µg/m^3
UK AQO target threshold	25 µg/m^3	
WHO guide value	10 µg/m^3	

27.5.4 Ground and / or Water Contamination

133. The environmental baseline for ground conditions and water resources has been provided in ***Chapter 18 Ground Conditions and Contamination*** and ***Chapter 20 Water Resources and Flood Risk*** respectively.

[12] Public Health England, 2018. Wider Determinants of Health. Available at: https://fingertips.phe.org.uk/profile/wider-determinants/data#page/3/gid/1938133043/pat/6/par/E12000006/ati/101/are/E07000205/iid/92924/age/-1/sex/-1

134. The potential for ground disturbance of historic contamination or new spills of pollutants (such as fuel or oil) to affect communities is dependent on proximity and behavioural exposure influences. This may include use of bathing waters or encountering in situ or mobilised contamination (dust or aerosols) whilst in the outdoor environment.

135. Children are more vulnerable to water contamination compared to adults as, in proportion to their body weight, they would ingest comparatively more contaminant than adults. Thus, the proportion of the population who are children and the overall population density is described in ***Table 27.17***.

Table 27.17 Summary of Population Baseline Relevant for Water Contamination

Project location	Landfall	Proposed onshore development area		Suffolk Coastal	National
Representative LSOA	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E	Suffolk Coastal	England average
Resident population aged under 16 at the 2011 Census[13]	9.7%	12.5%	13.1%	17.6%	19%
	Lower than average for England	Lower than average for England	Lower than average for England	Lower than average for England	
Resident population aged under 16 in 2017[14]	9.7%	12.5%	13.1%	16.7 %	19.1%
Population density (persons per km^2)[15]	15.05	7.83	38.71	139	401
	Much lower average for England	Much lower average for England	Much lower average for England	Much lower average for England	

[13] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

[14] ONS, 2017, Lower Super Output Area Mid-Year Population Estimates (supporting information). Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates

[15] ONS, 2017, Lower Super Output Area Population Density (National Statistics). Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareapopulationdensity

27.5.5 Physical Activity

136. Physical activity effects are expected at the site-specific level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

137. On a district level (***Table 27.18***), the proportion of people reporting their health to be very good or good is equal to the average for England. The proportion reporting fair health is slightly above average compared to the average for England. The proportion of people reporting bad or very bad health is slightly lower than the average for England. This is consistent with a similar proportion of people reporting that their day-to-day activities are not limited compared to England. This is despite the slightly older age profile of the area compared to England, which may indicate that the health strategies have thus far been effective.

Table 27.18 Summary of Baseline for Physical Activity at LSOA and District Level[16]

Project location	Landfall	Proposed onshore development area		Suffolk Coastal	National
Representative LSOA	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E		England average
People reporting their health is very good or good	73.5%	77%	81.2%	81.2%	81%
Proportion reporting fair health	20.6%	17.3%	13.8%	13.8%	13%
Proportion of people reporting bad or very bad health	5.9%	5.6%	5%	4.5%	5.4%
People reporting that their day-to-day activities are not limited	71.4%	78.5%	80.2%	81.5%	82.4%
Population aged over 65	50.8%	35.1%	32.5%	26%	17.6%
Health deprivation can increase sensitivity to change					
For overall deprivation[6] where 1 is the most deprived LSOA	23,277	21,985	16,821	240	32,844 LSOAs 326 Districts

[16] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

Project location	Landfall	Proposed onshore development area		Suffolk Coastal	National
Relative deprivation by neighbourhoods in England	Amongst the 30% least deprived LSOA	Amongst the 40% least deprived LSOA	Amongst the 50% least deprived LSOA	Amongst the 30% least deprived Districts	n/a
Access to a vehicle is indicative of being able to access alternative physical activity opportunities					
Households have a vehicle (2011 census)	86.4%	90.1%	92.9%	86.0%	74%

138. On a regional level (Suffolk County) (***Table 27.19***), the baseline for physical activity shows a slightly higher percentage of people active in some way in Suffolk Coastal to average for England. This correlates with the slightly higher percentage of adults using sports club or outdoor spaces for exercise (***Table 27.20***).

Table 27.19 Summary of Baseline for Physical Activity at District and County level[17]

	Suffolk Coastal	Suffolk	England
Physically active adults	67.0%	66.8%	66.0%
Physically inactive adults	22.5%	21.7%	22.2%
Adults who do any walking, at least five times per week	47.3%	49.1%	50.6%
Adults who do any walking, at least once per week	84.3%	80.2%	80.6%
Adults who do any cycling, at least three times per week.	4.8%	5.4%	4.4%
Adults who do any cycling, at least once per month	16.7%	16.9%	14.7%

[17] Public Health England, 2018, Physical Activity. Available at: https://fingertips.phe.org.uk/profile/physical-activity/data#page/1/gid/1938132899/pat/6/par/E12000006/ati/101/are/E07000205

Table 27.20 Summary of Baseline for Exercise Types at County level[18]

	Suffolk Average	England Average
Percentage of people aged 16+ with sports club membership	22.7%	22.0%
Percentage of the adult population that is active	67.2%	66.0%
Percentage of people using outdoor space for exercise or other health reasons	18.6%	17.9%

139. The representative populations considered in this assessment are just below the median of relative health deprivation (***Table 27.18*** – approximately 16,800-23,300 out of 34,844). A higher proportion of households in the Suffolk Coastal District have access to a vehicle which would allow them to access wider physical activity opportunities. But this may be representative of the low population density.

27.5.6 Reduced Access to Local Assets

140. There is a potential for access to health assets to be affected at the local level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate. District level data is used because statistics are not available at LSOA level.

141. The district of Suffolk Coastal has been chosen due to the fact that the proposed East Anglia TWO project is completely located in this district. The population tends to travel further to work than national average but have higher access to health assets. The local area has a lower rate of death of serious injury on the road, which can be correlated with the lower density of people in these regions.

142. The environmental baseline for traffic has been provided in ***Chapter 26 Traffic and Transport***.

143. The human health baseline relevant to this is shown in ***Table 27.21***.

[18] Data from Sport England, 2017, Active People Survey. Available at: https://www.sportengland.org/research/about-our-research/active-people-survey/

Table 27.21 Summary of Baseline for Journey Times and Access to Services[19]

	Suffolk Coastal	England
Average distance travelled to work	17.2km	15km
Baseline rate of people killed or seriously injured on the roads (per 100,000)[20]	32.0	39.7
Access to Health Assets & Hazards[21]	28.6%	21.2%
Access deprivation can increase sensitivity to change		
For the barriers to housing and services domain of deprivation[22] (where 1 is the most deprived area)	193	326

27.5.7 Employment

144. Employment effects are expected at the regional level (see ***section 27.3.1***). Baseline data is discussed accordingly.

145. The environmental baseline has been provided in ***Chapter 30 Tourism, Recreation and Socio-Economics.***

146. The human health baseline relevant to this topic is shown in ***Table 27.22***. ***Chapter 30 Tourism, Recreation and Socio-Economics*** indicates there would be an appropriate pool of construction workers who would benefit from employment opportunities associated with the onshore construction tasks of the proposed East Anglia TWO project.

147. The percentage of people living in income deprived households in Suffolk County in 2015 was above average compared to England at 18.5%, compared to 14.6% (***Table 27.22***). The percentage of older people and children affected by income deprivation are both below the average for England. In terms of

[19] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue
[20] Data from 2014 to 2016
[21] Access to Health Assets & Hazards (AHAH) index measures the percentage of the population who live in LSOAs which score in the poorest performing 20% of domains for access to retail services, access to health services, and physical environment.
[22] The barriers to housing and services domain of deprivation is comprised of indictors for: road distance to a post office; road distance to a primary school; road distance to general store or supermarket; road distance to a GP surgery; household overcrowding; homelessness; and housing affordability. Uses rank of average rank.

gender pay equality, the average in Suffolk is slightly below the average for England and therefore shows some scope for improvement.

Table 27.22 Summary of Employment Baseline[23]

	Suffolk County	England average
Working age (16-64) people in employment	80.0% (Jan-Dec 2017)	74.4%
People in skilled manual occupations	10.7% in East	10.1%
People affected by income deprivation	18.5%	14.7%
Older people affected by income deprivation	9.9%	16.2%
Children affected by income deprivation	10.4%	19.9%
Gender pay equality[24]	77.83%	80.29%

27.5.8 Electromagnetic Fields

148. Electric and magnetic fields and the electromagnetic forces they represent are an essential part of the physical world. Their sources are the charged fundamental particles of matter (principally electrons and protons). EMFs occur naturally within the body in association with nerve and muscle activity allowing these functions to happen. Humans also experience the natural static magnetic field of the Earth (to which a magnetic compass responds) and natural static electric fields in the atmosphere.

149. Electric and magnetic fields occur in the natural world, and people have been exposed to them for the whole of human evolution. The advent of modern technology and the wider use of electricity and electrical devices have inevitably introduced changes to the naturally occurring EMF patterns. Energised high voltage power-transmission equipment, along with all other uses of electricity, is a source of EMFs, for example many households make use of large kitchen appliances and mobile technology. Both the Alternating Current (AC) and Direct Current (DC) fields exist in addition to the Earth's steady natural fields.

