



**RWE Renewables UK Dogger Bank
South (West) Limited**

**RWE Renewables UK Dogger Bank
South (East) Limited**

Dogger Bank South Offshore Wind Farms

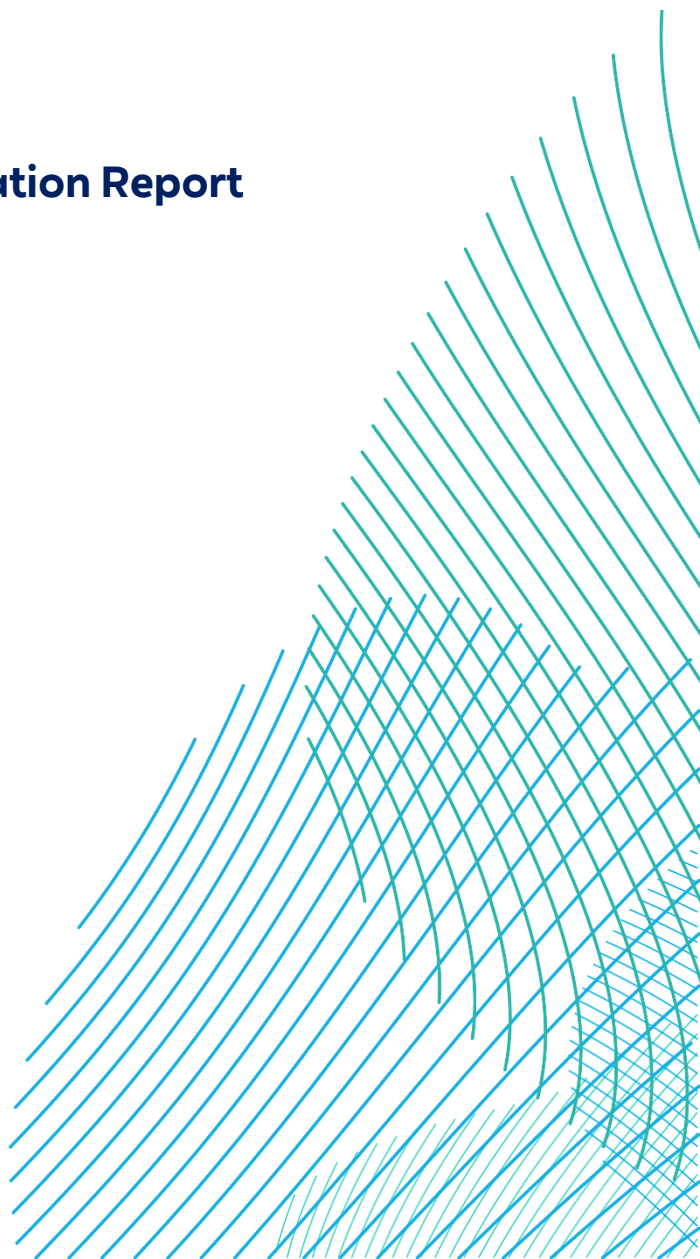
**Preliminary Environmental Information Report
Chapter 27 – Human Health**

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Contents

27	Human Health.....	12
27.1	Introduction	12
27.2	Consultation	14
27.3	Scope	18
27.3.1	Study Area.....	18
27.3.2	Realistic Worst Case Scenario	19
27.3.2.1	General Approach.....	19
27.3.2.2	Development Scenarios	29
27.3.2.3	Construction Scenarios	30
27.3.2.4	Operation Scenarios	31
27.3.2.5	Decommissioning Scenarios	31
27.3.3	Mitigation Embedded in the Design.....	31
27.4	Assessment Methodology	35
27.4.1	Policy, Legislation and Guidance.....	35
27.4.1.1	National Policy Statements	35
27.4.1.2	Other.....	41
27.4.2	Data and Information Sources.....	44
27.4.3	Impact Assessment Methodology	45
27.4.3.1	Determinants of Health, Risk Factors and Health Outcomes.....	45
27.4.3.2	Definitions.....	46
27.4.3.3	Significance of Effect	49
27.4.3.4	Significance in Public Health Terms.....	50
27.4.3.5	Impact Receptors	52
27.4.4	In-combination effects.....	56
27.4.5	Cumulative Effect Assessment Methodology	56
27.5	Existing Environment.....	57
27.5.1	Site Specific Wards.....	57
27.5.2	East Riding of Yorkshire.....	60
27.5.3	Future Trends.....	66
27.6	Assessment of Significance	68
27.6.1	Potential Effects During Construction	68

27.6.1.1	Impact 1: Health Related Behaviours: Physical Activity, Open Space and Leisure	68
27.6.1.2	Impact 2: Social Environment: Transport Modes, Access and Connections	72
27.6.1.3	Impact 3: Bio-Physical Environment: Air Quality	76
27.6.1.4	Impact 4: Bio-Physical Environment: Water	81
27.6.1.5	Impact 5: Bio-Physical Environment: Soil Contamination	86
27.6.1.6	Impact 6: Bio-Physical Environment: Noise Disturbance.....	86
27.6.1.7	Impact 7: Economic Environment: Workforce Upskilling	91
27.6.1.8	Impact 8: Economic Environment: Employment and Investment	94
27.6.2	Potential Effects During Operation	98
27.6.2.1	Impact 1: Bio-Physical Environment: Noise Disturbance.....	98
27.6.2.2	Impact 2: Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks	100
27.6.2.3	Impact 3: Bio-Physical Environment: Climate Change	102
27.6.2.4	Impact 4: Economic Environment: Workforce Upskilling	105
27.6.2.5	Impact 5: Economic Environment: Employment and Investment	106
27.6.2.6	Impact 6: Wider Social Infrastructure and Resources	108
27.6.3	Potential Effects During Decommissioning.....	110
27.7	Preliminary Assessment of Cumulative Effects.....	110
27.7.1	Initial Screening for Cumulative Effects	110
27.7.2	Plans/Projects Considered for Cumulative Impacts.....	115
27.7.3	Transboundary Impact/Effect Assessment Methodology	117
27.7.4	Assumptions and Limitations.....	118
27.8	Potential Monitoring Requirements.....	119
27.9	Transboundary Effects.....	119
27.10	Interactions	119
27.11	Inter-relationships.....	126
27.12	Summary	127

Tables

Table 27-1 Consultation Responses – Planning Inspectorate	14
Table 27-2 Realistic Worst Case Design Parameters.....	20
Table 27-3 Embedded Mitigation Measures	32
Table 27-4 EN-1 NPS Assessment Requirements	36
Table 27-5 EN-5 NPS Assessment Requirements	39
Table 27-6 Available Data and Information Sources	44
Table 27-7 Definition of Sensitivity for a Human Health Receptor	47
Table 27-8 Definition of Magnitude of Impacts	48
Table 27-9 Human Health Significance of Effect Matrix	49
Table 27-10 Definition of Effect Significance.....	50
Table 27-11 Receptors	53
Table 27-12 Site Specific Ward Level Baseline Health Indicators	58
Table 27-13 Local Area Baseline Health Indicators (Public Health Outcomes Framework)	62
Table 27-14 Potential Cumulative Effects.....	111
Table 27-15 High-Level List of Plans/Projects Screened For Further Assessment in the Final CEA.....	115
Table 27-16 High-Level List of Plans/Projects Screened For Further Assessment in the Final CEA.....	116
Table 27-17 Interactions Between Impacts – Screening.....	120
Table 27-18 Interaction Between Impacts by Geographic Populations – Construction and Decommissioning.....	122
Table 27-19 Interaction Between Impacts by Geographic Populations – Operation.....	123
Table 27-20 Interaction Between Impacts - Phase and Lifetime Assessment.....	124
Table 27-21 Summary of Potential Likely Significant Effects on Human Health.....	130

Volume 2 - Figures

Figure 27-1 Health Study Area

Glossary

Term	Definition
Array Areas	The DBS East and DBS West offshore array areas, where the wind turbines and array cables will be located. The array areas do not include the offshore export cable corridor.
Health	State of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.
Health outcome	Change in health status of an individual, group or population attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status.
Health risk factor	A social, economic or biological status, or behaviours or environments which are associated with or that cause increased susceptibility to a specific disease, ill health or injury.
Horizontal Directional Drilling (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
Landfall	The point on the coastline at which the offshore export cables are brought onshore, connecting to the onshore export cables at the Transition Joint Bay.
Likely health effect	This effect is one that, with reference to the scientific literature, shows a plausible theoretical link between source-pathway-receptor; and the occurrence of which is judged as probable, in a specific context.
Mental health	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 her or his community.

Term	Definition
Offshore Development Area	The Offshore Development Area encompasses the wind farm site and the options for the offshore transmission works.
Onshore Development Area	The Onshore Development Area for PEIR is the boundary within which all onshore infrastructure required for the Projects will be located including landfall, onshore export cable route, accesses, construction compounds and onshore substations. The Onshore Development Area is to be refined through the consultation and engineering review process.
Onshore Export Cables	Onshore export cables take the electricity from the Transition Joint Bay to the onshore substations.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network. There will be one onshore substation for each Project.
Population health	The health outcomes of a group of individuals, including the distribution of such outcomes within the group.
Significant health effect	An effect triggered by the project that is judged to be important for public health (a positive or negative effect), highly desirable for public health (a positive effect) or unacceptable for public health (a negative effect).
The Applicant	RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited as the owners of DBS West and DBS East respectively are the named undertakers that will have the benefit of the Development Consent Order. References in this document to obligations on, or commitments by, 'the Applicant' are given on behalf of RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited.

Term	Definition
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South offshore wind farms).
Vulnerable groups or subpopulations	Sensitive to changes in health determinant in a given context. Can include groups such as ethnic minorities, people with disabilities, people who are homeless, people living in poverty, those struggling with addiction and substance abuse, and isolated older people.
Wider determinants of health	Biological, behavioural, socio-economic, cultural or environmental factors which contribute to the health status of individuals or populations.

Acronyms

Term	Definition
CEA	Cumulative Effect Assessment
CoCP	Code of Construction Practice
COPD	Chronic Obstructive Pulmonary Disease
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electro-magnetic field
ES	Environmental Statement
EUPHA	European Public Health Association
DBS	Dogger Bank South
DCO	Development Consent Order
HDD	Horizontal Directional Drilling
HIA	Health Impact Assessment
HVDC	High Voltage Direct Current
HVAC	High Voltage Alternating Current
IAIA	International Association for Impact Assessment
ICNIRP	International Commission on Non-ionizing Radiation Protection
IEMA	Institute of Environmental Management and Assessment
IPH	Institute of Public Health

Term	Definition
IPMP	In-Principle Monitoring Plan
JSNA	Joint Strategic Needs Assessment
KSI	Killed and Seriously Injured
LSOA	Lower layer Super Output Area
MHCLG	Ministry for Housing, Communities and Local Government
NEET	Not in education, employment or training
NHS	National Health Service
NO2	Nitrogen dioxide
NOMIS	National Online Manpower Information System
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Planning
OEP	The Office for Environmental Protection
OHID	Office for Health Improvement and Disparities
ONS	Office for National Statistics
OCTMP	Outline Construction Traffic Management Plan
PEIR	Preliminary Environmental Information Report
PHE	Public Health England
PM	Particulate Matter
PRoW	Public Right of Way
SAR	Standardised Admission Ratios
SMR	Standardised Mortality Ratio

Term	Definition
SSC	Suspended Sediment Concentrations
UKHSA	United Kingdom Health Security Agency
WFD	Water Framework Directive
WHO	World Health Organisation

27 Human Health

27.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the likely significant effects of the Projects on human health. The chapter provides an overview of the existing environment for the proposed Onshore and Offshore Development Areas, followed by an assessment of likely significant effects for the construction, operation, and decommissioning phases of the Projects.
2. In this chapter the terms human health, health and wellbeing are used interchangeably. Key definitions are set out in the glossary.
3. Health in Environmental Impact Assessment (EIA) takes a public health approach, meaning it reaches conclusions on the health outcomes to defined populations, rather than the health outcomes of individuals. The guidance that explains that this is the correct approach is set out in section 27.4.1.
4. The chapter follows guidance and good practice, giving the public health perspective of impacts. In so doing, the chapter:
 - Takes a population health approach to assessing physical and mental health outcomes;
 - Considers the wider determinants of health, that may be significantly affected directly or indirectly;
 - Assesses the potential for health inequalities to vulnerable groups; and
 - Considers opportunities to improve population health.

5. The assessment should be read in conjunction with the following linked chapters:
 - **Chapter 8 Marine Physical Environment;**
 - **Chapter 13 Commercial Fisheries;**
 - **Chapter 14 Shipping and Navigation;**
 - **Chapter 16 Infrastructure and Other Users;**
 - **Chapter 19 Geology and Land Quality;**
 - **Chapter 20 Flood Risk and Hydrology;**
 - **Chapter 21 Land Use;**
 - **Chapter 23 Landscape & Visual Impact Assessment;**
 - **Chapter 24 Traffic;**
 - **Chapter 25 Noise;**
 - **Chapter 26 Air Quality;**
 - **Chapter 28 Socio-Economics;**
 - **Chapter 29 Tourism and Recreation;** and
 - **Chapter 30 Climate Change.**
6. This chapter does not seek to repeat text or replicate data from these inter-related technical disciplines. The health assessment takes as its input the residual effect conclusions of these other topic chapters. In this regard the health assessment relies on the mitigation measures set out in those chapters and does not repeat them. This avoids duplication and keeps the health assessment proportionate.

27.2 Consultation

7. Consultation with regard to human health has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements of consultation to date have included scoping and a letter offering a meeting to the Director of Public Health at East Riding of Yorkshire Council, dated 13/12/2022. The feedback received has been considered in preparing the PEIR. **Table 27-1** provides a summary of how the consultation responses received to date have influenced the approach that has been taken.
8. This chapter will be updated following consultation on PEIR in order to produce the final assessment that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report alongside the DCO application.