150. Electric fields are measured in volts per metre (V/m). The atmospheric static electric field at ground level is typically around 100 V/m in fine weather and may rise to many thousands of volts per metre during thunderstorms. Electricity in homes is at a voltage of 230 V (volts) but outside homes it is distributed at higher voltages - from 11,000 V (usually written 11 kV) up to 400,000 V (400 kV).

[23] Public Health England, 2018, Public Health Profiles. Available at: https://fingertips.phe.org.uk/search/income%20deprivatoin#page/1/gid/1/pat/6/par/E12000006/ati/102/are/E10000029

[24] Ratio between the gross median hourly earnings for women and the gross median hourly earnings for men

Generally, the higher the voltage, the higher the electric field. Electric fields are readily screened by most building materials and by trees, hedges etc. (unlike magnetic fields). Therefore, the electric field produced by a power line is screened when inside a house and is much less than the field outside without the screening walls. Electric fields next to trees, fences etc. are usually less than when located away from such objects, though they can also be greater directly above a fence.

151. Magnetic fields are produced by current, which is the flow of electricity. Magnetic fields are usually measured in microteslas (µT). The earth's static magnetic field varies over the surface of the globe and is about 50 µT in the UK.

152. Both AC and DC fields exist in addition to the Earth's steady natural fields. In AC the voltage, current and corresponding EMF switches direction. Most transmission infrastructure in the UK uses AC. Within the UK, the frequency of AC mains electricity is 50 hertz (Hz, or 50 cycles per second). Any alternating magnetic field will induce an electric field, which in turn produces a current in a conducting medium. The human body is conducting and will therefore have a current induced in it – albeit, usually, a very small one.

153. Mains-powered AC appliances produce elevated magnetic fields whenever they draw current. Such fields generally fall as the inverse cube of distance, and thus are significant only within a metre or two of the appliance, as shown in ***Table 27.23***.

Table 27.23 Typical Magnetic Field Levels from some Common Mains Appliances in the home (Source emfs.info)

Appliance	Magnetic Field (microteslas, µT)	
	Close to Appliance	1 Metre Away
Electric razor	2000	0.3
Vacuum cleaner	800	2
TV	50	0.2
Washing machine	50	0.2
Bedside clock	50	0.02
Fridge	2	0.01

154. The Applicant has made the decision to use High Voltage Alternating Current (HVAC) technology. Within the UK, the frequency of AC mains electricity is 50 hertz (Hz). AC fields are described as Extremely Low Frequency (ELF). Electric and magnetic fields are produced by AC power systems operating at 50 Hz

frequencies. Sources of static fields are from the earth's natural fields, and fields from lines and cables.

155. As discussed, electric fields are shielded by most common building materials, trees, and fences, and diminish rapidly with distance from the source. When high-voltage underground cables are buried underground, each cable is surrounded by a metal sheath/screen to provide mechanical protection. This also eliminates the electric field outside the cable, but it has no effect on the magnetic field.

156. Large National Grid substations do not produce significant electric fields outside their boundary because the perimeter fence screens the electric field from any sources within the substation. There is equipment inside substations which produces magnetic fields. But the field falls with distance quite rapidly, and by the time a person is at the perimeter fence or a few metres outside it, the magnetic field from inside the substation is usually approaching background levels.

157. Overall, ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line, but can actually be higher at small distances from the cable. To put this in context, in a buried AC system the typical magnetic field has a strength of 20-24 µT (EMFs.info 2018[25]) when standing directly over it which is, on average, half of that experienced from a TV or washing machine. This drops to 0.12-0.23 µT when 20m away (EMFs.info 2018).

27.5.9 Anticipated Trends in the Baseline Condition

158. The JSNA (Suffolk Health and Wellbeing Board and Suffolk County Council 2015) provides a good overview of trends in health needs:

- **Population** – the total population of Suffolk is expected to grow, with the number of older people increasing rapidly. In 2012, 20.9% of the population were aged 65 or above.4.7% of Suffolk residents were from an ethnic group other than white, with Ipswich being the most multicultural region with 11.1% of its residents from a non-white ethnic group. These trends are also observed in the site specific populations and as such are not expected to change;
- **Outside space** - Suffolk has 12,000 acres (4,800 hectares (ha)) of open access land and 5,500km of footpaths, bridleways and byways plus 800km of cycle lanes and waymarked leisure cycling routes. This means Suffolk has excellent access to outside space for its residents. Within the vicinity of the

[25] http://www.emfs.info/ This website is maintained by National Grid

proposed onshore development area there is a significant amount of outside space and this is not expected to reduce;

- **Work and economy** – the economy of Suffolk is characterised by stable employment and growth rate, but lower than average productivity and wages. 7.4% of Suffolk's population live in the 20% most deprived areas in England – equivalent to around 53,000 people. Based on findings in ***Chapter 30 Tourism, Recreation and Socio-Economics***, this trend is expected to continue;
- **Prenatal and early years** – in 2013, Suffolk saw 7,792 live births. However, there is a consistently large gap in life expectancy for males when compared to females. 12.5% of women smoked during pregnancy, meaning some children started life at a disadvantage. This disadvantage manifests also in children that are born in deprived areas. Reducing smoking and obesity in pregnant women is an opportunity highlighted for prevention. Obesity at school entry age is rising from 20.1% in 2013 to 22.1% in 2014, with this percentage higher in the most deprived areas. It is not expected that this trend would dramatically change however there is a comparatively smaller proportion of children in the site specific populations;
- **Education** – it's estimated that 1 in 7 children live in relative poverty in Suffolk (15%) with health measures for the county's Looked After Children are poorer than the rest of the population. 31.7% of children aged 10-11 in Suffolk are overweight or obese. There is a focus on improving the health and education of early years and school age children due to the positive impact this can have later in life. This includes reducing exposure to tobacco smoke both through smoking themselves and second-hand smoke and increasing activity levels in children. Also targeted interventions for children from deprived communities. A significant change is not expected in this aspect;
- **Moving into adulthood (16-24)** – this focusses on education and inequalities in education and obesity and physical activity. 5.2% of 16-18 year olds in Suffolk were Not in Education, Employment or Training (NEET) in 2015, but the proportion of those NEET was five times higher in the more deprived areas. Males are more likely than females to be active at almost every age, but physical activity declines with age in both sexes, more rapidly in females. A significant change is not expected in this aspect;
- **Working age (25-64)** – 51% of the Suffolk population is aged 25-64 which is below the national average suggesting an ageing population. Health outcomes for the most deprived working age people are significantly worse than those in the least deprived. Early cancer deaths are up to 40% higher in the 20% most deprived parts of Suffolk. Projections in ***Chapter 30 Tourism, Recreation and Socio-Economics*** show that this trend is set to

continue. However, none of the site specific populations are within the 20% most deprived in Suffolk; and

- **Retirement age from 65 upwards** – over 77,000 people provide unpaid care in Suffolk, 19,000 of these were over 65. The number of older carers is expected to increase across all age groups with a projected total of almost 31,300 unpaid carers over 65 in Suffolk by 2030. Survey evidence suggests approximately 70% of older carers experience high levels of physical and mental ill health highlighting a need for the health of carers to be protected.

27.6 Potential Impacts

27.6.1 Potential Impacts during Construction

159. This section considers the potential effects during construction as discussed in ***section 27.3.2.1***. First general effects and the potential causal pathway is discussed, then each scenario is assessed.

27.6.1.1 Noise Effects

27.6.1.1.1 Health Outcomes

160. During construction, there is potential for noise to temporarily arise from construction works and movement of heavy goods vehicles across the onshore development area.

161. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid infrastructure (site-specific).

162. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

163. The key health outcomes relevant to noise as a determinant of health are cardiovascular health (only as a result of chronic noise effects), mental health (including stress, anxiety or depression as a result of chronic noise effects) and cognitive performance in children, particularly at school. This is particularly

relevant to two of the health priorities (***section 27.4.1.4***) outlined by Suffolk County Council, quality of life for the elderly and support to young children.

27.6.1.1.2Temporal Scope

164. The temporal scope for this effect (as described in ***section 27.3.1.4***) varies depending on the element of the proposed onshore development area and construction scenario. The potential temporal scopes are discussed below.

165. At landfall, there is a potential for short term temporal scope due to HDD and the presence of landfall compound.

166. Along the onshore cable route there is a potential for short term temporal scope because (as described in ***Chapter 6 Project Description***) the onshore cable route will be constructed in 4 sections concurrently, each with a length of 500m to 2km. Within these sections works will be sequential therefore any noise (or dust or emissions, see ***section 27.6.1.2.2***) will be generated within these sections at the locations of construction works or where construction vehicles pass receptors. This is estimated to lead to a 24 month construction period and works are proposed to be undertaken during the day time.

167. At the onshore substation, National Grid substation and connection infrastructure location, there is potential for short term temporal scope because the works are planned across several months.

168. With regards traffic emissions, there is a potential for medium term temporal scope because this will be a requirement for the entirety of the proposed East Anglia TWO project. However, locally, the impacts will be short term as the works progress along the onshore cable route.

27.6.1.1.3Likelihood

169. Assessment in ***Chapter 25 Noise and Vibration*** shows that during construction of the proposed East Anglia TWO project:

- Predicted noise impacts from construction works at the landfall location and along the onshore cable route receptor locations would be of negligible significance;
- Predicted vibration impacts levels from onshore infrastructure construction works would be minor adverse significance; and
- Predicted impacts from off-site construction traffic noise are at worst of a low magnitude at a medium sensitivity receptor resulting in a minor adverse significance.