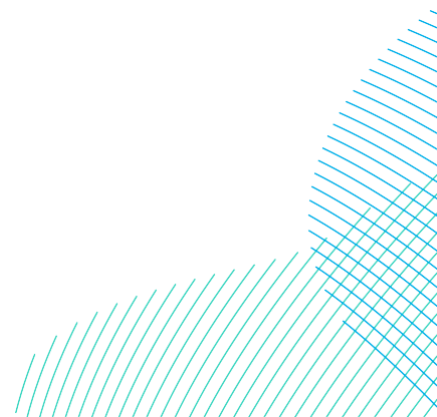
Table 27-1 Consultation Responses – Planning Inspectorate

Comment	Project Response
The Planning Inspectorate Scoping Opinion 02/09/2022	
The Inspectorate refers to the advice given elsewhere in this Scoping Opinion on these matters but agrees that effects on human health arising from them can be scoped out of the ES.	Agreed. This is consistent with the scope of the health assessment in section 27.6.
Paragraph 967 states that soil contamination is only considered to pose a potentially significant health risk to the public where it is associated with water contamination, (and as such) soil contamination in itself is scoped out. No evidence is provided within the Scoping Report for this statement. The chapters should provide this information, or an assessment of likely significant effects on human health from soil contamination.	Assessment of soil contamination is covered in section 27.6.1.5.
Interference with access to open space is discussed in the Scoping Report in relation to construction impacts but not discussed for operation. Impacts during operation to open space and transport routes including PRow and cycle routes are denoted as scoped out for in Table 4-3.	Agreed. This is consistent with the scope of the health assessment in section 27.6. Details of PRow and open space reinstatement are addressed in Chapter 5 Project Description .

Comment	Project Response
The Inspectorate is content that significant effects on human health, other than those of safety discussed elsewhere, are unlikely to arise from impacts to transport. The Inspectorate accepts that any short-term disruption to open space, PRow, cycle paths and bridleways etc will have occurred during construction and no additional impacts would be anticipated during operation. The ES should detail how PRow and open space areas will be reinstated following construction and how these works are to be secured.	
The Scoping Report does not provide any information about operational air quality impacts in the text or reasoning behind scoping it out in this section. As advised above, the Inspectorate considers that back-up generators, and other equipment in particular battery storage infrastructure if proposed, has the potential to result in air quality effects during the operational phase. In the absence of a detailed project description which allows this impact pathway to be removed, the Inspectorate cannot agree to scope this matter out. The ES should provide an assessment the likely significant effects on air quality during the operational phase.	The health assessment aligns with Chapter 26 Air Quality. If required, the use of back-up generators will be fully assessed at ES stage. Due to their occasional used, backup generators are unlikely to result in levels of air pollution that would have significant effects for population health. The expectation is that backup generator air quality effects will continue to be scoped out of the health assessment.
The Inspectorate agrees that these matters are either beyond the scope of EIA, or given the nature of the proposals and the reasoning provided in the Scoping Report unlikely to give rise to significant environmental effects and can be scoped out of the ES.	Agreed. This is consistent with the scope of the health assessment in section 27.6.
United Kingdom Health Security Agency (UKHSA) and Office for Health Improvement and Disparities (OHID) Scoping Responses 23/08/2022	
UKHSA is satisfied that the health baseline approach is reasonable and that likely impacts	Agree that the scope and methods for the health assessment are

Comment	Project Response
and populations at risk are considered for further assessment. UKHSA is satisfied that the proposed approach uses good practice and has identified appropriate data sources and health standards. UKHSA is satisfied likely impacts and populations at risk are considered and that appropriate issues have been scoped in for further assessment in subsequent stages of the submission. UKHSA is satisfied that appropriate determinants of health and population groups have been identified and scoped into future assessments. UKHSA is satisfied with the proposed approach. We note that EMF impacts have been scoped out of the assessment based on compliance with extant guidance and regulations. UKHSA is satisfied with this approach.	appropriate. See section 27.4 on methods and section 27.6 on assessment.
Our position is that pollutants associated with road traffic or combustion, particularly particulate matter and oxides of nitrogen are non-threshold; i.e., an exposed population is likely to be subject to potential harm at any level and that reducing public exposure to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards will have potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants, address inequalities (in exposure) and maximise co-benefits (such as physical exercise). We encourage their consideration during development design, environmental and health impact assessment, and development consent.	The health assessment considers the non-threshold effects of air quality. See section 27.6.1.3.
Hull City Council Scoping Response 23/08/2022	

Comment	Project Response
The extent of the defined onshore study area remains in relative proximity to the city of Kingston-upon-Hull, with a population of c.260, 000. There is potential for both positive and negative impacts to affect sensitive receptors within the adjacent Hull City Council administrative area, during the construction phase, particularly as a consequence of noise, vibration, and air quality as-associated with vehicular traffic movements, climate change mitigation and energy provision outputs during operation, and employment and training opportunities during both.	The city of Hull is included as appropriate within the study area. See section 27.3.1.



27.3 Scope

27.3.1 Study Area

9. The human health study area has been defined on the basis of relevant human populations that may be affected directly or indirectly by the Projects.
10. As study areas do not necessarily define the boundaries of potential health effects, particularly mental health effects, this chapter uses study areas to broadly define representative population groups, including in relation to sensitivity, rather than to set boundaries on the extent of potential effects.
11. In setting the study area, it is relevant context that the array areas are located in the southern North Sea. The DBS East array boundary lies approximately 100km from shore and the DBS West boundary is approximately 118km from shore at their closest points (Flamborough Head). The study area therefore reflects relevant indirect effects to onshore populations from the arrays and direct effects to onshore populations from the nearshore works, onshore cable corridor and substations.
12. The following study areas are used in the health assessment to indicate the relevant population and the expected maximum extent of any likely significant effects (**Figure 27-1**):
 - The site specific population is defined using the wards of:
 - **E05001695** East Wolds and Coastal and **E05001703** North Holderness (for landfall);
 - **E05001687** Beverley Rural and **E05001701** Mid Holderness (for the onshore cable corridor); and
 - **E05001693** Dale, **E05001705** St Mary's and **E05001702** Minster and Woodmansey (for the onshore substations).
 - The local population is defined using the local authority area of **East Riding of Yorkshire**.
 - The regional population is defined using the area of **Yorkshire and Humber** (including the city of Hull).
 - The national population is defined with reference to **England**, and the wider UK as relevant.
 - The international population is defined with reference to global effects relevant to international travel and transboundary effects.
13. The site-specific wards and lower layer super output areas (LSOA) have been selected to reflect the relevant geographic locations, but also the more deprived areas to ensure potential inequalities are reflected.

14. The local study area for human health focuses on the local authority area of East Riding of Yorkshire, as the location of onshore activities. As appropriate consideration is also given to effects to City of Hull, North East Lincolnshire and North Lincolnshire, for example in relation to wider transport effects, including associated air quality and noise impacts.
15. The local (East Riding of Yorkshire) and regional (Yorkshire and Humber) study areas reflect a broad area onshore from which the project workforces are likely to be drawn (aligning with **Chapter 28 Socio-Economics**), as well as the more localised effects of the landfall, onshore cable corridor and substation locations in East Riding of Yorkshire. These are also the areas with the closest community populations for offshore influences on determinants of health, such as those related to fishing and nearshore leisure activities. The study area does not extend to port related activities and associated port transport.
16. The health assessment also has regard to the zones of influence defined by other topic chapters. Those zones of influence are relevant and inform the health assessment's consideration of effect magnitude.

27.3.2 Realistic Worst Case Scenario

27.3.2.1 General Approach

17. The health assessment does not duplicate all the realistic worst case design parameters described in the inter-related topic chapters as set out in section 27.1. Key parameters are noted.
18. The key realistic worst case design parameters for likely significant effects scoped into the EIA for the health assessment are summarised in **Table 27-2**. These are based on the project parameters described in **Chapter 5 Project Description**, which provides further details regarding specific activities and their durations.
19. In addition to the design parameters set out in **Table 27-2**, consideration is also given to the different development scenarios still under consideration and the possible phasing of the construction as set out in sections 27.3.2.2 to 27.3.2.5.

Table 27-2 Realistic Worst Case Design Parameters

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
Onshore Construction				
Landfall	Single lower intensity time period of: Duration: 18 months Total works area: 582,661m² Temporary lighting during working hours. Temporary out-of-hours security lighting. Temporary access: Route from the existing road system	Single higher intensity time period of: Duration: 18 months Total works area: 602,661m² Temporary lighting during working hours. Temporary out-of-hours security lighting. Temporary access: Route from the existing road system	Extended lower intensity time period of: Duration: 42 months Total works area: 602,661m² Temporary lighting during working hours. Temporary out-of-hours security lighting. Temporary access: Route from the existing road system	Relevant to: - beach closures or restricted access. - disruption / disturbance of recreation and leisure opportunity. - risk of reduced water quality. - active travel routes diversions or temporary closures. - extended journey times, reduced access or increased severance due to additional construction vehicles.

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
				temporary exposures and disturbance associated with cable laying activities near community locations. (worst case is longest duration and largest scale of vessels, work areas and vehicles)
Onshore export cable route	Single lower intensity time period of: Overall duration: 33 months Working width: 50m (up to 125m at trenchless crossings) Corridor length: 39km Temporary lighting during working hours.	Single higher intensity time period of: Overall duration: 33 months Working width: 100m (up to 250m at trenchless crossings) Corridor length: 39km Temporary lighting during working hours.	Extended lower intensity time period of: Overall duration: 57 months, within a 5-year window Working width: 100m (up to 250m at trenchless crossings) Corridor length: 39km Temporary lighting during working hours.	Relevant to: - active travel route diversions or temporary closures. - extended journey times, reduced access or increased severance due to additional construction vehicles.

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	Temporary out-of-hours security lighting.	Temporary out-of-hours security lighting.	Temporary out-of-hours security lighting.	temporary exposures and disturbance associated with cable laying activities near community locations. (worst case is longest duration and largest scale of work and vehicles)
Onshore substations	Single lower intensity time period of: Total construction area: 180,000m² (based on one HVAC (AIS) substation + temporary construction compound) Duration: 4 years Temporary lighting during working hours.	Single higher intensity time period of: Total construction area: 274,416m² (based on one HVAC (AIS) substation + temporary construction compound, and one HVDC substation + temporary construction compound)	Extended lower intensity time period of: Total construction area: 274,416m² (based on one HVAC (AIS) substation + temporary construction compound, and one HVDC substation + temporary construction compound)	Relevant to temporary exposures and disturbance associated with substation construction near community locations. (worst case is longest duration and largest scale of work and vehicles)

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	Temporary out-of-hours security lighting.	Duration: 4 years Temporary lighting during working hours. Temporary out-of-hours security lighting.	Duration: 6 years Temporary lighting during working hours. Temporary out-of-hours security lighting.	
Onshore Operation				
Landfall	No relevant worst case parameter. All construction disturbance restored to pre-existing condition. No permanent above-ground infrastructure, other than manholes for link boxes.			
Onshore export cable route	No relevant worst case parameter. All construction disturbance restored to pre-existing condition. No permanent above-ground infrastructure, other than manholes for link boxes every 0.75-1.5km along the cable route.			
Onshore substations	Smaller scale of substation infrastructure: Permanent substation area: 135,000m ² (based on one HVAC substation)	Larger scale of substation infrastructure: Permanent substation footprint = 199,416m ² (based on one HDAC and one HVDC substation)	Extended period of new substation infrastructure: Permanent substation footprint = 199,416m ² (based on one HDAC and one HVDC substation)	Relevant to level of community concern about the risk of EMF (worst case is largest scale of infrastructure)

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	Substation buildings: Tallest building: 24m Largest building footprint: 55m x 45m Tallest structure: 27m height Duration: 30 years Security /operational lighting within the compound	Substation buildings: Tallest building: 24m Largest building footprint: 55m x 45m Tallest structure: 27m height Duration: 30 years Security /operational lighting within the compound	Substation buildings: Tallest building: 24m Largest building footprint: 55m x 45m Tallest structure: 27m height Duration: 30 years Security /operational lighting within the compound	
Offshore Construction				
Array areas	Smaller initial area of reduced shipping access, including for commercial fisheries Construction duration up to 5 years	Larger area of disruption to shipping access, including for commercial fisheries Construction duration up to 5 years	Larger area of disruption to shipping access, including for commercial fisheries Construction duration up to 7 years	Relevant to: Potential shipping access and commercial fisheries disruption (worst case is largest scale of reduced access)

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	Total developable array area 494.5km² Installation of up to 100 small turbines and five offshore platforms within the array area Maximum total vessels offshore on site simultaneously 66 Safety zones: 500m safety zones around wind turbines and offshore platforms during their construction. 50m safety zone around each item of infrastructure during the construction phase, where no construction	Total developable array area 989km² (DBS East and DBS West) Installation of up to 200 small turbines and five offshore platforms within the array area Maximum total vessels offshore on site simultaneously 66 Safety zones: 500m safety zones around wind turbines and offshore platforms during their construction. 50m safety zone around each item of infrastructure during the construction phase, where no construction	Total developable array area 989km² (DBS East and DBS West) Installation of up to 200 small turbines and nine offshore platforms within the array area Maximum total vessels offshore on site simultaneously 132 Safety zones: 500m safety zones around wind turbines and offshore platforms during their construction. 50m safety zone around each item of infrastructure during the construction phase, where no construction	

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	works are taking place on that infrastructure.	works are taking place on that infrastructure.	works are taking place on that infrastructure.	
Offshore export cable corridor	No relevant worst case parameter.			
Landfall	As above for landfall			
Offshore Operation				
Array areas	Smaller scale of generating capacity initially available Smaller initial area of reduced shipping access, including for commercial fisheries.	Larger scale of generating capacity delivered together Larger area of disruption to shipping access, including for commercial fisheries.	Larger scale of generating capacity delivered over time Larger area of disruption to shipping access, including for commercial fisheries.	Relevant to: Climate adaptation benefit to public health Wider societal infrastructure benefit of electricity generation to public health Potential shipping access and commercial fisheries disruption

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
	100 small turbines and five offshore platforms within the array area Maximum turbine height 450m (above MHWS) Operational design life of 30 years Total within the array area: 3,723,738m² Safety Zones: Up to 500m when major maintenance is in progress (use of jack-up vessel or similar). Maximum total vessels offshore on site simultaneously 11	200 small turbines and five offshore platforms within the array area Maximum turbine height 450m (above MHWS) Operational design life of 30 years Total within the array area: 3,869,970m² Safety Zones: Up to 500m when major maintenance is in progress (use of jack-up vessel or similar). Maximum total vessels offshore on site simultaneously 11	200 small turbines and nine offshore platforms within the array area Maximum turbine height 450m (above MHWS) Operational design life of 30 years Total within the array area: 8,284,669m² Safety Zones: Up to 500m when major maintenance is in progress (use of jack-up vessel or similar). Maximum total vessels offshore on site simultaneously 11	(worst case is lowest level of generation and largest scale of reduced access)

	Parameter			
	DBS East or DBS West in isolation	DBS East and DBS West concurrently	DBS East and DBS West sequentially	Notes and rationale
Offshore export cable corridor	No relevant worst case parameter.			
Landfall	No relevant worst case parameter.			
Decommissioning				
No final decision regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation has yet been made. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused or recycled wherever possible and the transition bays and cable ducts being left in place. Furthermore, it is likely that offshore project infrastructure will be removed above the seabed and reused or recycled where practicable. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the worst case scenario, the impacts will be no greater than those identified for the construction phase.				