170. Due to this the assessment in ***Chapter 25 Noise and Vibration*** states that no additional mitigation is required.

171. ***Figure 27.2*** shows seven health and community assets (***Table 27.24***) within 1km of the proposed onshore development area that are mainly care homes or schools. During the day, vulnerable groups (older people and children) would be present in these assets and may potentially be affected.

Table 27.24 Health and Community Assets within 1km of the Proposed Onshore Development Area

Asset Type	Name	Distance from proposed onshore development area
Care Home	Aldringham Court	0.06km
Care Home	Pear Tree Lodge Residential Home	0.41km
Care Home	Heritage Care at Home Ltd	0.53km
Care Home	Smyth House	1.05km
School	Coldfair Green Community Primary School	0.18km
School	Leiston Primary School	0.57km
School	Alde Valley School	0.42km

172. Potential health effects are considered likely because (based on the methods described in ***section 27.4.3.3***) there is a plausible source-pathway-receptor relationship where:

- The source is construction plant and operations;
- The pathway is through noise travelling through the air; and
- Receptors are communities of people.

173. Furthermore, the potential effect is probable as no unusual conditions are required for the source-pathway-receptor linkage.

27.6.1.1.4Sensitivity

174. As described in ***Table 27.25***, the sensitivity of the general population and vulnerable groups (described in ***section 27.5.1***) can be characterised as medium (based on the methods described in ***section 27.4.3.4***). The sensitivity of the general population is low however there is a higher proportion of older people than national averages, older people (potentially with ongoing health conditions) in care homes and young people at schools near the proposed onshore development area, as shown in ***Figure 27.2***.

Table 27.25 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly more (38 to 56% compared to 10.3%) households with no adults in employment and significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages (***Table 27.15***).
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	In Suffolk County and Suffolk Coastal District, the health of people is varied, but generally better than the average for England. Life expectancy is higher overall when compared against England averages.
Life stage	Households with no adult in employment and no dependent children correlates with the proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. Within the assets listed there are likely to be older people (probably with ongoing health issues) and children.
Outlook	Consultation indicates that populations closer to the onshore substation have a more negative outlook than other groups.

27.6.1.1.5Magnitude

175. As described in ***Table 27.26*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, noise levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.26 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 25 Noise and Vibration*** concludes that residual noise impacts would have negligible to minor adverse significance. The levels of noise experienced would be within working noise limits for temporary disruption.
Extent	Noise effects would be localised to the associated construction activity or vehicle movements. Therefore, they would be felt by a small number of people in the local population.
Frequency	Construction related noise close to particular dwellings or other community receptors would be infrequent and of short duration.
Reversibility	Noise effects would end completely once the associated construction elements has been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.1.6 Significance

176. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.27***. Although the sensitivity is medium there is only expected to be a small change to noise levels that is short term, localised and fully reversible. Based on this, noise effects are assessed to be **not significant** for the general population and for vulnerable groups within the general population.

Table 27.27 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.1*****,** scientific literature does show a causal link between chronic noise above certain thresholds and health determinants. The evidence does not indicate a lower threshold at which health effects do not occur.
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There is a higher proportion of older people and people not in work (likely to be a similar group) than national averages therefore these people are likely to spend more time at home. Conversely there are a fewer households with dependent children than national average. Baseline conditions indicate an older, retired, and relatively affluent compared to national deprivation indicators. These characteristics are more prevalent amongst coastal communities than inland communities. Baseline conditions also show care homes and schools within the vicinity of the proposed onshore development area.
Sensitivity	Sensitivity of the general population and vulnerable groups can be characterised as medium. The sensitivity of the general population is low however there is a higher proportion of older people than national averages.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as small.
Health priorities	***Section 27.4.1.4*** indicates that quality of life for older people is a key outcome of the Joint Health and Wellbeing Strategy for Suffolk that includes the aim to provide a good environment in which to live for older people.
Consultation responses	Consultees did not specifically highlight noise impacts as a concern.
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 25 Noise and Vibration.***
Policy context	In line with the NPS EN-1 (DECC, 2011c) it is considered that (based on the assessment in ***Chapter 25 Noise and Vibration***) the proposed East Anglia TWO project has avoided significant impacts for noise and vibration, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control noise.

27.6.1.2 Air Quality Effects

27.6.1.2.1 Health Outcomes

177. During construction, there is potential for air quality to be temporarily affected by dust and fine particulate from construction, and emissions from construction vehicles.

178. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid substation (site-specific).

179. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

180. The key health outcomes relevant to this determinant of health are an increased risk of cardiovascular diseases (Meo and Suraya 2015) and asthma exacerbation (Orellano et al. 2017).

27.6.1.2.2 Temporal Scope

181. The temporal scope for this effect (as described in ***section 27.3.1.4***) varies depending on the area of the proposed onshore development area:

- At landfall, there is a short term temporal scope due to horizontal directional drilling and the presence of landfall compound;
- Along the onshore cable route there is a short term temporal scope because (as described in ***Chapter 6 Project Description***) the onshore cable route will be constructed concurrently in 4 sections of 500m to 2km with sequentially construction in these areas. Therefore, any dust or emissions will be generated along short work intervals or at locations where construction traffic pass receptors. Works are estimated to cover 24 months (in line with the assessment presented in ***Chapter 26 Traffic and Transport***) and proposed to be undertaken during the day time;
- At the onshore substation and National Grid substation, there is a short term temporal scope because the works are planned across several months; and

- With regards traffic emissions, there is a medium term temporal scope because this will be a requirement for the entirety of the proposed East Anglia TWO project. However, locally, the impacts will be short term as the works progress along the onshore cable route.

27.6.1.2.3Likelihood

182. The conclusions of ***Chapter 19 Air Quality*** of this PEIR are as follows:

- Impacts due to construction dust and fine particulate are not significant with appropriate mitigation; and
- Development-generated traffic impacts upon local air quality are not significant.

183. The mitigation measures taken into consideration during the assessment are as described in ***section 19.6.1.1.5*** and ***section 19.6.1.2.1*** of ***Chapter 19 Air Quality***.

184. The potential health effect is considered likely because (based on the methods described in ***section 27.4.3.3***) there is a plausible source-pathway-receptor relationship where:

- Sources of dust are excavated materials and sources of particulate or emissions are construction traffic;
- The pathway is dispersion through the air and inhalation; and
- Receptors are communities of people.

185. Furthermore, the potential effect is probable as no unusual conditions are required for the source-pathway-receptor linkage.

27.6.1.2.4Sensitivity

186. As described in ***Table 27.28***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as medium (based on the methods described in ***section 27.4.3.4***). The sensitivity of the general population is low however there is a higher proportion of older people than national averages. It should be noted that the receptor population for noise and air quality is considered to be the same.

Table 27.28 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly more (38 to 56% compared to 10.3%) households with no adults in employment and significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages. (***Table 27.15***)
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	In Suffolk County and Suffolk Coastal District, the health of people is varied, but generally better than the average for England. Life expectancy is higher overall when compared against England averages.
Life stage	Households with no adult in employment and no dependent children correlates with the proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. As shown in ***Table 27.24*** there are also care homes and schools within the vicinity of the proposed onshore development area where older people (probably with ongoing health conditions) and young people are likely to reside during the day.
Outlook	Consultation indicates that populations closer to the onshore substations have a more negative outlook than other groups.

27.6.1.2.5Magnitude

187. As described in ***Table 27.26*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, air quality levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.29 Characterisation of Magnitude

Factor	Description
Severity	Annual mean concentration of human-made fine particulate matter ($PM_{2.5}$) is lower than the England average (***Table 27.16***). As such it is well below UK AQO target threshold and below WHO guide value. Therefore, the small change assessed in ***Chapter 19 Air Quality*** would not increase concentrations above target thresholds.
Extent	Air quality effects would be localised to the associated construction activity or vehicle movements. Therefore, they would be felt by a small number of people in the local population.
Frequency	Construction related dust or particulates close to particular dwellings or other community receptors would be infrequent and of short duration.
Reversibility	Air quality effects would end completely once the associated construction elements has been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.2.6 Significance

188. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.30***. Although the sensitivity of the receiving population is considered medium the level of change is expected to be short term, localised and fully reversible. Based on this, air quality effects are assessed to be **not significant** for the general population and for vulnerable groups within the general population.

Table 27.30 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.1***, scientific literature does indicate a causal link between air pollution due to dust, particulate, and various gases, including those associated with internal combustion engines with health impacts. Whilst the literature supports there being thresholds set for health protection purposes, it also acknowledges that for some air pollutants there are non-threshold health effects (i.e. when there is no known exposure threshold level below which adverse health effects may not occur). The assessment has identified population groups that may be particularly sensitive to air quality effects. The assessment in ***Chapter 19 Air Quality*** shows that the concentration of pollutants is not likely to exceeded thresholds set for health protection (i.e. UK AQOs).
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There is a higher proportion of older people and people not in work (likely to be a similar group) than national averages therefore these people are likely to spend more time at home. Conversely there are a fewer households with dependent children than national average. Baseline conditions indicate an older, retired, and relatively affluent compared to national deprivation indicators. These characteristics are more prevalent amongst coastal communities than inland communities. Baseline conditions also show care homes and schools within the vicinity of the proposed onshore development area.
Sensitivity	Sensitivity of the general population and vulnerable groups can be characterised as medium. The sensitivity of the general population is low however there is a higher proportion of older people than national averages.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as small.
Health priorities	***Section 27.4.1.4*** indicates that quality of life for older people is a key outcome of the Joint Health and Wellbeing Strategy for Suffolk that includes the aim to provide a good environment in which to live for older people.
Consultation responses	Consultation responses from PHE are relevant to the assessment undertaken in ***Chapter 19 Air Quality***.
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 19 Air Quality***.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 19 Air Quality***) the proposed East Anglia TWO project has avoided significant impacts for dust and vehicle emissions, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control dust and vehicle emissions.