27.3.2.2 Development Scenarios

20. There are currently two possible electrical solutions being considered for DBS West, HVAC or HVDC. Due to the distance of the array area offshore DBS East will be an HVDC project. Therefore, there are two possible electrical solutions for the Projects:
- One HVDC project and one HVAC project; or
 - Two HVDC projects.
21. Offshore the most significant difference between an HVAC solution and an HVDC solution is that if an HVAC electrical solution is used an additional platform (reactive compensation platform (RCP)) will be required along the offshore export cable. In addition, a HVAC solution will require two additional export cable lays offshore, over and above the four lays that would be required for two HVDC projects.
22. There are different parameters required for the onshore substations depending on which electrical solution is selected. Therefore, there are four possible development scenarios within the onshore substation zones that could be taken forward:
- Two HVDC substations in Substation Zone 4;
 - One HVDC substation in Substation Zone 1 and one HVAC substation in Substation Zone 4;
 - One HVDC substation in Substation Zone 4 and one HVAC substation in Substation Zone 1; or
 - One HVDC substation in Substation Zone 1 and one HVDC substation in Substation Zone 4.
23. In order to ensure that a robust assessment has been undertaken, all development scenarios and options have been considered to ensure the realistic worst case scenario for each topic has been assessed. Further details are provided in **Chapter 5 Project Description**.

27.3.2.3 Construction Scenarios

24. The following principles set out the framework for how the Projects may be constructed (relating to both onshore and offshore works):
- DBS East and DBS West may be constructed at the same time, or at different times;
 - If built concurrently, both Projects could be constructed in five years;
 - If built non-concurrently, either Project could be built first;
 - If built non-concurrently, each Project would require a five year period of construction;
 - If built non-concurrently, it is anticipated that there would be up to a two year lag between the start of construction for the first project and the start of construction for the second project; and
 - Assuming a maximum construction period per Project of five years, and taking the above into account, the maximum construction period over which the construction of both Projects could take place is seven years.
25. In order to determine which construction scenario presents the realistic worst case for each receptor and impact, the assessment considers both maximum duration effects and maximum peak effects, in addition to each Project being developed in isolation, drawing out any differences between each of the two Projects.
26. The three construction scenarios considered by the health assessment are therefore:
- Build DBS East or build DBS West in isolation;
 - Build DBS East and DBS West concurrently – reflecting the maximum peak effects; and
 - Build the Projects sequentially with a lag of up to two years – reflecting the maximum duration of effects.
27. The individual, concurrent and sequential construction scenarios all allow for flexibility to build out the Projects using a phased approach. This will allow the Projects to adapt to National Grid Electricity Transmission Operator's development plans for onshore grid connection points. Under a phased approach the maximum timescales for individual elements of the construction have been assessed.

28. Any differences between the Projects, or differences that could result from the manner in which the first and the second Projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in section 27.6. For each potential impact, only the worst case construction scenario for two Projects is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in section 27.3.

27.3.2.4 Operation Scenarios

29. Operation scenarios are described in detail in **Chapter 5 Project Description**. The assessment considers the following scenarios:
- Only DBS East in operation;
 - Only DBS West in operation; and
 - The two Projects operating concurrently, with or without a lag of up to two years between each Project commencing operation.
30. If the Projects are built out using a phased approach, there would also be a phased approach to starting the operational stage. The worst case scenario for the operational phase for the Projects has been assessed. See section 5.1.1 of **Chapter 5 Project Description** for further information.
31. The operations lifetime of each Project is expected to be 30 years.

27.3.2.5 Decommissioning Scenarios

32. Decommissioning scenarios are described in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a Decommissioning Programme prior to construction, however for the purpose of this assessment it is assumed that decommissioning of the Projects could be conducted separately, or at the same time.

27.3.3 Mitigation Embedded in the Design

33. This section outlines the embedded mitigation relevant to the health assessment, which has been incorporated into the design of the Projects (**Table 27-3**). Where other mitigation measures are proposed, these are detailed in the impact assessment (section 27.6).
34. This health assessment takes as its input the residual effect conclusions of the inter-related technical disciplines set out in section 27.1. In this regard the health assessment relies on the mitigation measures set out in those chapters and does not repeat all measures. This avoids duplication and keeps the health assessment proportionate. Key measures are set out in **Table 27-3**.

Table 27-3 Embedded Mitigation Measures

Parameter	Mitigation Measures Embedded into the Project Design
Pollution Prevention Measures	All vessels involved will be required to comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78. An outline Pollution Environmental Management Plan (PEMP) will be produced to cover the construction and, operation and maintenance and decommissioning phases of the Projects and submitted with the DCO application. This will set out all procedures and measures (in the form of a Marine Pollution Contingency Plan (MPCP)) to be followed during construction and, operation and maintenance and decommissioning phases to minimise the risk of, and effects in the event of an accidental spill. The final PEMP will identify all potential sources and types of accidental pollution for all project phases and set out the proposed mitigation measures and will be developed in consultation with key stakeholders for approval by the MMO. This will be undertaken post-consent.
Fisheries Liaison	Ongoing liaison with the fishing industry through the Fisheries Liaison Officer (FLO) will be maintained during construction, maintenance and decommissioning activities. Good practise with regards to fisheries liaison will be adhered to, in order to maintain effective communications between the Projects and the fishing industry.
Communication	Advance warning and accurate location details will be provided to fishing fleets of construction, maintenance and decommissioning activities, associated safety zones and advisory passing distances; communication will be via timely and efficient Notices to Mariners (NtMs) and Kingfisher Bulletins. This is to ensure that the fishing industry is fully informed, in advance, of any offshore activities.
Navigation	Aids to navigation (marking and lighting) will be deployed in accordance with the latest relevant available standard industry guidance. The United Kingdom Hydrographic Office (UKHO) will be notified of both the commencement, progress, and completion of offshore construction works, to allow marking of installed infrastructure on nautical charts.

Parameter	Mitigation Measures Embedded into the Project Design
Cable routing	The route of the onshore export cable corridor has been determined as part of a detailed site selection process (see Chapter 4 Site Selection and Assessment of Alternatives). The route of the onshore export cable corridor has been designed to avoid potential sources of contamination (e.g. landfills) where possible.
	The onshore export cable corridor has been designed to avoid sensitive landscape elements, such as woodland, buildings and trees, where the loss of such features would be detrimental to the character of the area.
Project dimensions	All parameters for the Projects, such as substation dimensions and working widths, are the smallest that can reasonably be defined at the PEIR stage.
Offshore platform	Any proposed offshore platform (including those in the offshore export cable route and in the more distant array areas) will be over 52km from the landfall point, and over 37km from the closest location on land (Flamborough Head). It will therefore not have likely significant effects on onshore receptors.
Construction Traffic Management Plan	An outline Construction Traffic Management Plan (OCTMP) is presented as part of the statutory consultation. The OCTMP contain details of measures to control, monitor and enforce HGV movements and would provide details of the mechanisms for managing design of accesses and offsite highway works. The OCTMP also include 'Travel Plan' measures to manage the number of single occupancy car trips.
Strategy for Access	An access strategy has been developed that seeks to reduce the impact of HGV traffic upon the most sensitive communities and to minimise travelling via narrow roads. The access strategy would be facilitated by: • The construction of a temporary haul road along the onshore cable route; • The creation of vehicle crossovers; and • Controls on vehicle routing.

Parameter	Mitigation Measures Embedded into the Project Design
Trenchless Crossings	To avoid disruption to transport users whilst the Projects' onshore export cables are installed under road and rail infrastructure, trenchless crossing techniques will be used at the following locations: • The railway line between Hull and Bridlington (to the north of Beverley); • All A and B roads (for the B1230 the option of trenching is retained); • Dunnington Lane; and • Meaux Lane.
B1230 Crossing	To avoid disruption to transport users whilst the Projects' onshore export cables are installed under the B1230, temporary traffic signals will be utilised to allow shuttle working, i.e. one lane will remain open to traffic.
Park Lane Crossing	To avoid disruption to transport users whilst the Projects' onshore export cables are installed under Park Lane, access would be maintained via either temporary road diversions/road widening within the DCO order limits.
Crossing Private Access Tracks	To avoid disruption to transport users whilst the Projects' onshore export cables are installed under private access tracks, temporary road diversions would be established. This would be via agreed diversion routes, via existing private tracks or a temporary access track within the DCO order limits.
Construction noise	Prior to the commencement of construction, noise management measures will be detailed in a Code of Construction Practice (CoCP) detailing site-specific best practicable means (BPM) noise control measures to be adopted throughout construction.

27.4 Assessment Methodology

27.4.1 Policy, Legislation and Guidance

27.4.1.1 National Policy Statements

35. The assessment of potential impacts upon human health has been made with specific reference to the relevant National Policy Statements (NPS). The three NPSs relevant to this project are:
- the NPS for Energy (EN-1);
 - NPS for Renewable Energy Infrastructure (EN-3); and
 - NPS for Electricity Networks (EN-5).
36. The specific assessment requirements for human health, as detailed in the NPS, are summarised in **Table 27-4** together with an indication of the section of this chapter where each is addressed.
37. EN-3 (DECC, 11b) has been reviewed and it is not considered that there are relevant policy positions in relation to human health that need to be taken into account for the Project.
38. It is noted that EN-1 (DECC, 2011a) and the EN-5 (DECC, 2011c) are in the process of being revised. Draft versions were published for consultation in September 2021 (Department for Business Energy and Industrial Strategy (BEIS), 2021a and BEIS 2021b, respectively). A review of these draft versions has been undertaken in the context of this chapter. The revised draft EN-3 had also been considered but there are no substantive changes relevant to health.
39. **Table 27-4** includes sections of the draft versions of the NPS (EN-1) in which relevant additional NPS requirements that are not presented within the current NPS (EN-1) have been included. Minor wording changes within the draft version which do not materially influence the NPS (EN-1 and EN-5) requirements have not been reflected in **Table 27-4**.
40. Following the consultation in 2021 on the draft energy NPS, a new consultation opened on the 30 March 2023 on revised drafts of the energy NPSs, including EN1, EN3 and EN5. Due to the timing of this consultation, and finalisation of this PEIR we have been unable to review and take these revised draft NPS into account within these documents. However, these will be reviewed and incorporated into the final ES where relevant.

Table 27-4 EN-1 NPS Assessment Requirements

NPS Requirement	NPS Reference	PEIR Section Reference
EN-1 NPS for Energy		
<i>“The energy NPSs are likely to contribute positively towards improving the vitality and competitiveness of the UK energy market by providing greater clarity for developers which should improve the UK’s security of supply and, less directly, have positive effects for health and well-being in the medium to longer term through helping to secure affordable supplies of energy and minimising fuel poverty; positive medium and long term effects are also likely for equalities.”</i> [emphasis added]	EN-1 paragraph 1.7.2	Noted. Wider societal benefits have been assessed in section 27.6.2.6. These consider the positive effects to health and equalities.
<i>“To consider the potential effects, including benefits, of a proposal for a project, the [Infrastructure Planning Commission (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.”</i> [emphasis added]	EN-1 paragraph 4.2.2	Employment is considered within this chapter, as well as Chapter 28 Socio-Economics. Well-being is an integral con-sideration throughout this chapter, reflecting that the WHO define health in terms of states of wellbeing.
<i>“Energy production has the potential to impact on the health and well-being (“health”) of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the production, distribution and use of energy may have negative impacts on some people’s health.”</i> <i>“... where the proposed project has an effect on human beings, the ES should assess these effects for each element of</i>	EN-1 paragraphs 4.13.1 and 4.13.2	The effects to population health are considered in the section 27.6 Assessment of Significance.

NPS Requirement	NPS Reference	PEIR Section Reference
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. " [emphasis added]		
"The direct impacts on health may include increased traffic, air or water pollution , dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests."	EN-1 paragraph 4.13.3	The scope of the health assessment is set out in the Scoping Opinion. For this application direct effects of particular relevance relate to traffic, air, water pollution, dust, noise and public understanding of EMF. It has been agreed though the Scoping Opinion that other direct effects are scoped out.
"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 key public services, transport or the use of open space for recreation and physical activity." "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 air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refused consents or require specific mitigation under the Planning Act 2008. However, the IPC will want to take account of health concerns when setting	EN-1 paragraph 4.13.4 and 4.13.5	The scope of the health assessment is set out in the Scoping Opinion. For this application in-direct effects of particular relevance relate to physical activity, open space and leisure, as well as employment and training opportunities. It has been agreed though the Scoping Opinion that other indirect effects are scoped out.

NPS Requirement	NPS Reference	PEIR Section Reference
requirements relating to a range of impacts such as noise.”		
“During the construction, operation and decommissioning phases, developments can lead to ... increased risk of spills and leaks of pollutants to the water environment. These effects could lead to adverse impacts on health.”	EN-1 paragraph 5.15.1	Potential health effects are considered in sections 27.6.1.4 and 27.6.1.5, as well as in Chapter 8 Marine Physical Environment .
Draft EN-1 NPS for Energy		
“All proposals for projects that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project. The Regulations specifically refer to effects on population, human health , biodiversity, land, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them. The Regulations require an assessment of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, transboundary, short, medium, and long-term, permanent and temporary, positive and negative effects at all stages of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects.”	EN-1 paragraph 4.2.1	This chapter provides the health assessment.
“...Opportunities should also be taken to mitigate indirect impacts, by promoting local improvements to encourage health and wellbeing , this includes potential impacts on vulnerable groups within society i.e. those groups within society	EN-1 paragraph 4.3.5 (slight addition to end of paragraph	This chapter considers opportunities to promote health and wellbeing where proportionate and appropriate.

NPS Requirement	NPS Reference	PEIR Section Reference
<i>which may be differentially impacted by a development compared to wider society as a whole."</i>	4.13.5 of current EN-1 (DECC, 2011a))	This chapter considers the potential for differential effects to vulnerable groups. See section 27.6.