27.6.1.3 Ground or Water Contamination Effects

27.6.1.3.1 Health Outcomes

189. During construction, water quality has the potential to be temporarily affected by construction site run-off, or temporary impoundment of water courses. Drinking water is not likely to be affected because the population of Suffolk District is supplied by piped drinking water and do not abstract water directly from surface or ground water sources without treatment.

190. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid substation (site-specific).

191. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

192. The key health outcomes relevant to this determinant of health relate to potential toxicological exposure associated with contaminated bathing water. Effects may relate to either biological toxins (e.g. associated with eutrophication) or chemical toxins (e.g. associated with mobilisation of historic contamination).

27.6.1.3.2 Temporal Scope

193. The temporal scope for these effects is (as described in ***section 27.3.1.4***) very short term because the most likely pathways are at points where the cable makes landfall, or where the onshore cable route crosses small watercourses using temporary dam and diversion methods. As described in ***Chapter 6 Project Description***, at this point water would be temporarily impounded upstream of the crossing and, therefore, has the potential to stagnate.

27.6.1.3.3 Likelihood

194. The conclusions of ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination*** of this PEIR can be summarised as follows.

195. Five water resources are considered in ***Chapter 20 Water Resources and Flood Risk*** with regards Impact 3: Accidental Release of Contaminants provides the following residual significance of impact following mitigation (see ***Figure 20.1 and Figure 20.3***):

- Coastal fringe – no impact;
- Hundred River – negligible impact;
- Leiston Beck – negligible impact;
- Friston Watercourse – negligible impact; and
- Groundwater – negligible impact.

196. Impact 4 - Impact on Surface Water Quality from Contamination of Groundwaters And Subsequent Discharge of ***Chapter 18 Ground Conditions and Contamination*** states that "*after adopting the outlined embedded mitigation measures, specifically the adherence to the Environment Agency Pollution Prevention Guidance (PPG), the magnitude of effect will be reduced to negligible*".

197. The mitigation measures taken into consideration during the assessment are as described in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination.***

198. Based on the methods described in ***section 27.4.3.3*** there is a plausible but unlikely source-pathway-receptor relationship:

- Sources include the potential for increased water turbidity, accidental fuel spill, or mobilisation of historic contamination;
- The pathway would be contaminants in surface waters or ground waters discharge to surface water; and
- Receptors include users of watercourses.

199. The plausibility of the potential effect occurring largely depends on unusual conditions to make the source-pathway-receptor linkage. The sources relate to accidental releases of pollutants or the unexpected encountering of historic contamination in combination with a failure of the outlined mitigation measures.

27.6.1.3.4Sensitivity

200. As described in ***Table 27.31***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4).*** Younger people are considered to be more vulnerable to ground or water

contamination due to having a lower body mass and a higher likelihood of exposure to water bodies during recreational activities. There are fewer young people in the local population than national averages and statistics show that they are generally of better health than average. Therefore, the sensitivity of vulnerable populations is considered to be low.

Table 27.31 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly fewer people under 16 (both in 2011 and 2017) compared to national averages (***Table 27.17***)
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed. However, there are more children living in low income families than the national average **(*Table 27.14***).
Health status	Young people's health in Suffolk Coastal (***Table 27.14***) is considered to be equal or better than national average.
Life stage	There are significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages. (***Table 27.15***), more (38 to 56% compared to 10.3%) households with no adults in employment and a great proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. This suggests that the average life stage in the local population is older than average.
Outlook	Consultation has not indicated particular concern about water contamination.

27.6.1.3.5Magnitude

201. As described in ***Table 27.32*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, water quality levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.32 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination*** conclude negligible to no impact on surface water bodies or ground water discharging to surface water.
Extent	Any effects would be highly localised to the associated accidental spillage. Therefore, they would be felt by a very small number of people in the local population.
Frequency	Accidental spillage would be highly infrequent.

Factor	Description
Reversibility	In the event of a spillage any material would be removed and disposed of. Any residual material is likely to be small and diluted in the water body.
Exposure	The general exposure profile would be one of very low exposure by a very small population.

27.6.1.3.6 Significance

202. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.33***. The sensitivity of the receiving population is assessed to be low and the magnitude of change is small. Based on this, water contamination effects are assessed to be **not significant for the general population** and **for vulnerable groups** within the general population.

Table 27.33 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.1*****,** scientific literature indicates sufficient strength of evidence from sufficiently high-quality scientific studies to establish that clean and sufficient drinking water is required to remain healthy. Children may be particularly sensitive to toxicological effects due to developmental stage and more time spent outdoors, including use of bathing waters. The baseline indicates that the areas affected by the proposed East Anglia TWO project typically have a lower than average percentage of young people (compared to national comparators) and lower population density (compared to national comparators).
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages but a higher level of children living in low income households. However, there is a generally lower level of children in the local population than national averages, children are comparatively healthy and there is a much lower population density.
Sensitivity	Considered to be low for both the general population and vulnerable groups.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as small
Health priorities	Review of regional public health needs assessments and strategies indicates that water quality, as a determinant of health, is not a key public health priority issue, health priorities for Norfolk County Council do focus on young people generally.
Consultation responses	Consultation responses from PHE stress that assessment of water impacts should include potential impacts to human health. This chapter draws on assessments undertaken in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination.***
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination***.) the proposed East Anglia TWO project

Evidence sources	Description
	has avoided significant impacts for contamination, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control contamination.

27.6.1.4 Physical Activity Effects

27.6.1.4.1 Health Outcomes

203. During construction, there is the potential for physical activity to be temporarily affected by the proposed East Anglia TWO project temporarily diverting Public Rights of Way (PRoWs). All other interactions with public spaces such as playing fields and common land has been avoided through site selection as part of the embedded mitigation for the proposed East Anglia TWO project and discussed in ***Chapter 4 Site Selection and Assessment of Alternatives***.

204. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid infrastructure (site-specific).

205. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

206. The key health outcomes relevant to this determinant of health are physical health conditions (e.g. cardiovascular health) and mental health conditions (e.g. stress, anxiety or depression) associated with levels of physical activity and obesity levels. For example, due to the level of active travel (such as road cycling), leisure activities (such as team sports on public facilities) or outdoor activities (such as hiking or mountain biking).

27.6.1.4.2 Temporal Scope

207. The temporal scope for these effects is (as described in ***section 27.3.1.4***) very short term. This is because the onshore cable route does not directly impact any community infrastructure (such as sports facilities) as shown in ***Figure 30.2***.

However, temporary and reversible impacts to PRoW are discussed in ***Chapter 30 Tourism, Recreation, and Socio-economics***. During these periods, there may be a change in the tranquillity and perceived quality of physical activity opportunities.

27.6.1.4.3Likelihood

208. The conclusion of this PEIR chapter can be summarised as follows, assuming mitigation is implemented:

- There are no residual impacts on community infrastructure (such as sports facilities) as shown in ***Figure 27.2*** and ***Figure 30.2***, due to site selection avoiding interaction with these sites; and
- At PEI stage, the proposed onshore development area indicates that there is potential interaction with a number of PRoWs. Residual impact on the majority of PRoWs is assumed to be negligible to minor adverse, as discussed in ***Chapter 30 Tourism, Recreation, and Socio-economics.***

209. The mitigation measures taken into consideration during the assessment are as described in ***Chapter 30 Tourism, Recreation and Socio-economics***. Any temporary or alternative routes or diversions of PRoWs would be agreed with Suffolk County Council.

210. Disturbance of people using space near the construction sites are mitigated through the measures described in ***Chapter 19 Air Quality*** and ***Chapter 25 Noise and Vibration***.

211. Based on the methods described in ***section 27.4.3.3*** there is a plausible but unlikely source-pathway-receptor relationship:

- The source is construction activity and vehicles/plant operations increasing emissions and disturbance on PRoWs, and recreational areas;
- The pathway is noise, emissions and dust particulates travelling through the air reducing amenity; and
- Receptors are users of the recreational facilities resulting in a lower level of active travel or outdoor recreation.

212. The effects would be due to the sequential construction of the onshore cable route. During this time, temporary alternative routes may be put in place or, at worst, PRoWs would be temporarily closed as agreed with the local authority for a short duration. After this, the site would be reinstated except for temporary access points. The area would then be reinstated but some time would be

required before the same level of natural coverage (such as grass, shrubs, and hedgerows) returns.

27.6.1.4.4 Sensitivity

213. As described in ***Table 27.34***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4***).

214. There is a higher proportion of older people in the site-specific populations than district and national averages but they are also relatively less-deprived and have a high proportion of car ownerships (***Table 27.18***). Adult activity levels are reported at a similar level to national averages that indicates a larger proportion of older people are physically active than on average. This suggests that they would be resilient to potential changes in availability of recreational assets and would temporarily use another location, thus their health would not be affected. This correlates with the rural character of the area and availability of natural areas (such as PRoWs, open land, and woodland) as people would use these assets for physical activity. Therefore, sensitivity of vulnerable groups is also characterised as low.

Table 27.34 Characterisation of Sensitivity

Factor	Description
Inequalities	Although the area around the proposed onshore development area does not have a significant number of sports facilities (***Figure 27.2***) as a rural area it benefits from ready access to open space. This includes PRoWs, open land, woodland, and beaches.
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	Self-reported health levels and activity levels in the three LSOAs are generally consistent with national averages (***Table 27.18***). People in Suffolk Coastal District report marginally higher levels of physical activity than national average across the indicators in ***Table 27.19*** with the exceptions of “adults who walk at least five times a week”. However, this is countered by a higher level of adults who cycle three times a week or once a month. These are broadly similar across the three LSOAs with a slightly more people reporting lower levels of health amongst the landfall community than the inland communities (***Table 27.18***).
Life stage	A higher proportion of the site specific population is over 65 years old when compared to average levels in Suffolk Coastal District and at a national level. Around half the population at landfall are of an older age and a third amongst in land populations.
Outlook	Consultation responses have not shown a strong concern about the proposed East Anglia TWO project’s impact on physical activity levels. However, consultation has raised the importance of the local PRoW network across on proposed onshore development area.

27.6.1.4.5Magnitude

215. As described in ***Table 27.35*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, physical activity levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.35 Characterisation of Magnitude

Factor	Description
Severity	As described in ***Chapter 30 Tourism, Recreation, and Socio-economics*** the proposed East Anglia TWO project is unlikely to adversely impact on recreational assets.
Extent	As shown in ***Figure 28.2*** there are some areas of open or common land in the vicinity of the proposed onshore development area but it is unlikely that physical disturbances would negatively impact on these areas.
Frequency	Any potential impacts would be short term.
Reversibility	Any disturbance to recreational assets would be completely reversible once construction activities stop.
Exposure	Due to the sequential nature of the construction process there would be a small number of people potentially affected at any one time.

27.6.1.4.6Significance

216. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.36***. Sensitivity of the receiving population is considered to be low and the magnitude of change is assessed as small. Based on this physical activity effects are assessed to be **not significant for the general population** and **for vulnerable groups** within the general population.

Table 27.36 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.1***, scientific literature does show a substantial health benefit from increased physical activity that includes improvements to mental health. However, there is no evidence to suggest that construction projects reduce the amount of physical activity in an area unless there is an obvious obstruction of recreational assets.
Baseline conditions	The existing environment shows a population with a comparatively high proportion of older people and fewer children. Levels of physical activity are broadly similar to national averages and there is good availability of natural assets that can be enjoyed for recreational physical activity – such as PRoWs and beaches.

Evidence sources	Description
Sensitivity	Considered to be low for both the general population and vulnerable groups.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as small
Health priorities	Ensuring older people have a good quality of life and that people in general have the opportunity to improve their mental health are both priorities for Suffolk County Council. Access to recreational assets is an import aspect of this.
Consultation responses	Consultation responses do not show a strong concern about the proposed East Anglia TWO project's impact on physical activity.
Regulatory standards (if appropriate)	There are no relevant regulatory standards.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that proposed East Anglia TWO project has avoided significant impacts for obstruction to recreational activities, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control temporary obstruction.

27.6.1.5 Effect of Reduced Access to Health Services

27.6.1.5.1 Health Outcomes

217. During construction, there is the potential for journey times and access to be temporarily affected by an increase in the number of HGVs or employee vehicles on the road and temporary traffic management at certain locations. These have the potential to lead to temporary delays and temporarily reduce access to local health services.

218. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the population of Suffolk Coastal District (local).

219. Vulnerable groups are:

- People living in deprived areas; and
- Older people (aged of 65 years).

220. Travelling to, or accessing health care, underpins management of illness or injury. The key health outcomes relevant to this determinant of health are emergency response times or non-emergency treatment outcomes associated with delays or non-attendance caused by increased traffic and journey times arising from additional proposed East Anglia TWO project traffic.

27.6.1.5.2Temporal Scope

221. The temporal scope for these effects is (as described in ***section 27.4.3.3***) short term as any obstruction to access would be temporary due to the sequential nature of the construction works.

222. With regards traffic movement, the temporal scope would also be short term. Although the proposed East Anglia TWO project as a whole has a medium term (measured in years) temporal scope, for areas where impacts are predicted in ***Chapter 26 Traffic and Transport***, the duration is measured in weeks.

27.6.1.5.3Likelihood

223. ***Chapter 26 Traffic and Transport*** of this PEIR can be summarised as follows:

- Peak daily change in total traffic flow would lead to negligible to minor adverse impacts on community severance;
- Of the 15 links that are considered, it is predicted that the peak daily change in total flows HGV flows for link 9 (B1069 from the A1094 to Coldfair Green) and link 12 (Lover's Lane / Sizewell Gap) would be minor adverse for pedestrian amenity. But it should be noted that these links have minimal housing frontage and therefore it is unlikely for pedestrians to be present;
- Mitigation is required at the point where the A12 meets the A1094 and along the A1094. This is outlined in ***section 26.6.1.10.2*** leading to a residual impact significance for road safety of minor adverse significance; and
- Mitigation is required at points along the B1122, B1069. This is outlined in ***section 26.6.1.11.3*** and ***section 26.6.1.12.2*** leading to a residual impact significance for driver delay of minor adverse significance.

224. NPS EN-1 (DECC 2011c) requires projects to consider indirect health impacts due to an increase in the size of local population. As discussed in ***Chapter 30 Tourism, Recreation and Socio-economics***, the peak employment level (333 staff per day) would not increase the population of Suffolk Coastal district by a significant amount. Furthermore, non-residential workers would be distributed within a 45 minute driving cordon of the proposed onshore development area and would be mobile enough to access health services at several locations around Suffolk Coastal, Waveney, Ipswich, and Great Yarmouth. Non-residential workers are also expected to return to their normal residence when not working on the proposed East Anglia TWO project. For these reasons, this potential for reduced access to health services will not be considered further.

225. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- Sources include the potential for increased temporary traffic disturbance locally;
- The pathway would be delays in accessing health care; and
- Receptors include people with ongoing health conditions, people living in deprivation and health services responding to emergency calls.

27.6.1.5.4 Sensitivity

226. As described in ***Table 27.37***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4***). Sensitivity of the vulnerable group with long-term health problems or disability is considered medium because of this makes up a larger proportion of the population than national averages.

Table 27.37 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality across Suffolk Coastal district and Aldeburgh ward is generally low (***Plate 27.3)***. Deprivation levels are marginally lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Deprivation	The majority of LSOAs in Suffolk Coastal and Aldeburgh ward are within the 50% and 40% of least deprived neighbourhoods in England, respectively. Therefore, there is a lower likelihood of this effect affecting people living in relatively deprived areas.
Health status	Adult health status in Suffolk Coastal is relatively good and people self-report a similar level of health to national averages. However, a higher proportion of people have a long-term health conditions or problems when compared to national averages (***Table 27.15***).
Life stage	A higher proportion of people in Suffolk Coastal are over 65 years old and this proportion is seen to increase amongst coastal populations near landfall. This trend correlates with the higher proportion of people with long-term health problems or disabilities.
Outlook	Consultation responses show that, in general, people closer to the onshore substations hold stronger negative views to the proposed East Anglia TWO project than other areas. Wider public concerns are mostly related to short term disturbance from construction activities.

27.6.1.5.5 Magnitude

227. As described in ***Table 27.38*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or

very short-term, reduced access levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.38 Characterisation of Magnitude

Factor	Description
Severity	Following mitigation, the residual impact would be minor adverse.
Extent	Effects would be localised to the B1121 and B1069 and can be mitigated as identified in ***Chapter 26 Traffic and Transport***
Frequency	Construction and traffic related disturbance would infrequent and for short duration.
Reversibility	Effects would be end completely once the associated elements have been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.5.6 Significance

228. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.39***. Sensitivity of the receiving population is considered to be low and the magnitude of change is assessed as small. Based on this effect of reducing access to health services is assessed to be **not significant for the general population** and for **vulnerable groups** within the general population.

Table 27.39 Characterisation of Significance

Evidence sources	Description
Scientific literature	Scientific literature, as described in ***Appendix 27.1***, shows that barriers to transport can have significant health effects and community. Particularly for vulnerable groups and especially where there are shortages of health care available.
Baseline conditions	Baseline conditions show that inequality is relatively low across Suffolk Coastal District, the population has a relatively high number of older people and people living with long-term health problems or disabilities. ***Figure 27.2*** also shows that health assets are mainly located in Coldfair Green and Leiston whereas there is a higher proportion of older people in Thorpeness (***Table 27.15*****).** This indicates that they may need to travel further to access health services.
Sensitivity	Sensitivity is considered low for the general population due to low levels of comparative deprivation and health levels that are as good as or better than national averages. However, there is a higher proportion of people with long-term health problems or disabilities thus this vulnerable group is considered to have a medium sensitivity.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as small
Health priorities	Maintaining quality of life of older people is a priority of Suffolk County Council and this would be a factor within that aim.
Consultation responses	Consultation responses do not indicate specific concern about traffic delays.