Table 27-5 EN-5 NPS Assessment Requirements

NPS Requirement	NPS Reference	PEIR Section Reference
EN-5 NPS for Electricity Network Infrastructure		
<i>"EMFs can have both direct and indirect effects on human health."</i> <i>"The balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease."</i>	EN-5 paragraphs 2.10.2 and 2.10.6	This chapter considers public understanding of EMF exposure in terms of mental health outcomes associated with concern, acknowledging that actual risks are unlikely to be significant for public health.
<i>"To prevent these known effects, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) developed health protection guidelines in 1998 for both public and occupational exposure..."</i>	EN-5 paragraph 2.10.3	The project adopts the ICNIRP guidelines.
<i>"The levels of EMFs produced by power lines in normal operation are usually considerably lower than the ICNIRP 1998 reference levels. For electricity substations, the EMFs close to the sites tend to be dictated by the overhead lines and cables entering the installation, not the equipment within the site."</i>	EN-5 paragraph 2.10.4	This chapter notes the importance of given the public relevant non-technical information such as this in order to mitigate against levels of concern about EMF, which could affect mental health.

NPS Requirement	NPS Reference	PEIR Section Reference
<i>"...Government policy is that exposure of the public should comply with the ICNIRP (1998) guidelines"</i>	EN-5 paragraph 2.10.5	The Projects adopt the ICNIRP guidelines.
<i>"Government has developed with the electricity industry a Code of Practice, "Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice" ... that specifies the evidence acceptable to show compliance with ICNIRP (1998)..."</i>	EN-5 paragraph 2.10.5	The Projects adopt the Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice.
<i>"Where EMF exposure is within the relevant public exposure guidelines, re-routing a proposed overhead line purely on the basis of EMF exposure, or undergrounding a line solely to further reduce the level of EMF exposure are unlikely to be proportionate mitigation measures."</i>	EN-5 paragraph 2.10.16	This chapter acknowledges the value of such information in reassuring the public that further design modification in relation to EMF would not be proportionate.
Draft EN-5 NPS for Electricity Network Infrastructure		
No substantive changes relevant to health. The main differences relate to organisation name changes.		

27.4.1.2 Other

41. In addition to the NPS, there a number of pieces of legislation, policy and guidance applicable to the assessment of human health. These include:
- The Environment Act 2021 (HM Government, 2021a) – The Environment Act 2021 established The Office for Environmental Protection (OEP) as a public body in England and Northern Ireland. The OEP sets targets and takes enforcement action to prevent, or mitigate, serious damage to the natural environment or to human health. This includes reducing adverse impacts on public health. The OEP objective (OEP, 2022) is for environmental law (including EIA legalisation) and its implementation to be well designed and delivered, so that positive outcomes for the environment and people’s health and wellbeing are achieved.
 - The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017) (HM Government, 2017) – The 2017 update of the EIA Regulations clarified that population and human health was to be included in the list of topics to be considered in an EIA: *“The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the Project on the following factors – population and human health”*.
 - The Air Quality Standards Regulations 2010 (HM Government, 2010) – set out statutory health protection standards on ambient air quality.
 - The Environment Act 1995 (HM Government, 1995)– sets provisions for protecting certain environmental conditions of relevance to health in the UK. Part II covers contaminated land and Part IV covers air quality.
 - The Environmental Protection Act 1990 (HM Government, 1990)– Part IIA covers contaminated land and Part III manages the control of emissions (including dust, noise and light) that may be prejudicial to health or a nuisance.
 - The Public Health (Control of Disease) Act 1984 (HM Government, 1984) – relates to disease control and establishing of port health authorities. Port health authorities carry out a range of health controls at the UK borders.
 - Health and Safety at Work Act 1974 (HM Government, 1974)– The act sets a duty on employers to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all their employees. Similarly, employers must also ensure, so far as is reasonably practicable, that

persons not in their employment are not exposed to risks to their health or safety as a result of activities being undertaken.

- International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 (International Maritime Organization, 1973) – Regulations aimed at preventing and minimising, both accidental and operational, pollution from ships are included in the MARPOL (International Maritime Organisation, 1973).
- Bathing Water Directive 2006/7/EC – The revised Bathing Water Directive 2006/7/EC safe-guards public health and clean bathing waters (European Parliament and Council of the European Union, 2006).
- Water Framework Directive 2000/60/EC (WFD) – The WFD sets out a commitment to protecting water bodies, including bodies of water designated as recreational waters (European Parliament and Council of the European Union, 2000).
- Institute of Environmental Management and Assessment (IEMA) 2022 guidance on health in EIA series, effective scoping (Pyper *et al.*, 2022a) and determining significance (Pyper *et al.*, 2022b) . – Practitioner guidance on the coverage of human health in EIA for England, Wales, Scotland, Northern Ireland and the Republic of Ireland. This includes methods for determining population health sensitivity, magnitude and significance. This is the key methods citation.
- Institute of Public Health (IPH), Guidance, Standalone Health Impact Assessment and health in environmental assessment (IPH, 2021)– Sets current good practice for the assessment of human health in EIA, including assessment methods. This updates the 2009 guidance from the IPH. This guidance for Northern Ireland and Republic of Ireland can be applied more broadly in the UK.
- International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA). A reference paper on addressing human health in EIA (IAIA and EUPHA, 2020) – This international consensus piece informed the IPH 2021 guidance. The publication explains EIA for public health stakeholders and sets out transparent assessment approaches adopted by the IPH.
- International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles, 2021 – Confirms the relationship between HIA and EIA. Confirms the application of HIA principles when undertaking health in EIA.

- Public Health England (PHE), Health Impact Assessment in spatial planning (PHE, 2020) – The guidance confirms that where EIA is undertaken the requirements for HIA should be met through the EIA health chapter. *“First, establish whether the project is subject to EIA. If yes, follow health in EIA process”*. (Page 28 final paragraph).
 - PHE, Advice on the content of Environmental Statements accompanying an application under the Nationally Significant Infrastructure Planning (NSIP) Regime (PHE, 2021) – Guidance to assist applicants preparing an ES as part of their NSIP submission. Themes of access, traffic and transport, socio-economics and land use are discussed in addition to bio-physical health determinants.
42. East Riding Local Plan (adopted April 2016) includes objectives to deliver “*A Strong and Healthy Community*”. This includes to “*Support the vitality of settlements by seeking to protect and/or enhance community facilities and services, including education, health care, recreation, cultural and sports facilities.*”
43. East Riding Local Plan Update 2020 – 2039 Draft Strategy Document Update May 2021 confirms that the Council will continue to seek infrastructure contributions as set out under the currently adopted Local Plan and not include a Community Infrastructure Levy charge at this time.
44. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

27.4.2 Data and Information Sources

45. Sources that have been used to inform the assessment are listed in **Table 27-6**.

Table 27-6 Available Data and Information Sources

Data Set	Spatial Coverage	Year	Notes
OHID	National, regional, local and ward level.	Various (depending on indicator).	Public health intelligence data, notably from the Fingertips tools for Local Authority Health Profiles and Local Health (ward level).
Ministry for Housing, Communities and Local Government (MHCLG)	LSOA	2019	LSOA resolution data on community deprivation.
Office of National Statistics (ONS) and official labour market statistics (NOMIS) statistics.	National, regional, local and ward level.	Various (depending on indicator).	Census data (2021 used where released at time of baseline work).
East Ridings of Yorkshire Health and Wellbeing Strategy	Local	2019-2022	Local public health priorities.
East Ridings of Yorkshire Joint strategic needs assessment (JSNA)	Local	Various	Local vulnerable groups and local health challenges.

27.4.3 Impact Assessment Methodology

46. **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied. The following sections describe the methods used to assess the likely significant effects on human health.
47. The health assessment methodology uses best practice IEMA 2022 guidance on health in EIA:
 - IEMA Guide: Effective Scoping of Human Health in Environmental Impact Assessment (Pyper *et al.*, 2022a); and
 - IEMA Guide: Determining Significance for Human Health in Environmental Impact Assessment (Pyper *et al.*, 2022b).
48. The health assessment is a qualitative analysis, following the IEMA 2022 guidance approach, which draws on qualitative and quantitative inputs from other topic chapters. This is considered the most appropriate methodology for assessing wider determinants of health proportionately, consistently and transparently.
49. As set out in guidance the assessment methods allow a consideration of the effect on population health outcomes and what this means for public health, drawing on scientific literature, health baseline change, local health priorities, health policy context, compliance with regulatory or statutory standards and consultation as relevant.
50. The approach taken ensures that wider requirements for Health Impact Assessment (HIA) are embedded within this EIA health assessment in line with good practice.
51. Where proportionate, the need for monitoring has been considered, including relevant governance.

27.4.3.1 Determinants of Health, Risk Factors and Health Outcomes

52. The chapter uses the World Health Organization (WHO) definition of health, which states that health is a “*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*” (WHO, 1946).
53. The chapter also uses the WHO definition for mental health, which is 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 her or his community*” (WHO, 2007).

- 54. Health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.
- 55. Impacts of the Projects that result in changes 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.
- 56. A change in a determinant of health affects does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The health assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Project. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.
- 57. Typically, the change in a risk factor may need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

27.4.3.2 Definitions

- 58. For each potential impact, the health assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the health assessment are provided in **Table 27-7** and **Table 27-8**.
- 59. The health assessment conclusions are presented in both EIA categories of significance, such as major, moderate, minor or negligible; and a narrative explaining this score with reference to evidence, local context and any inequalities. The approach follows that set out in the IEMA 2022 guidance.
- 60. **Table 27-7, Table 27-8** and **Table 27-10** together summarise the health assessment criteria. The approach uses professional judgement, drawing on consistent and transparent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for human health in public health terms.

61. Judgments are based on the most relevant criteria in **Table 27-7**, **Table 27-8** and **Table 27-10**, and it is likely in any given analysis that some criteria will span score categories.

Table 27-7 Definition of Sensitivity for a Human Health Receptor

Sensitivity	Definition
	Indicative Criteria
High	High levels of deprivation (including pockets of deprivation); reliance on resources shared (between the population and the Projects); existing wide inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or concern ; people who are prevented from undertaking daily activities; dependants ; people with very poor health status; and/or people with a very low capacity to adapt.
Medium	Moderate levels of deprivation; few alternatives to shared resources; existing widening inequalities between the most and least healthy; a community whose outlook is predominantly uncertainty with some concern; people who are highly limited from undertaking daily activities; people providing or requiring a lot of care ; people with poor health status; and/or people with a limited capacity to adapt.
Low	Low levels of deprivation; many alternatives to shared resources; existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern; people who are slightly limited from undertaking daily activities; people providing or requiring some care ; people with fair health status; and/or people with a high capacity to adapt.
Very low	Very low levels of deprivation; no shared resources; existing narrow inequalities between the most and least healthy; a community whose outlook is predominantly support with some concern; people who are not limited from undertaking daily activities; people who are independent (not a carer or dependant); people with good health status; and/or people with a very high capacity to adapt.

Table 27-8 Definition of Magnitude of Impacts

Magnitude	Definition Indicative Criteria
High	High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; majority of population affected; permanent change; substantial service quality implications.
Medium	Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications.
Low	Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications.
Negligible	Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life ; very few people affected; immediate reversal once activity complete; no service quality implication.

27.4.3.3 Significance of Effect

62. The health assessment of significance of an effect is informed by the sensitivity of the receptor and the magnitude of the impact (see **Chapter 6 EIA Methodology** for further detail). The determination of significance is guided by the use of a human health significance of effect matrix, as shown in **Table 27-9**. Definitions of each level of significance are provided in **Table 27-10**. For the purposes of this assessment, any effect that is of major or moderate significance is considered to be significant in EIA terms, whether this be adverse or beneficial. Any effect that has a significance of minor or negligible is not significant. Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.
63. For the health assessment, following IEMA 2022 guidance, a single conclusion on significance is reached that takes into account the sensitivity of both the general population and the vulnerable group population. In this regard the significance conclusion takes into account the potential for health inequalities between these groups. For the purposes of applying the **Table 27-9** significance matrix sensitivity is driven by the vulnerable population group score.

Table 27-9 Human Health Significance of Effect Matrix

		Adverse Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major / moderate	Moderate / minor	Minor / negligible	Minor / negligible	Moderate / minor	Major / moderate	Major
	Medium	Major / moderate	Moderate	Minor	Minor / negligible	Minor / negligible	Minor	Moderate	Major / moderate
	Low	Moderate / minor	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate / minor
	Very low	Minor / negligible	Minor / negligible	Negligible	Negligible	Negligible	Negligible	Minor / negligible	Minor / negligible

27.4.3.4 Significance in Public Health Terms

Table 27-10 Definition of Effect Significance

Category/Score	Indicative Criteria
Major (Significant)	The narrative explains that this is significant for public health because (select as appropriate): - Changes, due to the Projects, have a substantial effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show consensus on the importance of the effect. - Change, due to the Projects, could result in a regulatory threshold or statutory standard being crossed (if applicable). - There is likely to be a substantial change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a causal relationship between changes that would result from the Projects and changes to health outcomes. - In addition, health priorities for the relevant study area are of specific relevance to the determinant of health or population group affected by the Projects.
Moderate (Significant)	The narrative explains that this is significant for public health because (select as appropriate): - Changes, due to the Projects, have an influential effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show mixed views. - Change, due to the Projects, could result in a regulatory threshold or statutory standard being approached (if applicable). - There is likely to be a small change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a clear relationship between changes that would result from the Projects and changes to health outcomes. - In addition, health priorities for the relevant study area are of general relevance to the determinant of health or population group affected by the Projects.

Category/Score	Indicative Criteria
Minor (not significant)	The narrative explains that this is not significant for public health because (select as appropriate): • Changes, due to the Projects, have a marginal effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that no relevant consultation themes emerge among stakeholders. • Change, due to the Projects, would be well within a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable). • There is likely to be a slight change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a suggestive relationship between changes that would result from the Projects and changes to health outcomes. • In addition, health priorities for the relevant study area are of low relevance to the determinant of health or population group affected by the Projects.
Negligible (not significant)	The narrative explains that this is not significant for public health because (select as appropriate): • Changes, due to the Projects, are not related to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the project having no responses on this issue among stakeholders. • Change, due to the Projects, would not affect a regulatory threshold, statutory standard or guideline (if applicable). • There is likely to be a very limited change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is an unsupported relationship between changes that would result from the Projects and changes to health outcomes. • In addition, health priorities for the relevant study area are not relevant to the determinant of health or population group affected by the Projects.