Evidence sources	Description
Regulatory standards (if appropriate)	There are no relevant regulatory standards with regards increased traffic delaying access to health services. Regulatory standards with regards traffic impacts in general are detailed in ***Chapter 26 Traffic and Transport.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that proposed East Anglia TWO project has avoided significant impacts for obstruction to health services, ***Chapter 26 Traffic and Transport*** has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control temporary obstruction.

27.6.2 Potential Impacts during Construction and Operation

27.6.2.1 Employment

27.6.2.1.1 Health Outcomes

229. Employment has been considered across both construction and operation because, as discussed in ***Chapter 30 Tourism, Recreation and Socio-economics***, the development of the proposed East Anglia TWO project is part of a wider process of developing an offshore wind supply chain in the New Anglia LEP region. Therefore, from a human health point of view, creating a demand for transferable skills (both between construction projects and on to operation of projects) has a multiplying effect on employment. Direct employment by the proposed East Anglia TWO project also creates indirect employment in the supply chain and induced employment due to expenditure.

230. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the population of Suffolk County (regional).

27.6.2.1.2 Temporal Scope

231. The temporal scope for these effects is (as described in ***section 27.3.1.4***) is variable:

- During construction, the temporal effect is measured in years but individuals may only be directly employed for months at a time. However, the overall effect on direct and indirect employment would be considered across the duration of the construction phase and is therefore medium term; and
- During operation, it is expected that people would be permanently employed and that this employment could last for decades. Therefore, the temporal scope is long term.

27.6.2.1.3 Likelihood

232. The conclusions of ***Chapter 30 Tourism, Recreation and Socio-economics*** of this PEIR found that employment has a moderate beneficial impact during

construction, a potentially major beneficial impact for the tourism industry (due to increased demand in the off-peak season) and a major beneficial impact on long term employment during the operational phase. To counter this, it also found minor adverse impacts for visitors in both the short and long term which are unlikely to significantly reduce employment in the tourism industry.

233. Enhancement measures taken in to consideration during the assessment is the continuation of the Supply Chain Plan (ScottishPower Renewables 2014) from the East Anglia ONE project that is currently under construction. The continuation of this strategy was agreed as part of East Anglia THREE which has received consent and builds on the process set out for the earlier project. The proposed East Anglia TWO project would continue the same trend and continue from the position subsequently set. Therefore, a continuation of investment in to local employment and supply chains would create long term benefit across many years.

234. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- The source is direct, indirect and induced job creation due to the development of the proposed East Anglia TWO project;
- The pathway is through employment, with increased probability of effect due to supply chain and skills development being undertaken by ScottishPower Renewables; and
- The receptor is people of working age in the regional labour market (and their dependants).

27.6.2.1.4 Sensitivity

235. As described in ***Table 27.40***, the sensitivity of the general population can be characterised as medium (based on the methods described in ***section 27.4.3.4***).

236. As people cannot be vulnerable to an employment benefit, this population grouping has been omitted from this effect.

Table 27.40 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality across Suffolk County is generally high (***Plate 27.2***).
Deprivation	Almost as many LSOAs are in the 50% of most deprived neighbourhoods in England as are in the 50% least deprived. The proportion of people suffering income deprivation is higher in Suffolk than England but the proportion of children in households suffering from income deprivation is nearly half that of England (***Table 27.22***).

Factor	Description
Health status	Adult health status in Suffolk County is variable but generally comparable or better than averages in England (***Table 27.13).*** People self-report a similar level of health to national averages (***Table 27.19***)
Life stage	Proportion of population that are of working age in Suffolk County is higher than the average for England.
Outlook	Consultation responses show that stakeholders are concerned about the potential for employment due to the proposed East Anglia TWO project.

27.6.2.1.5Magnitude

237. As described in ***Table 27.41*** the magnitude of the change due to the proposed East Anglia TWO project is characterised as medium (based on the methods described in ***section 27.4.3.4.2***). Improvements in socio-economic status associated with long term employment are likely to lead to improvements in general wellbeing.

Table 27.41 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 30 Tourism, Recreation, and Socio-economics*** concludes that the proposed East Anglia TWO project would produce major long term benefit for the region.
Extent	Direct effect would benefit several hundred people (both during construction and operation) and indirect effects due to the continuous supply chain would benefit several hundred more. This may lead to higher expenditure levels by those directly and indirectly employed by the proposed East Anglia TWO project which could, in turn, benefit people at lower socio-economic levels through induced employment.
Frequency	Although construction employment is contract based over a short term (months) the continuous demand during construction and operation would generate continuous long term opportunity.
Reversibility	The benefit would be maintained for at least 25 years following construction.
Exposure	The general exposure profile would be one of high exposure to a medium population due to direct or indirect employment and low exposure to a large population due to induced employment.

27.6.2.1.6Significance

238. As a wider determinant of overall health this has the potential to lead to improvements in wellbeing.

239. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.42***. The receiving population is judged to have a medium sensitivity as deprivation is comparatively high therefore employment opportunities would be welcomed. The magnitude of change is considered to be medium to large and potentially long term due to the

operational lifetime of the proposed project. The development of the offshore wind industry in Suffolk is assessed to be positive (see ***Chapter 30 Tourism, Recreation and Socio-Economics*** for details) Increasing employment demand over a long period is assessed to have a beneficial impact for the general population but the health effect due to the proposed project is considered to be **not significant**.

Table 27.42 Characterisation of Significance

Evidence sources	Description
Scientific literature	Scientific literature, as described in ***Appendix 27.1***, shows that as wider determinant of health, employment has a beneficial impact on general health and wellbeing.
Baseline conditions	Baseline conditions in ***Chapter 30 Tourism, Recreation and Socio-economics*** show that there is a labour market that would benefit from increased demand for employment but also that there is a higher proportion of adults living in income deprivation. This inequality is mirrored in the IMD decile spread in Suffolk County (***Plate 27.2***) where it can be seen that as many people live in relatively deprived areas as relatively affluent areas.
Sensitivity	As such the sensitivity of the general population is considered to be medium.
Magnitude	Magnitude of the long term employment is considered to be medium to large. A medium number of people would receive a moderate to major benefit whereas a large number of people would receive a moderate to minor benefit.
Health priorities	Providing the opportunity for people to improve their wellbeing is a priority for Suffolk County Council. However, it should be noted that long term employment is only one of several wider determinants to lead to this.
Consultation responses	Consultation responses do indicate specific concern about employment opportunities and opportunities for people from lower socio-economic backgrounds.
Regulatory standards (if appropriate)	There are no relevant regulatory standards with regards increased employment opportunities.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that the proposed East Anglia TWO project has identified significant benefit from potential employment and proposes enhancement measures with the aim of retaining benefit in the regional economy.

27.6.2.2 Perception of Risk

27.6.2.2.1 Health Outcomes

240. Perception of risk is considered across both construction and operation phases because the concern highlighted by site specific populations at the onshore substation relate to the visual impact of presence of industrial infrastructure in a rural environment. Although ***Chapter 30 Tourism, Recreation and Socio-economics*** concludes that there is likely to be limited economic change due to

presence of the substations, PHE have highlighted that the perception of risk has been observed to lead to health outcomes.

241. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the site specific population at the substation location.

27.6.2.2.2Temporal Scope

242. The temporal scope for these effects is (as described in ***section 27.3.1.4***) is considered to potentially be long term due to the presence of industrial infrastructure in a predominantly rural area.

27.6.2.2.3Likelihood

243. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- Source: opinions raised at Public Information days and the development of local action groups show that there is a clear source of anxiety, predominantly due to visual impacts; and
- There is a potential pathway because uncertainty and ambivalence are associated with reduced mental wellbeing, as highlighted by PHE in their scoping response.

244. The only way to mitigate against uncertainty is through strong communication and provision of information by the Applicant. This has been affected through a series of public information days as well as targeted briefings and public meetings. This will be on-going throughout the development process.

245. As described in ***Table 27.40***, the sensitivity of the general population can be characterised as low (based on the methods described in ***section 27.4.3.4***). Sensitivity of vulnerable groups (e.g. those potentially directly affected by works or with existing strong opinions) is considered to be high.

Table 27.43 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality in site specific populations are generally low.
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England
Health status	Populations in LSOA 003A (Coldfair Green side) and 003E (Friston side) report a similar level of health as national averages. 003E reports a slightly higher level of people with good to very good health. (***Table 27.18***)

Factor	Description
Life stage	Proportion of population that are of older age in LSOA 003A and 003E is 35.1% and 32.5% respectively. This is higher than Suffolk Coastal District (26%) and national averages (17%).
Outlook	Consultation responses show that some people in these site specific populations have strong concerns about the development of industrial infrastructure in a rural area, as well as other concerns around construction activities.

27.6.2.2.4Magnitude

246. As described in ***Table 27.44***, the magnitude of the change due to the proposed East Anglia TWO project is characterised as medium (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new physical or mental health conditions. However, if people have existing conditions the increase in uncertainty may increase anxiety and exacerbate their condition.