64. The following terminology is also used to consistently classify effects:
- Beneficial – effects that have a positive influence on population health;
 - Adverse – effects that have a negative influence on population health;
 - Temporary – effects that persist for a limited period only (due for example, to particular activities taking place for a short period of time);
 - Permanent – effects that result from an irreversible change to the base-line or which persist for the foreseeable future;
 - Direct – effects that arise from the impact of activities that form an integral part of the Projects (e.g., direct employment and income generation);
 - Indirect – effects that arise from the impact of activities that do not explicitly form part of the scheme (e.g., off-site infrastructure upgrades to accommodate the Projects);
 - Secondary – effects that arise as a consequence of an initial effect of the Projects (e.g., induced employment elsewhere); and
 - Cumulative – effects that can arise from a combination of different effects at a specific location or the interaction of different effects over different periods of time.
65. The temporal scope of this chapter used the following summary terms:
- Very short term relates to effects measured in hours, days or weeks;
 - Short term relates to effects measured in months, (up to 24 months duration);
 - Medium term relates to effects measured in years; and
 - Long term relates to effects measured in decades (e.g., the long-term effects on health from long-term employment).

27.4.3.5 Impact Receptors

66. The principal receptors with respect to human health are population groups located onshore who may be affected by onshore, nearshore and offshore activities of the Projects.
67. The specific groups and characteristics of these populations that are taken into account by the health assessment are listed in **Table 27-11**.

Table 27-11 Receptors

Receptor Group	Receptor	Relevant Features	Closest Distance from the Projects
Human Population	General Population	- Residents - Visitors - Workforce - Energy consumers	Offshore, the nearest point from the wind farm site to shore is approximately 100km. On a smaller scale, the offshore RCP platform is approximately 37km from Flamborough head. In some locations, the Onshore Development Area is adjacent to or directly interacts with residential properties or public rights of way (PRoW).
	Vulnerable Group Population	- Age - Income status - Health status - Social disadvantage - Access/geographical	

68. In line with IEMA, IPH and IAIA/EUPHA guidance a population health approach has been taken, informed by discussion of receptors within the other topic chapters.
69. For each determinant of health, the health assessment identifies relevant inequalities through consideration of the differential effect to the general population of the relevant study area and effects to the vulnerable population group of that study area. The vulnerable population group being comprised of relevant sensitivities for that determinant of health. The following population groups have been considered:
- The general population including residents, visitors, workers, service providers, and service users; and
 - The vulnerable group population.
70. That there is variation between people is widely acknowledged in public health. Public health frames this variation in terms of a likely distribution of effects within a population. This distribution can be applied conceptually or statistically as a way of describing how most individuals are likely to be affected. This links to the general population analysis.

71. Because there are invariably people towards the extremes of the distribution, e.g. experiencing much smaller or larger effects, it is relevant to also consider sub-populations who may be more likely to experience such extremes because of certain characteristics. This links to the vulnerable group analysis.
72. The methods draw on the list of vulnerable population groups set out in guidance. The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the health assessment. These groups are broadly defined to facilitate a consistent discussion across health issues. People falling into more than one group may be especially sensitive:
- Young age: Children and young people (including pregnant women and unborn children).
 - Old age: Older people (particularly frail elderly).
 - Low income: People on low income, who are economically inactive or unemployed/workless.
 - Poor health: People with existing poor health; those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities.
 - Social disadvantage: People who suffer discrimination or other social disadvantage, including relevant protected characteristics under the Equality Act 2010 or groups who may experience low social status or social isolation for other reasons.
 - Access and geographical factors: People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and/or health indicators.

73. The following general characterisations of how the general population may differ from vulnerable group populations have been considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction and operation.
- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
 - The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).
 - The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
 - The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
 - Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.
 - Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Projects. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources.
 - The general population includes the proportion of the community whose outlook on the Projects includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Projects.

74. As all development has the potential for adverse effects to some particularly vulnerable individuals, the role of EIA significance conclusions are not to set a threshold of no harm from development, but to show where, at a population level, the harm should weigh strongly in the balance alongside the development's benefits for health and other outcomes.
75. As stated by guidance: *"Where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change."*

27.4.4 In-combination effects

76. The analysis considers how, due to the Projects, the same populations may be affected by more than one change in relevant health determinants, for example the combined effects of changes in water quality and economic impacts on population health outcomes. The combined effects have regard to the nature of the interactions and the degree to which the same people are likely to be affected.

27.4.5 Cumulative Effect Assessment Methodology

77. The cumulative effect assessment (CEA) considers other plans and projects that may result in a cumulation of effects with the Projects. **Chapter 6 EIA Methodology** provides details of the general framework and approach to the CEA that will be undertaken for the Projects.
78. The final assessment of cumulative effects will be undertaken during the later stages of the EIA, once further information is available on a number of projects such as the Outer Dowsing Offshore Wind Farm, Hornsea Project Four decision and the Sheringham Shoal and Dudgeon Extension Projects examination. However, for the purposes of the PEIR, it is possible to identify a number of projects and plans which are likely to feature in that assessment and consider the extent to which cumulative effects might arise. Section 27.7 presents the following preliminary information regarding cumulative effects:
- Screening for cumulative effects; and
 - A preliminary short list of plans and projects considered for CEA, including a brief description as to how projects have been screened in and the initial tier level they have been assigned.

27.5 Existing Environment

27.5.1 Site Specific Wards

79. Most outcomes of the Projects relate to localised effects at landfall, along the cable corridor or at the onshore substations. There are relatively few public health indicators that are available at this small area geographic resolution. The site specific baseline draws on available indicators and in line with proportionate reporting summarises the site specific health baseline relative to local (East Riding of Yorkshire), regional (Yorkshire and Humber) and national (England) benchmarks.
80. The site specific population is defined using the seven wards of:
- **E05001695** East Wolds and Coastal and **E05001703** North Holderness (for landfall), including LSOA East Riding of Yorkshire **010A** (40% most deprived – landfall site at Skipsea) and **006D** (20% most deprived – adjoining more deprived area);
 - **E05001687** Beverley Rural and **E05001701** Mid Holderness (for the onshore cable corridor), including LSOA East Riding of Yorkshire **017A** (20% most deprived – central Beverley) and **014D** (50% least deprived – rural corridor) in relation to the index of multiple deprivation. Noting the location of East Riding Community Hospital as a sensitive receptor; and
 - **E05001693** Dale, **E05001705** St Mary's and **E05001702** Minster and Woodmansey (for the onshore substations) including LSOA East Riding of Yorkshire **024B** (which has higher health and environment deprivation than other surrounding LSOAs).

Table 27-12 Site Specific Ward Level Baseline Health Indicators

Indicators	Seven wards (Site-specific)	East Riding of Yorkshire (Local)	Yorkshire and Humber (Regional)	England (National)
Population aged 0 to 15 years (%) (young age population)	15.6	16.3	19.0	19.2
Population aged 16 to 64 years (%) (working age population)	57.9	57.3	62.1	62.3
Population aged 65 years and over (%) (older age population)	26.6	26.4	18.9	18.5
Limiting long-term illness or disability (%) (general health indicator)	17.4	19.1	18.8	17.6
Deaths from causes considered preventable, under 75 years (Standardised mortality ratio (SMR)) (general health indicator)	69.1	82.6	113.5	100
Income deprivation (%) (economic indicator)	7.6	9.6	14.6	12.9
Older people living alone (%) (social isolation indicator)	26.2	27.3	32.2	31.5
Emergency hospital admissions for Chronic Obstructive Pulmonary Disease (COPD) (Standardised Admission Ratios (SAR)) (respiratory health indicator)	60.4	79.8	118.2	100
Emergency hospital admissions for intentional self-harm (SAR) (mental health indicator)	76.2	83.7	103.1	100
Deaths from circulatory disease under 75 years (Standardised mortality ratio (SMR)) (cardiovascular health indicator)	72.2	90.3	113.2	100
Households in fuel poverty (%) (energy security indicator)	13.1	14.7	17.5	13.2

81. **Table 27-12** shows that the seven ward site specific area:

- Has proportionally fewer younger people than local, regional or national benchmarks;
- A similar working age population to the local benchmark, but lower than the regional and national benchmarks;
- A similar proportion of older people to the local benchmark, which is higher than the regional and national benchmarks;
- Notwithstanding this older age profile, there are a lower proportion of people with limiting-long-term illness than the local and regional benchmarks. The figure is similar to, and slightly lower than, the national benchmark. This suggests above average general health within the population;
- This is consistent with all cause mortality considered preventable in under 75 year olds, which is another general measure of population health and is lower than the local, regional or national benchmarks;
- Income deprivation is also lower than the local, regional or national benchmarks. This suggests a more prosperous than average population, though does not exclude that there are pockets of higher general deprivation, as noted above;
- The proportion of older people living alone is an indicator of social isolation, which can increase vulnerability. This is lower than the local, regional or national benchmarks, suggesting a potentially more resilient population than average;
- Measures of specific types of health outcomes across respiratory health, mental health and cardiovascular health are all lower than the local, regional or national benchmarks; and
- Across the indicators the site-specific level performs well, indicating the presence of vulnerable groups, but also a generally good state of population health. Local benchmarks also tend to outperform the regional, but not the national, benchmark, indicating the greatest health challenges are at the regional level.

27.5.2 East Riding of Yorkshire

82. **Table 27-13** provides additional public health outcomes framework indicators that are available at the local authority, but not ward level. The data is from the OHID Fingertips data tool. In the following summary the comparative terminology of 'similar', 'better' or 'worse' in relation to the national benchmark is a Fingertips classification.
83. Overall health can be informed by life expectancy indicators. For both men and women, healthy life expectancy is better in East Riding of Yorkshire compared to the national benchmark. Health inequalities are an important public health consideration, reflecting how health varies by social gradient. Inequalities in life expectancy, an indicator of levels of variation between those with and without additional pressures and barriers to achieving good health, is also better in East Riding of Yorkshire compared to the national benchmark. These indicators are a general measure of health and of existing inequalities.
84. Socio-economic status has correlations with health, both for those directly employed and their dependants. The number of children in low income families in East Riding of Yorkshire is better compared to the national benchmark. However, the recent trend has been for increasing numbers, i.e. a worsening situation with this indicator. Whilst better than the national benchmark, there are still around four percent of 16 to 17 year olds not in education, employment or training (NEET) in East Riding of Yorkshire. Notwithstanding this, levels of employment are better than the national benchmark. These indicators are relevant to employment and training opportunities due to the Projects.
85. Exposure to transport noise, complaints about noise and particulate air pollution attributable mortality are all lower in East Riding of Yorkshire than the national benchmark. Measures of respiratory and cardiovascular disease are also lower in East Riding of Yorkshire than the national benchmarks. These indicators are relevant to disruption and disturbance associated with construction works and associated traffic.
86. Road injury rates, hospital admissions for falls in the elderly and measures of social isolation (adult loneliness) are all lower in East Riding of Yorkshire than national benchmarks. These indicators are relevant to transport modes, access and connection changes due to the Projects, including pedestrian and cyclist amenity. Injury rates can be used as a road safety indicator.

87. Changes to the physical environment can influence health behaviours. Health related utilisation of outdoor space in East Riding of Yorkshire is slightly below, but similar to, the national benchmark. Prevalence of being overweight at age 4-5 years old is worse than the national benchmark, though is similar by the age of 10-11 years old. For adults the proportion who are overweight is higher than, though similar to, the national benchmark. Adult physical activity levels are similar to national benchmarks. These indicators are relevant to changes in access to physical activity, outdoor space or leisure due to the Projects.
88. The Projects have benefits for climate change, energy security and potentially energy costs. A relevant public health indicator relates to excess deaths at times of extreme cold temperatures when home heating is a factor. Fuel poverty and excess winter deaths are higher in East Riding of Yorkshire than the national benchmarks.
89. Levels of anxiety within the population are lower than the national benchmark. This indicator is relevant to changes in public understanding of risk due to the Projects.
90. Deprivation can be used as a health resilience indicator. Deprivation mapping (2019) indicates relatively low levels of deprivation in the majority of the East Riding of Yorkshire. For overall deprivation the East Riding of Yorkshire is in the second lowest quintile compared to England. That there are pockets of deprivation within areas of overall low deprivation is noted.
91. The East Riding Health and Wellbeing Strategy 2019 – 2022 (East Riding Health and Wellbeing Board, 2019) identifies that the following priorities:
 - For children and young people to enjoy good health and wellbeing;
 - For working age adults to reduce their risk of ill health;
 - For residents to achieve healthy, independent ageing; and
 - For health inequalities to be reduced.
92. Overall, the health baseline indicators suggest generally higher than average resilience in the population compared to national benchmarks. The data suggests the importance of maintaining opportunities for people to be physically active. It also highlights that there are also opportunities for the Projects to respond positively to challenges around worsening numbers of low-income households and fuel poverty.

Table 27-13 Local Area Baseline Health Indicators (Public Health Outcomes Framework)

Indicator Name	Time period	East Riding of Yorkshire	England	Recent Trend	Compared to England
Healthy life expectancy at birth (male)	2018 - 20	65.34	63.14	N/A	Better
Healthy life expectancy at birth (female)	2018 - 20	67.89	63.87	N/A	Better
Inequality in life expectancy at birth (male)	2018 - 20	6.80	9.70	N/A	2nd lowest quintile
Inequality in life expectancy at birth (female)	2018 - 20	3.20	7.90	N/A	Lowest quintile
Percentage of children in absolute low income families (under 16s)	2020/21	14.00	15.10	Increasing and getting worse	Better
Percentage of 16 to 17 year olds NEET or whose activity is not known	2020	4.12	5.48	No significant change	Better
Percentage of people in employment (16-64 years old)	2021/22	78.30	75.40	No significant change	Similar
Killed and seriously injured (KSI) casualties on England's roads (per billion vehicle miles)	2020	59.66	86.08	N/A	Better

Indicator Name	Time period	East Riding of Yorkshire	England	Recent Trend	Compared to England
Violent crime - violence offences per 1,000 population	2021/22	23.01	34.95	No significant change	Lowest quintile
The rate of complaints about noise per 1,000 population	2019/20	4.19	6.37	Decreasing and getting better	Better
The percentage of the population exposed to road, rail and air transport noise of 65dB(A) or more, during the daytime	2016	1.95	5.50	N/A	Lowest quintile
The percentage of the population exposed to road, rail and air transport noise of 55 dB(A) or more during the night-time	2016	2.88	8.48	N/A	Lowest quintile
Utilisation of outdoor space for exercise/health reasons (16+ years old) (percentage)	Mar 2015 - Feb 2016	16.78	17.92	N/A	Similar
Fuel poverty (low income, low energy efficiency methodology) (percentage)	2020	14.66	13.23	N/A	2nd highest quintile
Loneliness: Percentage of adults who feel lonely often or always or some of the time (16+ years old)	2019/20	13.86	22.26	N/A	Better

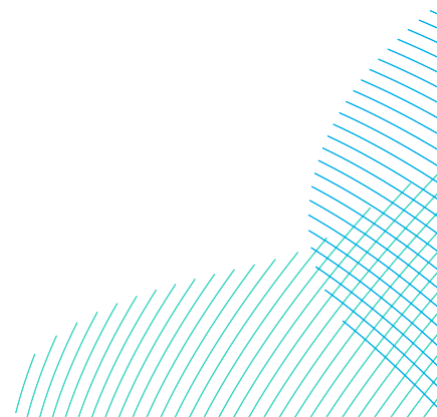
Indicator Name	Time period	East Riding of Yorkshire	England	Recent Trend	Compared to England
Reception: Prevalence of overweight (including obesity) (4-5 years old) (percentage)	2021/22	23.85	22.25	Increasing and getting worse	Worse
Year 6: Prevalence of overweight (including obesity) (10-11 years old) (percentage)	2021/22	37.46	37.76	Increasing and getting worse	Similar
Percentage of adults (aged 18+) classified as overweight or obese	2020/21	67.63	63.45	N/A	Similar
Percentage of physically active adults (aged 19+)	2020/21	64.36	65.94	N/A	Similar
Percentage of physically inactive adults (aged 19+)	2020/21	24.58	23.38	N/A	Similar
Self reported wellbeing: people with a high anxiety score (aged 16+) (percentage)	2020/21	19.41	24.15	N/A	Better
Emergency hospital admissions due to falls in people aged 65 and over (directly standardised rate per 100,000 people)	2020/21	1,735.25	2,022.98	No significant change	Better
Fraction of mortality attributable to particulate air pollution (new method) (aged 30+) (percentage)	2020	4.39	5.64	N/A	Not compared

Indicator Name	Time period	East Riding of Yorkshire	England	Recent Trend	Compared to England
Under 75 mortality rate from cardiovascular diseases considered preventable (2019 definition) (directly standardised rate per 100,000 people)	2020	25.94	29.21	No significant change	Similar
Under 75 mortality rate from respiratory disease considered preventable (2019 definition) (directly standardised rate per 100,000 people)	2020	10.79	17.08	No significant change	Better
Excess winter deaths index (ratio of extra deaths from all causes that occur in the winter months compared with the expected number of deaths)	Aug 2019 - Jul 2020	21.60	17.40	N/A	Similar

27.5.3 Future Trends

93. In the event that the Projects are not developed, an assessment of future conditions for human health has been carried out and is described within this section.
94. Population health data presents a snapshot at a particular time. It is well recognised that population health is subject to continuing influences, both at the individual and community level. Influences may be environmental, such as seasonal variation in wellbeing and communicable diseases, they may also respond to socio-economic factors, such as migration and the availability of jobs.
95. Longer term trends and interventions in population health may influence the future baseline. Health and social care, public health initiatives and government policies aim to reduce inequalities and improve quality of life. The historic success of such interventions is increasingly challenged by national trends such as an aging population, rising levels of obesity and the COVID-19 pandemic. The implications of COVID-19 for public health will take years to be reflected within statistical data releases, but it is expected that the pandemic will have exacerbated public health challenges. The pandemic disproportionately affected vulnerable groups, including due to age and ill-health.
96. For assessment purposes, the current health baseline is considered a suitable proxy of the future baseline. The current baseline used in this assessment includes appropriate health indicators to reflect the types of health outcomes that that would also be relevant for the future population (e.g. in relation to age and long-term conditions). The health assessment methodology includes a categorisation of vulnerable population groups, which, for example, allows for the effects of older people and people with existing poor health to be distinguished from the general population. The health assessment sensitivity score for each vulnerable group is independent of the population size within that group, which would be the main change between the current and future baseline. The sensitivity scores within the health assessment therefore account for both current and future population characteristics.

97. It would not be proportionate (or consistent with the qualitative assessment approach taken) to quantitatively model the population's future health. This reflects the complexities of interactions between the wider determinants of health, as well as the potential for macro-economic changes in the next decade that are hard to predict. Any predication would have such wide error margins that it would greatly limit the value of the exercise. Annual national population health trend forecasting is undertaken as a government public health activity (HM Government, 2021b) and has been taken into account by the health assessment.
98. In the do nothing scenario there is the potential for the future baseline of UK energy security to be met by non-renewable sources, or not met at all. The former is likely to increase climate change related pressures on public health, including extreme weather events, exacerbating inequalities and mental health outcomes. The latter is also likely to increase pressure on public health due to interrupted energy supplies affecting availability of goods and services, including healthcare, employment and food safety.



27.6 Assessment of Significance

27.6.1 Potential Effects During Construction

27.6.1.1 Impact 1: Health Related Behaviours: Physical Activity, Open Space and Leisure

99. This section considers the population health implications of construction activities affecting marine, nearshore and onshore recreational and leisure activities. Relevant activities may lead to temporary disruption of public open spaces (including beaches) and public rights of way (PRoW), potentially affecting recreational activities. Consideration has also been given to the influences on nearshore recreation, e.g. bathing, sailing and other water sports.
100. The context is of coastal communities near the possible landfall locations (with long stretches of beach below cliffs). Further inland land use is dominated by agricultural fields. Both are characterised by small communities, including holiday accommodation. Routes crossed by the onshore cable corridor, such as Hudson Way (the 'rail trail' between Beverley and Market Weighton), are important for physical activity (walking and cycling). The wider area includes the City of Hull, which provides port and marina facilities. Affected activities include:
 - Offshore disruption to leisure related sea transport, including blue water or live aboard sailing;
 - Nearshore fishing, diving, boat trips or water sports; and
 - Onshore community open space or recreational amenities, coastal or inland, including use of the beach and adjoining land.
101. The health benefits of recreation and leisure include physical activity, as well as general wellbeing benefits. Health outcomes span physical health (e.g. cardiovascular health) and mental health (e.g. stress, anxiety or depression). Locations such as Skipsea Castle, accessed via a footpath from the B1249, are also influential to physical activity. Use of such locations may be affected by not only physical barriers but also changes in the amenity or setting of the destination.
102. This section has been informed by **Chapter 14 Shipping and Navigation** and **Chapter 29 Tourism and Recreation**, which set out relevant assessment findings and mitigation measures that have been taken into account.

103. **Chapter 14 Shipping and Navigation** concludes:

- All scenarios:
 - Impacts relating to vessel displacement and increased vessel to vessel collision risk between third-party vessels has been assessed as broadly acceptable for all phases.
- DBS East or DBS West in isolation:
 - Should only DBS East or DBS West in isolation be developed, this would result both in a greater area of available sea room for routing commercial vessels, and fewer routes requiring a deviation; four route deviations would be necessary compared to five for DBS East and DBS West together. Therefore, it is expected that both the severity of consequence and frequency of occurrence for this impact would decrease compared to if both DBS East and DBS West are built together.
- DBS East and DBS West concurrently:
 - Vessel displacement and third-party collision risk for DBS East and DBS West together is considered broadly acceptable.
- DBS East and DBS West sequentially:
 - Vessel displacement and third-party collision risk for DBS East and DBS West in isolation is considered broadly acceptable.

104. **Chapter 29 Tourism and Recreation** concludes:

- All scenarios:
 - The effect of the construction of the Projects on onshore recreational assets is assessed to be minor adverse. No impacts have been identified during the construction phase which could impact the performance of marine recreation activities.

105. A potential population health effect is considered plausible because there is a source-pathway-receptor relationship:

- The source is disruption and disturbance by construction activities.
- The pathway is behavioural change in levels of use of leisure and recreation, affecting physical activity and wellbeing outcomes.
- Receptors are coastal and inland populations of residents and visitors.

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

107. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.1.1.1 Sensitivity of Receptor – All Scenarios

108. The following conclusions on population sensitivity apply to all scenarios.
109. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. This reflects that most people in the local area would only make occasional use of the affected marine, coastal and inland recreational and leisure opportunities. It also includes those with access to many alternatives that are not affected. The general population comprise those members of the community with a high capacity to adapt to changes, for example due to greater resources and good physical and mental health.
110. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to have fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on the affected recreational and leisure opportunities with greater likelihood that any additional disruption or disturbance could affect use and behaviours. For example vulnerable groups living in Skipsea, including use of caravans and similar holiday accommodation.

27.6.1.1.2 Magnitude of Impact – All Scenarios

111. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **low**. This reflects that in the worst case (sequential development) there is a *small* scale of change over the *medium-term* from construction activities, including shipping movements and land access, affecting marine, nearshore and onshore recreational and leisure activities. Any such effect is likely to be characterised as an *occasional* effect on opportunities to be active at a given location, e.g. due to transitory cable laying. It is likely there would be *rapid* reversal of any effect once the given construction activity concluded, with limited potential to cause lasting behavioural change. The outcome is likely to be a *minor* change in *quality of life* and / or *cardiovascular related morbidity* for a *small minority* of the affected population. No effect on healthcare services would be expected. If DBS East or DBS West were carried out in isolation the level of disruption would be over a shorter timeframe, albeit the overall magnitude score would still be characterised as low rather than negligible.

27.6.1.1.3 Significance of Effect – All Scenarios

112. All scenarios have been considered by the assessment and the conclusion on significance is the same. As set out in **Chapter 5 Project Description**, open spaces (offshore, nearshore and onshore) and PRow onshore will be reinstated following construction activities that require temporary closures or access restrictions. This will be secured as a DCO requirement.
113. The effect is characterised as being *adverse* in direction, *temporary* and *indirect*. The significance of the population health effect is **minor** adverse (not significant). Although the scientific literature supports a *clear* association between recreational and leisure activities and health outcomes, there is likely to be at most a *slight* change in the population health baseline. This would have no more than a *marginal* effect on health policy delivery and is *not* expected to change population health inequalities.

27.6.1.1.4 Mitigation and Residual Significance of Effect – All Scenarios

114. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse. No additional mitigation is considered to be required.

27.6.1.2 Impact 2: Social Environment: Transport Modes, Access and Connections

115. This section considers the onshore population health implications of changes in construction activities affecting highway safety and access as well as other PRow and cycle routes. This includes road works, temporary diversions and traffic volumes required due to the onshore cable corridor or in relation to the construction of the onshore substations.
116. Active travel health effects may relate to physical health (e.g. cardiovascular health) and mental health conditions (e.g. stress, anxiety or depression) associated with obesity and levels of physical activity.
117. The scientific literature indicates that there is an association between the transport changes, road safety and accessibility. The literature does not identify particular thresholds for effects. The health assessment has had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, pregnant women and cyclists (particularly older cyclists) are generally more vulnerable in terms of road safety. People with lower socio-economic status typically face more transportation barriers in accessing health care.
118. This section has been informed by **Chapter 24 Traffic and Transport** which set out relevant assessment findings and mitigation measures that have been considered.
119. **Chapter 24 Traffic and Transport** concludes:
 - All scenarios
 - Severance residual effects are considered negligible to minor adverse.
 - Amenity residual effects are considered negligible to minor adverse.
 - Road safety residual effects are considered negligible to minor adverse.
 - Driver delay residual effects are considered negligible to minor adverse.
120. The potential health effect is considered plausible because there is a source-pathway-receptor relationship:
 - The source is potential construction disruption and disturbance, including to PRow and cycle routes.
 - The pathway is behavioural change in levels of physical activity, driver delay and accidents and safety.
 - Receptors are coastal and inland populations of residents and visitors.

121. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
122. The population groups relevant to this assessment are:
 - The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).
123. Regard has been had to the potential for effects to the regional population of Yorkshire and Humber (including the city of Hull). Whilst transport effects, as assessed in **Chapter 24 Traffic and Transport**, would extend to this area; there is not considered the potential to affect public health at a regional level from such impacts. The health assessment focus is on effects at the site specific and local level.

27.6.1.2.1 Sensitivity of Receptor – All Scenarios

124. The following conclusions on population sensitivity apply to all scenarios.
125. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. Most residents are unlikely to make regular use of the PRow and cycle routes affected by the Projects and would likely have a high capacity to adapt by selecting alternative routes or physical activity opportunities to avoid any temporary disruption or disturbance. The general population comprise those members of the community with a high capacity to adapt to changes in access, including changes in healthcare access, for example due to greater resources and good physical and mental health.

126. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. This sub-population may have fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on the affected routes with greater likelihood that any disruption or disturbance could affect physical activity behaviours. Vulnerability is linked to mode of travel, including pedestrians and cyclists being more sensitive to road safety changes. It also relates to age (young people and older people) being more vulnerable to accident severity, as well as to those who are reliant on services accessed on affected sections of the road network (e.g. traveling to schools). Vulnerability may be increased in areas of greater deprivation. Deprived populations may already face more access barriers compared to general population and therefore be more sensitive to access changes. Low incomes may compound access barriers by limiting adaptive response. Vulnerability also includes those accessing health services (emergency or non-emergency) at times and locations affected by congestion. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient). Ambulances are generally less affected by congestion due to the priority given to them travelling under blue lights, but journey times may benefit from the road improvements. People in poor or very poor health may be more frequent users of healthcare service and therefore be more sensitive to access changes.

27.6.1.2.2 Magnitude of Impact – All scenarios

127. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **low**. For traffic impacts, the worst case scenario is DBS East and DBS West concurrently. It is assumed the impacts associated with a sequential construction scenario would be the same or less than those associated with the concurrent scenario.

128. In relation to active travel, as reported in **Chapter 24 Traffic and Transport** there would be appropriate diversions of active travel routes to maintain access and provide early notice of any route changes. Such measures would be secured through the OCTMP submitted with the DCO application. The scale of change is considered *small* and *medium-term*, albeit of limited duration at any given location, including due to the transitory nature of construction works to lay cables. Only *minor* changes in *morbidity* for *cardiovascular* and *mental health* outcomes would be expected for a *small minority* of the population due to the temporary disruption during construction works. Most adverse effects on health behaviours and outcomes would be expected to *reverse* on completion of the construction works.
129. In relation to road safety at the population level the scale of change in accidents would be *small*. The frequency of any incidents would be *occasional*, with severity related to a *very minor change in risk of injury or mortality* (though with outcome reversal gradual or permanent). The expectation is that *very few* people would be affected, with *no or slight* implications for healthcare services. As noted in **Chapter 24 Traffic and Transport** there are currently identified to be a number of locations where accident risk is elevated by the project during the construction, but mitigation is proposed. Reflecting the residual effects reported in **Chapter 24 Traffic and Transport** the health chapter identifies a **low** magnitude of change on this issue.
130. In relation to health-related travel times and accessibility the scale of change in delays is expected to be *small*. The frequency with which health related journeys may be affected is likely to be *occasional* for most people though for a few people, severity could relate to a *small* change in risk for morbidity or mortality associated with time critical treatment. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient). Even with the delays described in **Chapter 24 Traffic and Transport**, the priority given to ambulances travelling under blue lights would be expected to reduce any changes in journey times. Mitigation in terms of early and ongoing information sharing with emergency and healthcare services is secured within the OCTMP. Due to the temporary nature of the work and ability for people to adapt to known planned diversions or delays means there is a low magnitude of change in access to social infrastructure such as shops, employment and educational facilities. A **low** magnitude is assigned to active travel and health-related travel times.