Table 27.44 Characterisation of Magnitude

Factor	Description
Severity	Anxiety is observed amongst site specific populations. This may be affecting general wellbeing amongst some people. However, this is unlikely to lead to a significant change in health outcomes for the general population. ***Chapter 29 Landscape and Visual Impact Assessment*** notes that *"significant effects on the character of the landscape are assessed as occurring within a localised area."*
Extent	People within the onshore study area are demonstrating anxiety about the proposed East Anglia TWO project. This is mitigated by significant public engagement being undertaken by the proposed East Anglia TWO project. ***Chapter 29 Landscape and Visual Impact*** notes that the localised areas is "*approximately 1km around the onshore substation and National Grid substation"* and experienced to the north of Friston or whilst using PRoWs.
Frequency	Anxiety is a continuous problem but the perception of risk due to the presence of substations may dissipate over time as people adjust to the change in the landscape.
Reversibility	All construction impacts discussed above will cease at the completion of the construction proposed East Anglia TWO project. However, visual impacts will persist throughout operation.
Exposure	The general exposure profile would be one of low exposure to a small population.

27.6.2.2.5Significance

247. The significance of the potential effects has been informed by the guide questions in ***Table 27.12*** as described in ***Table 27.45***. The general population is not considered to be sensitive so even though the magnitude of change is high it is expected that the health impact would be **not significant for the**

general population. However, within the general population there are evidently some people who are particularly sensitive to the proposed changes. It would be disproportionate to the overall effect to assess their individual health levels but there is little evidence to connect landscape change of this nature to significant health changes. Some people may still be anxious about the change and the best way to mitigate against this uncertainty is by providing information and engaging them in dialogue. This is being achieved through several public engagement channels as described in ***section 27.6.1.5.3*** and appropriate community consultation will be maintained throughout development. Due to the continuation of this mitigation, the health effect for **vulnerable groups within the general population would be not significant**.

Table 27.45 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarised in ***Appendix 27***.1.
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There is a higher proportion of older people than national averages who have a higher probability of living with an existing health condition.
Sensitivity	The general population are considered to have low sensitivity but vulnerable groups are considered to have high sensitivity.
Magnitude	Change due to the proposed East Anglia TWO project is characterised as medium and is mitigated through a strong public engagement process.
Health priorities	***Section 27.4.1.4*** indicates that people in Suffolk should have the opportunity to improve their mental health and wellbeing.
Consultation responses	PHE specifically states that *"in some cases, perception of risk may have a greater impact on health than the hazard itself."*
Regulatory standards (if appropriate)	There are no regulatory standards with regards the management of the perception of risk.
Policy context	The perception of risk in not considered under relevant policy.

27.6.3 Potential Impacts during Operation

27.6.3.1 Noise Effects

27.6.3.1.1 Health Outcomes

248. The potential for noise impacts during operation of the onshore substation and National Grid substation has been considered in ***Chapter 25 Noise and Vibration***.

249. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near the onshore substation (site-specific) including the following vulnerable groups:
  - Children and young people;
  - Older people;
  - People with existing poor health (physical and mental health); and
  - People living in deprivation, including those on low incomes.

250. The key health outcomes are the same as those discussed in ***section 27.6.1.1*** in relation to construction noise effects.

27.6.3.1.2Temporal Scope

251. The temporal scope for this effect (as described in ***section 27.3.1.4***) is long term because it relates to the operational phase of the onshore infrastructure.

27.6.3.1.3Likelihood

252. ***Chapter 25 Noise and Vibration*** concludes that against the requirement for limiting operational noise from the onshore substation to no greater than 35dB $L_{Aeq\ 15\ min}$ during the night. For context, 30dB is regarded as a quiet rural area and 40dB is equivalent to bird calls (IAC Acoustics 2018). Therefore, the results show that noise levels would have an impact magnitude of no impact at all receptors (medium sensitivity) and therefore be of negligible significance. There will be no sources of noise associated with the operation of the National Grid Substation.

253. The mitigation measures taken into consideration during the assessment are described in ***Chapter 25 Noise and Vibration.***

254. Based on the methods described in ***section 27.4.3.3*** there is not a plausible source-pathway-receptor relationship. Before mitigation all locations are assessed to have no impact:

- Following implementation of the mitigation measures outline in ***Chapter 25 Noise and Vibration*** there would be no residual impact from noise arising from the onshore substation;
- Therefore, the pathway that existed for one receptor location would be removed following implementation of mitigation; and
- Due to this, there would be no change in human health resulting from noise from the onshore substation.

27.6.3.2 EMF Effects

27.6.3.2.1 Health Outcomes

255. During operation, EMF effects may arise from the operation of the onshore substation and National Grid substation and along the onshore cable route.

256. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near the onshore substation (site-specific); and
- The population along the cable route including the following vulnerable groups:
  - Children and young people;
  - Older people;
  - People with existing poor health (physical and mental health); and
  - People living in deprivation, including those on low incomes.

27.6.3.2.2 Temporal Scope

257. The temporal scope for potential effects would be likely to be long term due to the operation of the infrastructure being at least 25 years.

27.6.3.2.3 Likelihood

258. The Applicant's policy is only to design and install equipment that is compliant with the relevant exposure limits. To ensure this, all of the equipment for the proposed East Anglia TWO project capable of producing EMFs will be assessed in accordance with the provisions of the Government's Code of Practice on Compliance, which is compliant with ICNIRP guidance (ICNIRP 1998).

259. There are two main sources of EMF within the proposed onshore development area: the HVAC underground cable and the onshore substations. AC produces a magnetic field that switches direction and induces a current in a conducting material.

260. As described in ***section 27.4.1.3.1***, if the EMFs produced by an item of equipment are lower than 9kV/m and 360µT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with PHE recommendations and Government policy.

261. National Grid (EMFs.info 2018) provides the following information with regards the magnetic fields for buried underground cables and substation:

262. The maximum magnetic field typically produced by an underground 400kV AC cable is[26] between 80µT and 95µT depending on type of installation (as shown in ***Table 27.23*** this is significantly lower than the field created by a vacuum cleaner). The typical fields are much lower between 21µT and 24µT. The magnetic field strength drops rapidly with distance and by 5m a buried 400kV cable would typically have a maximum field strength of between 7µT and 13µT.

263. Fields from substations are usually measured rather than calculated. Calculations are not usually feasible because of the complex geometry of the current paths within a substation. At the perimeter fence of a large, high-voltage substation, the highest fields are invariably produced by overhead lines or underground cables entering the substation. Away from these lines and cables, the field would normally be below 1µT[27].

264. Magnetic fields will be calculated and measured where appropriate but are expected to be well below the limit of 360µT. When compared to ***Table 27.23*** it can be seen that the expected level of a typical magnetic fields is below that of a domestic appliance.

265. Based on the methods described in ***section 27.4.3.3*** there is no a plausible source-pathway-receptor relationship:

- The source of EMF arising from the onshore cable route, and onshore substations are all below regulatory exposure limits;
- There is limited demonstrable health effect due to static EMF from HVAC infrastructure and all elements of the onshore substation are designed within regulatory standards; and
- Receptors would be people living close to the onshore substation. But typical level of magnetic fields generated by infrastructure is expected to be below typical levels of household appliances.

27.6.4 Potential Impacts during Decommissioning

266. 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. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. 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. A decommissioning plan will

[26] Information available online at: http://www.emfs.info/sources/overhead/specific/400-kv/
[27] Information available from: http://www.emfs.info/compliance/public/

be provided. 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.

27.7 Cumulative Impacts

267. As discussed in ***section 27.4.4***, the human health chapter takes a different approach to the methodology used for the CIA described in ***Chapter 5 EIA Methodology***. This starts from the consideration of the many inter-relationships between determinants of health and health outcomes. Therefore, the sections considering interactions and inter-relationships discussed in other technical PEIR chapters, are included in the overall approach of cumulative effect.

268. This section on inter-relationships considers both cumulative intra-project effects and cumulative inter-project effects:

- **Intra-project** effects relate to the combined influence from different aspects of the proposed East Anglia TWO project on the same population groups.
- **Inter-project** effects consider the effect of the proposed East Anglia TWO project in combination with the expected effects of other projects that may be occurring at a similar time with effects to the same populations.

27.7.1 Cumulative Impact with proposed East Anglia ONE North Project

269. The East Anglia ONE North offshore windfarm project (the proposed East Anglia ONE North project) is also in the pre-application stage. The proposed East Anglia ONE North project will have a separate Development Consent Order (DCO) application but is working to the same programme of submission as the proposed East Anglia TWO project. The two projects will share the same landfall location and cable route and the two onshore substations will be co-located, and feed into the same National Grid substation.

270. The construction of onshore infrastructure for proposed East Anglia TWO project and proposed East Anglia ONE North project is being considered under one of two scenarios as follows:

- Scenario 1 where both projects are being built simultaneously; and
- Scenario 2 where the projects will be built sequentially.

271. More detailed information regarding these scenarios is given in ***Chapter 5 EIA Methodology***.

272. As discussed in ***section 27.4.3***, change in health determinants are reliant upon the size of the factor influencing it. Under Scenario 2 one project will be

constructed and all ground reinstated. Then following a construction gap, the second project would be constructed. 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. Therefore, these projects would not overlap and none of the potential effects discussed in ***section 27.6.1*** would combine to create a greater influence.

273. Therefore, both intra-project and inter-project cumulative effects will be considered under Scenario 1 where both the proposed East Anglia TWO and proposed East Anglia ONE North projects are built simultaneously. Under this scenario it is likely for effects to be increased. As such this would be the worst case scenario with regards change to human health determinants, as described in ***Table 27.46***.