27.6.1.2.3 Significance of Effect – All scenarios

131. All scenarios have been considered by the assessment and the conclusion on significance is the same.
132. In relation to active travel and health-related travel times, the significance of the population health effect is **minor** adverse (not significant). The professional judgment is that there would, at most, be a *slight* adverse change in the health baseline. This conclusion reflects that physical activity is a public health priority and the scientific literature on the benefits of physical activity to health is well established however, the level of change due to the Projects, whether in isolation, sequential or concurrent, is small and is appropriately mitigated by standard good practice measures that minimise disruption. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, *no* widening of health inequalities would be expected, and *no* influence is expected on the ability to deliver local or national health policy.
133. For road safety the significance of the population health effect is **minor** adverse (not significant). This conclusion reflects the potential for a *slight* change in the health baseline due to increased risk of high severity road accident outcomes. The change is *not* expected to widen inequalities and have *marginal* influence on the achievement of health policy relating to road safety.

27.6.1.2.4 Mitigation and Residual Significance of Effect – All scenarios

134. For active travel, health-related journey times and road safety, based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse. No additional mitigation is considered to be required.

27.6.1.3 Impact 3: Bio-Physical Environment: Air Quality

135. This section discusses changes to onshore air quality during construction, and related effects on population health. Construction of the onshore transmission works has the potential to result in dust effects from construction activities and construction compounds, as well as vehicle emissions from construction traffic.
136. This section has been informed by **Chapter 26 Air Quality**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

137. **Chapter 26 Air Quality** concludes:

- All scenarios
 - The dust and PM₁₀ emission risk of effects for human health is considered to be low for earthworks, construction and trackout. It is anticipated that the risk of dust effects would be the same under all scenarios. Mitigation measures (including a Dust Management Plan and Travel Plan) will be outlined within the Project's Code of Construction Practice (CoCP) submitted as part of the Project's DCO application and will be secured within the final CoCP submitted post-consent. Effects following mitigation measures are considered to be not significant.
- DBS East or DBS West in isolation
 - The results of the construction phase road traffic emissions assessment show that annual mean concentrations of NO₂, PM₁₀, and PM_{2.5} are predicted to be well below (i.e. less than 75% of) the respective air quality Objectives in the peak construction (2026) Scenario 1 (DBS East or DBS West in isolation) at all receptors, both 'with' and 'without' DBS East or DBS West in place, including in the city of Hull. Therefore, this is deemed to be a **negligible** effect.
- DBS East and DBS West concurrently
 - The assessment concluded that impacts generated by road traffic upon local air quality (NO₂, PM₁₀ and PM_{2.5} concentrations) with DBS East and DBS West concurrent construction scenario are considered to be **negligible**.

138. Potential effects on human health are considered plausible because there is a source-pathway-receptor relationship:

- The source is air pollutants (particularly Nitrogen dioxide (NO₂), particulate matter (PM), including PM_{2.5} and PM₁₀ from construction emissions.
- The pathway is diffusion through the air.
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

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

140. The population groups relevant to this assessment are:
 - The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire;
 - The regional population of Yorkshire and Humber and the city of Hull; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).
141. Regard has been had to the potential for effects to the regional population of Yorkshire and Humber. Whilst transport related air quality effects would extend to this area; there is not considered the potential to affect public health at a regional level from such impacts. The health assessment focus is on effects at the site specific and local level. Effects within the city of Hull are discussed.
142. Construction activities that produce dust tend to relate to the coarser fractions of PM₁₀ and potential nuisance from dust deposition on property. The great majority of anthropogenic PM_{2.5} health effects relate to combustion related processes, e.g. construction plant and transport.
143. The health outcomes of PM₁₀ and PM_{2.5} are not distinguished in this assessment. This reflects that both are typically present (though the relative proportions change) and that the evidence base does not consistently distinguish their effects particularly given that PM_{2.5} is a subset of PM₁₀. However, generally, elevated concentrations of PM_{2.5} are considered of greater concern due to their greater potential to interact within the body.
144. For construction dusts, the main health outcomes are likely to relate to exacerbation of existing conditions, such as asthma or COPD (i.e. airway inflammation by coarse PM) and to reductions in wellbeing associated with annoyance or reduced amenity. Whilst other outcomes (e.g. cardiovascular events) may be relevant in the event of brief high concentrations, such elevated exposures are expected to be avoided through the use of standard good practice mitigation that would be secured through the Project's CoCP as discussed in **Chapter 26 Air Quality**. The potential for dusts and PM to include mobilised soil contaminants is noted and taken into account. The use of standard good practice measures to avoid new contamination and appropriately manage any historic contamination encountered (see **Chapter 19 Geology and Land Quality**) would mitigate against a public health risk due to airborne mobilisation of soil contaminants.

145. Whilst the literature supports there being thresholds set for health protection purposes, it also acknowledges that for PM_{2.5} and NO₂ 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 health assessment has identified population groups that may be particularly sensitive to air quality effects. For example, young children are particularly susceptible to air pollution because of their developing lungs, high breathing rates per bodyweight, and amount of time spent exercising outdoors. Other vulnerable groups include the sick (e.g. people with type 2 diabetes), the elderly, and pregnant women.

27.6.1.3.1 Sensitivity of Receptor – All scenarios

146. The following conclusions on population sensitivity apply to all scenarios.
147. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. The general population comprise those members of the community who live, work and study at a distance where high levels of dispersion and deposition would greatly limit the effects any change in exposure due to the Projects. Furthermore, most people enjoy good respiratory health (e.g. are not asthmatic) and are not at a life stage (e.g. infant or frail elderly) with particular sensitivity to air quality.
148. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. For example, existing respiratory conditions including asthma COPD and type 2 diabetes would increase sensitivity. People likely to be most affected by the Projects are those living close to the onshore transmission works.

27.6.1.3.2 Magnitude of Impact – All scenarios

149. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **low**. The worst case is likely to be the concurrent scenario, where greater intensity of activity resulting in higher exposures. As reported in **Chapter 26 Air Quality** the construction activity and construction compound dust impacts on the identified sensitive receptors are predicted to have very localised spatial extent, be short-term in duration and intermittent. Occasionally, weather conditions may coincide with construction activities to generate higher levels of dust. This can cause temporary annoyance, and for people with existing poor health, higher levels of coarse dust in the air it can exacerbate some conditions (e.g. asthma). Coarse PM is larger and heavier and so it is deposited more quickly, this includes dusts containing any mobilised contaminants. This means that the concentration of coarse PM in the air reduces rapidly as it gets further from the source. The potential for polluting or nuisance-type dust effects is therefore expected to be *occasional* and limited in extent. Deposition rates are slower for finer PM and affect a wider area and thus, potentially, a greater number of people. However, exposure is expected to be *very low* due to the finer PM being typically a relatively small component of construction dusts and the effects of dispersion would reduce concentrations over distance. At these levels it is unlikely that there would be discernible changes in the risk of developing a new health condition or of exacerbating an existing condition. Such changes would overall during construction be *medium-term*, with a *minor* influence on quality of life and/or morbidity risk for respiratory and cardiovascular conditions for a *small minority* of the population. Most effects on wellbeing would *rapidly* reverse, with *no* discernible influence for healthcare services. The transitory nature of the works along the onshore cable corridor is relevant and indicates that at any given location exposures would be of shorter duration.

27.6.1.3.3 *Significance of Effect – All Scenarios*

- 150. All scenarios have been considered by the assessment and the conclusion on significance is the same.
- 151. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. For the health assessment, the construction air quality effects are considered **minor** adverse (not significant). This assessment conclusion reflects that whilst the scientific literature establishes a causal effect relationship between changes in air quality and health outcomes, the changes would result in a very limited effect in the health baseline of the local population. This finding takes into account potential for mobilisation of new or historic contaminants in construction dusts, as well as non-threshold effects of PM_{2.5} and NO₂, particularly for vulnerable sub-populations. The temporary and slight reduction in air quality is not expected to affect health inequalities. All air quality changes are predicted to be well within statutory standards set for health protection.

27.6.1.3.4 *Mitigation and Residual Significance of Effect – All Scenarios*

- 152. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse. No additional mitigation is considered to be required.

27.6.1.4 *Impact 4: Bio-Physical Environment: Water*

- 153. This section considers onshore and nearshore water quality implications for population health of potential pollution releases during construction.
- 154. During construction, there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels. Bentonite, which is an inert clay-based material used at the drillhead during the installation of trenchless crossings, can breakout during use and cause smothering of habitats, although it is inert and not a pollutant.
- 155. Pollution of surface water or groundwater bodies which are subsequently used as a potable source could pose a risk to public health. The Onshore Development Area is predominately agricultural and food safety could be compromised by contamination affecting agricultural land directly, or indirectly contaminating agricultural water sources. This includes contamination that occurs during flood events.

156. Bathing water quality at the nearshore of the possible landfall locations may be temporarily affected by activities of the offshore cable corridor (including Horizontal Direction Drilling (HDD)). The key health outcomes relevant to this determinant of health arise from toxicological exposure by skin contact, accidental swallowing of water or inhalation and can cause a wide range of acute or chronic illnesses.
157. Changes to water quality onshore and nearshore may be due to either new accidental pollutant spills or mobilisation of historic pollutants. In both cases standard good practice pollution control measures form part of construction management plans. Increased suspended sediment concentrations (SSC) that do not pose toxicological risk may discourage bathing but are not expected to pose direct risks to population health. The indirect effects are covered as part of the physical activity discussion in section 27.6.1.1.
158. This section has been informed by **Chapter 8 Marine Physical Environment** and **Chapter 20 Flood Risk and Hydrology**, which set out relevant assessment findings and mitigation measures that have been taken into account.
159. **Chapter 8 Marine Physical Environment** concludes:
 - DBS East or DBS West in isolation
 - The effect on suspended sediment concentrations due to foundation installation, drill arisings from foundation installation, cable installation, and landfall HDD installation is considered to be **negligible**. Any changes in suspended sediment will be short-lived and considering the coarse-grained nature of the seabed, any disturbed sediment would settle back to the seabed in close proximity to the area of disturbance.
 - The effects on water quality due to the release of sediment bound contaminants are considered to be **negligible**.

- DBS East and DBS West concurrently
 - If both DBS East and DBS West are constructed together, a larger volume of sediment would be disturbed over the entire construction phase which may result in higher concentrations of suspended sediment overall. However, suspended sediment concentrations arising from one foundation installation are unlikely to persist for a sufficiently long period of time for them to interact with subsequent operations. Therefore the construction of DBS East and DBS West together would not result in a more significant effect than DBS East or DBS West in isolation, and the effect is considered to be **negligible**.
 - Construction of DBS East and DBS West together would not result in a more significant effect than DBS East or DBS West in isolation. As a result, the significance of effect is predicted to be **negligible**.

160. **Chapter 20 Flood Risk and Hydrology** concludes:

- DBS East or DBS West in isolation
 - Significance of effect on each watercourse resulting from the direct disturbance of surface water bodies due to construction of the Projects in isolation is considered to be **negligible** to **minor** adverse, except for Beverley and Barmston Drain, which is **moderate** adverse. Best practice mitigation measures at trenched crossings of Ordinary watercourses will reduce all effects to not significant. Groundwater contamination risk will be assessed in the ES.
- DBS East and DBS West concurrently
 - Construction activities will adhere to industry good practice measures, therefore impacts will reduce to **negligible** in all catchments except for the Catchwater Drain, which will reduce from **medium** to low. All effects are judged to be not significant.

161. A potential population health effect is considered plausible because there is a source-pathway-receptor relationship:

- The source is mobilisation of contaminants or sediment or new leaks or spills of pollutants.
- The pathway is transmission through marine or onshore waters. Exposure includes ingestion and dermal contact.
- Receptors are populations of residents and visitors.

162. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
163. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.1.4.1 *Sensitivity of Receptor – All Scenarios*

164. The following conclusions on population sensitivity apply to all scenarios.
165. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. This reflects many people would make limited use of coastal waters for bathing or related recreation. The potential for any effect to public water supplies is considered very limited, with the great majority of people having water supplies that would be unaffected. The general population includes those who are in good health and less likely to be adversely affected by contaminants.
166. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case relates to people more sensitive due to life stage or health status. For example, children and young people may spend more time in coastal waters and due to developmental stage or relative body size have increases risks from a given toxin exposure. Increase sensitivity to exposure may also apply to older people and those with existing poor health (e.g. long-term illness).

27.6.1.4.2 Magnitude of Impact – All Scenarios

167. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. The concurrent scenarios is considered the worst case due to potential for greater mobilisation of sediments and therefore higher concentrations of any exposures. In all scenarios the magnitude of change due to the Projects is **low**. This reflects that nearshore works would result in high dispersion in relation to bathing waters and the use of standard good practice mitigations to avoid and contain any spills or appropriately respond to historic contamination encountered. It is considered unlikely that SSC would be directly harmful or could have secondary effects, e.g. via toxic algal blooms. Whilst **Chapter 20 Flood Risk and Hydrology** identifies the potential for some localised effects to a limited number of water courses, these are not considered to pose a risk to public health. The level of exposure to any contaminants would likely be *very low, short-term* and associated with *one-off* events. The severity of health outcomes would likely relate to a *minor* change in *mortality or morbidity* related risk factors associated with toxin exposures for a *very few* people. At most there may be *slight* healthcare service implications.

27.6.1.4.3 Significance of Effect – All Scenarios

168. All scenarios have been considered by the assessment and the conclusion on significance is the same.
169. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. The significance of the population health effect for this determinant of health is **minor** adverse (not significant). This conclusion reflects that although there are credible pathways in the scientific literature by which bathing waters and onshore waters (surface or ground) may be affected, these are addressed by mitigation and there is therefore potential for only a *very limited* effect on the population health baseline. Water quality is expected to be *well within* standards for bathing and drinking water and the changes are *not* expected to affect delivery of health policy or influence inequalities.