Table 27.46 Realistic Worst Case Scenarios

Impact	Parameter	Notes
Construction		
Noise Effects	Intensity and duration of noise	Under Scenario 1 overall noise effects would not increase in residual significance compared to building one project in isolation.
Air Quality Effects	Intensity and duration of dust or emissions	Under Scenario 1 overall air quality effects would not increase in residual significance compared to building one project in isolation.
Ground or Water Contamination Effects	Simultaneous construction would not increase the likelihood of spillage or exposure to contaminated land	This will not be considered as a cumulative effect intra-project effect. But will be considered as an inter-project effect discussed in ***section 27.7.3.***
Physical Activity Effects	Reliant upon on location of multiple effects.	Intra-project effects discussed in ***section 27.7.2*** and Inter-project effects discussed in ***section 27.7.3.***
Effect of Reduced Access to Health Services	Reliant upon on location of multiple effects.	Intra-project effects discussed in ***section 27.7.2*** and Inter-project effects discussed in ***section 27.7.3.***
Construction and operation		
Employment	Reliant upon the number of people employed.	Only considered as an Inter-project effect discussed in ***section 27.7.3.***

Impact	Parameter	Notes
Perception of Risk	It is possible that multiple projects being constructed will increase anxiety.	Only considered as an Inter-project effect discussed in ***section 27.7.3*.**
Operation		
As discussed in ***section 27.6.3*** operational effects are unlikely to occur and therefore will not be considered cumulatively.		
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. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. 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. A decommissioning plan will be provided. 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.		

27.7.2 Intra-project Cumulative Effects

274. Intra-project cumulative effects consider whether there are areas where effects to more than one health determinant by the proposed East Anglia TWO project may lead to a health outcome.

275. The following section considers the overall effect of different elements of the proposed East Anglia TWO project on the same population groups. This includes populations geographically defined within the proposed onshore development area, as well as those defined for other sensitivities.

276. Due to their increased likelihood to spend more time at home and their vulnerability to environmental changes it is assessed that there is an increased likelihood of effects on older people, those with existing health conditions and those living in deprived areas.

Table 27.47 Intra-project Cumulative Effects for Site Specific Population Groups

	Population near landfall	Population along the proposed onshore development area	Population near the onshore substation and National Grid substation
Effects related to location	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.
Outcome for general population at location	The general population intra-project cumulative effect is considered to be **not significant** due to the very short temporal scope of negligible effects and the avoidance of significant impacts through design decisions.	The general population intra-project cumulative effect is considered to be **not significant**. This is due to the sequential construction process which results in negligible effects of very short temporal scope at individual locations.	The general population intra-project cumulative effect is considered to be **not significant**. Consultation and site selection has led to design decisions that reduce the likelihood of health outcomes due to accumulated effects.
Outcome for vulnerable population at location	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. This is because the likelihood of vulnerable groups being at home during the day they may feel the effects accumulate more rapidly. However, the effects would be **not significant** because magnitude is low, the effects are localised, short term and reversible and transient.	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. This is because the likelihood of vulnerable groups being at home during the day they may feel the effects accumulate more rapidly. However, the effects would be **not significant** because magnitude is low, the effects are localised, short term and reversible and transient.	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. The cumulative effect on physical health is **not significant** but some people may feel more anxious due to perceived risk however this would the cumulative health effect be **not significant**.

Table 27.48 Intra-project Cumulative Effect for Potentially Vulnerable Groups within site Specific Populations

	Children and young people	Older people	People with existing poor health (physical and mental health)	People living in deprivation, including those on low incomes
Effects related to vulnerable group	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.
Outcome for vulnerable population at location	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered to be **not significant**. This is because the main effect on children would be a change in conditions that reduce their ability to concentrate while at school but design decisions have avoided these effects.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered possible due to the increased percentage of older people in the community and the likelihood that they would spend more time at home where they may feel the effects accumulate more rapidly. However, the health effect would be **not significant** due to low level of change.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered possible because they are more likely to be at home where they may feel the effects accumulate more rapidly and may feel anxiety more acutely due to their existing conditions. However, the health effect would be **not significant** due to low level of change.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered to be **not significant**. On the one hand deprivation may increase their vulnerability of effects but on the other hand the increased opportunity for training and employment may have a beneficial effect.

27.7.3 Inter-project Cumulative Effects

277. Inter-project cumulative effects are those effects that would increase due to the presence of more than one project in an area. Through consultation it has been agreed that the only project being considered will be Sizewell C New Nuclear Power Station, ***Table 27.49***.

278. Therefore, the following section considers the overall effect on health of the proposed East Anglia TWO project being constructed simultaneously with:

- The proposed East Anglia ONE North project; and
- The Sizewell C New Nuclear Power Station.

279. This includes consideration of geographically defined populations, as well as those defined for other sensitivities. The Applicant is in consultation with EDF Energy to coordinate projects and understand cumulative effects. At present, there is insufficient information in the public domain to effectively assess significance of cumulative effect.

280. Due to this, a general assessment of the potential for cumulative effect at landfall, along the proposed onshore development area and at the onshore substation has been included. This will be updated to include an assessment of cumulative effect on vulnerable groups as part of the ES submitted as part of the DCO application.

Table 27.49 Summary of Projects Considered for the CIA in Relation to Human Health

Project	Status	Development period	Distance from East Anglia TWO proposed onshore development area (km)	Project definition	Level of information available	Included in CIA	Rationale
Sizewell C New Nuclear Power Station	Scoping Opinion Adopted by the Secretary of State (SoS) on 02.06.2014	Uncertain	0.49km	Full Scoping Report Available: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-000103-Sizewell%20C%20EIA%20Scoping%20Report_Main%20text.pdf	Tier 5[28]	No	At this time there is insufficient information to take this forward into the CIA.

Table 27.50 Inter-project Cumulative Effects for Site Specific Population Groups

	Population near landfall	Population along the onshore cable route	Population near the onshore substation and National Grid infrastructure
Effects related to location	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities;	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and

[28] Based on criteria outlined in ***section 5.7.2*** of ***Chapter 5 EIA Methodology***

	Population near landfall	Population along the onshore cable route	Population near the onshore substation and National Grid infrastructure
	• Employment; and • Journey times or reduced access.	• Journey times or reduced access.	• Journey times or reduced access.
Outcome for general population at location	It is plausible that construction at landfall will overlap with construction of Sizewell C New Nuclear Power Station. At this point it is possible that noise, air quality and traffic impacts would cumulatively increase the impact to the north of landfall between Thorpeness and Sizewell. However, at present there is insufficient information in the public domain to assess a significance.	It is plausible that construction period for the onshore cable will overlap with the construction of Sizewell C New Nuclear Power Station. Due to proximity, there is potential for cumulative health effects around Leiston. Negative effects are plausible due to increased traffic density and positive effects are due to increased employment. However, at present there is insufficient information in the public domain to assess a significance.	It is plausible that construction periods will overlap between the proposed projects and Sizewell C New Nuclear Power Station. The onshore substation and National Grid substation are far enough from Sizewell C New Nuclear Power Station for direct cumulative effects to be unlikely. It is possible for increased traffic density to have an effect but at present there is insufficient information in the public domain to assess a significance.
Outcome for vulnerable population at location	The Applicant is in consultation with EDF Energy to coordinate projects and understand cumulative effects. At present, there is insufficient information in the public domain to assess a significance. Generally, vulnerable groups at each location are likely to be more sensitive to change than the general population. The existing environment shows that there is a higher proportion of older people and people living with ongoing health conditions. Therefore, these groups are likely to be more significant to any cumulative effects.		

27.8 Summary

281. A summary of the findings of the PEIR for human health is presented in ***Table 27.51***.

282. The main drivers of potential human health effect are the construction process and the associated construction traffic. These activities may lead to increased noise levels, dust and emissions. However, a combination of embedded mitigation (described in this chapter) and additional mitigation (detailed in the relevant chapters) can be used to control these impacts to an acceptable level.

283. Using the methodology agreed with Public Health England, human health effects due to changes in noise, air quality, ground or water contamination, physical activity, reduced access to health services, employment and the perception of risk have been assessed. This assessment finds that for the general population there would be a **not significant** effect on human health as a result of the proposed East Anglia TWO project.

284. There is the potential for increased effects on vulnerable groups due to their increased sensitivity to change. Due to the demography of the local environment vulnerable groups are likely to be people over 65 years old and people with ongoing health conditions. However, it is unlikely that any particular health determinant will have a significant effect on these groups due to the extensive mitigation proposed as part of the proposed East Anglia TWO project.

285. In conclusion, the proposed East Anglia TWO project is unlikely to have a significant effect on human health of either the general population or vulnerable groups within the population.

Table 27.51 Potential Impacts Identified for Human Health

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
Construction							
Noise	Mainly short term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Air quality	Mainly short term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Ground/water contamination	Short term	Plausible but improbable	Medium	Medium	Small	Not significant	**Not significant**
Physical activity	Very short term	Likely	Medium	Medium	Small	Not significant	**Not significant**
Journey times or reduced access	Short term	Likely	Low	Medium	Small	Not significant	**Not significant**
Construction and Operation							
Employment	Medium to long term	Likely	Medium	High	Low	Not significant	**Not significant**
Perception of risk	Long term	Plausible	Low	High	Medium	Not significant	**Not significant due to community engagement**
Operation							
Noise	Long term	Low probability	Low	High	None	No effect	**No effect**
EMF	Medium term	Low probability	Medium	High	None	No effect	**No effect**
Decommissioning							

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
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. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. 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. A decommissioning plan will be provided. 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.							

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