27.6.1.4.4 Mitigation and Residual Significance of Effect – All Scenarios

170. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse. No additional mitigation is considered to be required.

27.6.1.5 Impact 5: Bio-Physical Environment: Soil Contamination

171. Linked to the issue of air and water quality discussed in sections 27.6.1.3 and 27.6.1.4 respectively, the source of contaminants may include new or historic soil-based pollutants or toxins. Occupational soil contamination exposures are governed by statutory health and safety requirements, appropriately avoiding or reducing risks to the construction workforce, including through working practices, management plans and personal protective equipment. For the community, the potential for exposures may either be via water, as discussed in section 27.6.1.4, or via construction dusts as discussed in section 27.6.1.3. Given restricted access to the onshore transmission works construction areas, including due to fencing, it is unlikely that there is the potential for the community to have direct contact with contaminated soils to an extent that could affect public health. This issue is not assessed further as a separate issue.

27.6.1.6 Impact 6: Bio-Physical Environment: Noise Disturbance

172. This section discusses nearshore and onshore changes in noise and vibration exposure during construction that may be detrimental to population health. Some specific activities such as HDD and concrete pouring require periods of night-time working, however the majority of works would occur during normal daytime construction working hours. Noise effects may also arise from construction transport activities.

173. This section has been informed by **Chapter 25 Noise**, which sets out relevant assessment findings and mitigation measures that have been taken into account.
174. **Chapter 25 Noise** concludes:
- All scenarios
 - Prior to the commencement of construction activity, a Construction Noise Management Plan (CNMP) as part of the CoCP will be prepared detailing site-specific noise control measures to be adopted throughout construction. Following the implementation of the noise control measures agreed through the CNMP, the residual effect from landfall construction activities, should the Projects be built in isolation or concurrently, is considered to be **negligible**.
 - After implementation of generic mitigation and specific targeted noise control measures the residual effect for on-site construction noise at temporary construction compounds and HDD locations is considered **negligible**.
 - A **moderate** adverse effect (significant) may remain at on receptor location, R43, which is approximately 65 m from the A164, should HDD works be required at night.
 - The effect of on-site construction noise at onshore substation site options is considered to be a **negligible** effect if the Projects are built concurrently or in isolation.
 - Following the implementation of agreed traffic measures within the Construction Traffic Management Plan (CTMP), noise from off-site construction traffic is considered **minor** adverse for all project scenarios.
 - Due to the large increase of traffic on Eske Lane it is likely that the effect, with mitigation incorporated, will be of **moderate** adverse effect (significant) at NSRs on Eske Lane.
 - Vibration impacts for all project scenarios are predicted to be no greater than **negligible** impact.

175. Potential effects on human health are considered plausible because there is a source-pathway-receptor relationship:
- The source is noise generated by construction activities and vehicle movements.
 - The pathway is pressure waves through the air.
 - Receptors are residents and long-term occupiers of nearby properties and community buildings.
176. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
177. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).
178. The literature highlights cardiovascular effects, annoyance and sleep disturbance (and consequences arising from inadequate rest) as being the main pathways by which population health may be affected. The literature also notes the potential for chronic noise to have a detrimental effect on learning outcomes (e.g. noise distracting and affecting communication within classrooms). Whilst the literature supports there being thresholds at which effects (such as annoyance and sleep disturbance) are likely, it also acknowledges the subjective nature of responses to noise. In this regard noise effects can be considered to have non-threshold effects, with characteristics other than sound levels also determining the influence on health outcomes. The health assessment has regard to the population groups identified in the literature that may be particularly sensitive. For example, children, the elderly, the chronically ill, people with a hearing impairment, shift-workers and people with mental illness (e.g., schizophrenia or autism).

27.6.1.6.1 Sensitivity of Receptor – All Scenarios

179. The following conclusions on population sensitivity apply to all scenarios.
180. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to change. Additionally, most people live, work or study at a distance from the onshore transmission works where construction noise and vibration would be unlikely to be a source of concern.
181. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. This sub-population may experience existing widening inequalities due to living in areas with increased noise and elevated deprivation, with limited capacity to adapt to changes. Vulnerability particularly relates to those living close to the construction activities and construction compounds, including those spending more time in affected dwellings, e.g. due to low economic activity, shift work or poor health. People who are concerned or have high degrees of uncertainty about construction noise and its effect on their wellbeing may be more sensitive to changes in noise. The small population living at the coastal edge of Skipsea may experience nearshore noise (noise can travel longer distances across water than land) as well as night-time landfall HDD noise and noise associated with the Transition Joint Bays. Occupants of dwellings with less acoustic insulation properties, such as caravans and similar, may be more sensitive to noise effects. Schools, e.g. at Skipsea and Beverley, are considered sensitive in terms of educational outcomes affected by noise.
182. **Chapter 25 Noise** identifies a total of 51 noise sensitive receptor locations to represent the worst case effects. The majority of the receptors are residential, two are educational (R5 and R29) and one relates to healthcare (R33).

27.6.1.6.2 Magnitude of Impact – All Scenarios

183. As reported in **Chapter 25 Noise**, construction along the onshore cable corridor would involve activities that are mobile (i.e. only temporarily taking place at a given location during the construction period), such as trenching for cable laying; and activities that are static such as construction of the onshore substations. Mobile works will impact receptors for short periods of time, whereas static works will last longer.
184. Noise and vibration impacts from construction activities and construction traffic will be mitigated through the use of appropriate construction hours and best practice measures detailed in **Chapter 25 Noise**.
185. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. Whether the concurrent or sequential scenario is worst case depends on subjective responses to noise. Generally sequential effects which extend the level of noise disruption over a longer period are likely to be slightly worse, though at some locations the higher noise levels of concurrent exposure may cause a greater, albeit more temporary, effect on quality of life. The main health outcome is likely to be an annoyance related. Physiological effects of long-term exposure to road traffic noise are considered unlikely for temporary construction traffic. In all scenarios the magnitude of change due to the proposed construction works is **low**. In terms of population health, the *small* scale of change in noise levels is likely to predominantly relate to a *minor* change in quality of life and/or cardiovascular and mental wellbeing morbidity for a *small minority* of the community populations along the new onshore cable corridor. The changes would be *medium-term* duration and relate to *frequent* construction related noise exposures. The greatest potential for effects is likely for the *few people* close to either the landfall HDD and Transition Joint Bay works, or the onshore substations. Prolonged periods of construction noise at night or daytime disruption of educational activities at schools (e.g. Skipsea Primary School or Longcroft School in Beverley) are not anticipated. The elevated noise level at a small number of representative receptor location reported in **Chapter 25 Noise** (R43 and Eske Lane) are taken into account, and may warrant individual level mitigation, but are not expected to drive a population level change in health outcomes even accounting for vulnerable group effects.

27.6.1.6.3 Significance of Effect – All Scenarios

186. All scenarios have been considered by the assessment and the conclusion on significance is the same.
187. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. Construction noise impacts of the Projects are considered to result in a **minor** adverse (not significant) effect on population health. This assessment conclusion reflects that although the scientific literature indicates a *clear* association between elevated and sustained noise disturbance and reduced health outcome, the changes would result in a *very limited* effect in the health baseline of the population. The temporary construction noise is *not* expected to affect health inequalities. The level of effect is *not* expected to affect the ability to deliver local or national health policy. The score takes into account the subjective, and therefore non-threshold, nature of noise, including that tonal and other characteristics influence the effect on wellbeing.

27.6.1.6.4 Mitigation and Residual Significance of Effect – All Scenarios

188. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse. No additional mitigation is considered to be required.

27.6.1.7 Impact 7: Economic Environment: Workforce Upskilling

189. This section considers the population health implications of additional upskilling and educational support to the construction workforce.
190. Increased educational attainment is associated with better health outcomes and delayed mortality. Education is an important indicator of socioeconomic status and is associated with subsequent income, employment, social networks, and behaviours.
191. The Projects are associated with general construction workforce upskilling opportunities.
192. This section has been informed by **Chapter 28 Socio-Economics**, which sets out relevant assessment findings and mitigation measures that have been taken into account. At PEIR there are not specific commitments on apprenticeships, education or training opportunities. Further consideration to these will be provide in the ES.

193. A potential population health effect is considered plausible because there is a source-pathway-receptor relationship:
- The source is potential for educational opportunities and support.
 - The pathway is good quality education supporting socio-economic status and other outcomes, which are influential for health.
 - Receptors are the local population, particularly young adults commencing employment.
194. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
195. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire;
 - The regional population of Yorkshire and Humber; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.1.7.1 Sensitivity of Receptor – All Scenarios

196. The following conclusions on population sensitivity apply to all scenarios.
197. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. This reflects that most people in the local area would make use of alternative educational or training opportunities or have existing educational attainment appropriate to their vocation and career progression.
198. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to young adults, in relation to apprenticeship opportunities, and children or young people, in relation to educational support initiatives. For both these groups those who are from disadvantaged backgrounds would be particularly sensitive to educational interventions that provide knowledge, new skills or personal development. Young people leaving education or early in their careers may have the most to gain from an increase in training opportunities as a pathway into good quality local employment.

27.6.1.7.2 *Magnitude of Impact – All Scenarios*

199. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **negligible**. The worst case would be either DBS East or DBS in isolation, as this would be a smaller scale of workforce with fewer upskilling opportunities. Whether sequential or concurrent there are expected to be similar levels of overall opportunity. This reflects, based on current commitments, that the scales of new training opportunities is expected to be *very small* over the *medium-term*. The opportunities would vary with some being *one-off* and others being *continuous* learning opportunities, e.g. apprentices. The health effect is characterised as a *minor* change in *morbidity* for risk factors related to educational outcomes for a *very few people*.

27.6.1.7.3 *Significance of Effect – All Scenarios*

200. All scenarios have been considered by the assessment and the conclusion on significance is the same.
201. The effect is characterised as being *beneficial* in direction, *permanent* in supporting ongoing future career progression and *indirect*. The significance of the population health effect for this determinant of health is **negligible** beneficial (not significant). This conclusion reflects the scientific literature supports a *clear* association between educational outcomes and health outcomes, with the potential for a *very limited* change in the population health baseline, reflecting existing commitment levels. Potential opportunities will be explored further in the ES. Should greater opportunities be identified, these have the potential for lasting effects over the life-course due to improved employment opportunities following upskilling. This change could have a supportive influence on delivering health policy, including narrowing inequalities where vulnerable groups are targeted by and take-up the training opportunities.

27.6.1.7.4 *Mitigation and Residual Significance of Effect – All Scenarios*

202. Based on the negligible magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **negligible** beneficial. No additional mitigation is proposed at PEIR but potential opportunities will be further considered in the ES.

27.6.1.8 Impact 8: Economic Environment: Employment and Investment

203. This section considers the population health implications of increased employment and economic impacts during construction.
204. If DBS East or DBS West were built in isolation, at its peak (Q4 2029), construction activity is expected to support a total of 900 jobs across Humberside and 1,470 jobs across the UK.
205. If DBS East and DBS West are built together, at its peak (Q4 2029), construction activity is expected to support a total of 1,240 jobs across Humberside and 2,150 jobs across the UK.
206. Employment is an important determinant of health and well-being both directly and indirectly by making health-promoting resources available to an employee and any dependants. The socio-economic benefits associated with employment are improved living conditions and the potential to make healthier choices, e.g. eating a healthier diet and undertaking more physical activity. If members of the community are employed, this can also generate indirect economic activity.
207. Economic effects may also arise from disruption caused by the Projects to local trades and business. The area around landfall at Skipsea includes holiday accommodation, as well as associated retail and services that cater to a visiting population. Offshore and nearshore there is also the potential to affect commercial leisure and fisheries activities that support the local economy. Inland effects are less likely, though may be influenced by construction traffic.
208. This section has been informed by **Chapter 13 Commercial Fisheries, Chapter 14 Shipping and Navigation, Chapter 28 Socio-Economics and Chapter 29 Tourism and Recreation**, which set out relevant assessment findings and mitigation measures that have been taken into account.
209. **Chapter 13 Commercial Fisheries** concludes:
 - All scenarios
 - The significance of effect for loss or restricted access to fishing grounds during construction for all project scenarios is considered to be **negligible** to **minor** adverse for all receptor groups.
 - Following mitigation measures, a residual effect for inshore static gear vessel receptor groups is considered to be **minor** adverse.
 - The effect relating to displacement of fishing activity leading to gear conflict and increased pressure on adjacent grounds during

- construction is considered **negligible** to **minor** adverse for all receptor groups for all project scenarios.
- The effect of increased steaming times is deemed **minor** adverse for all project scenarios.
 - The risk of loss or damage of gear due to snagging during construction is considered to be **negligible** to **minor** adverse for all receptor groups.
 - The impact on supply chain opportunities during construction is considered to be **negligible** to **minor** beneficial for all receptor groups.
 - The impact on commercially important fish and shellfish during construction is considered **negligible** to **minor** adverse for all receptor groups.
 - The effect on navigational safety during construction is considered **negligible** to **minor** adverse for all receptor groups.
210. **Chapter 14 Shipping and Navigation** conclusions are set out at paragraph 103.
211. **Chapter 28 Socio-Economics** concludes:
- All scenarios:
 - The effect on expenditure and employment is assessed as **minor** beneficial with respects to the Humberside economy and as **negligible** with respects to the UK economy.
212. **Chapter 29 Tourism and Recreation** concludes:
- DBS East or DBS West in isolation
 - The effect of the Projects in isolation are not assessed.
 - DBS East and DBS West Together
 - The effect of the construction of the Projects on the tourism economy is assessed as negligible for the Local Area.
213. A potential population health effect is considered plausible because there is a source-pathway-receptor relationship:
- The source is changes in direct and indirect jobs and economic activity.
 - The pathway is good quality employment providing more health supporting resources.
 - Receptors are people of working age (and their dependants).

214. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
215. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1;
 - The local population of East Riding of Yorkshire;
 - The regional population of Yorkshire and Humber; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.1.8.1 Sensitivity of Receptor – All Scenarios

216. The following conclusions on population sensitivity apply to all scenarios.
217. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. This reflects that most people would already be within stable employment that would be unaffected by the Projects (or being a dependant of such a person).
218. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case relates to people and their dependants who are on low incomes, have poor job security, poor working conditions or who are unemployed. Future young or older people may also come to rely on those employed. Owners and employees of business experiencing large direct or indirect effects, positive or negative, due to the project would be particularly sensitive.

27.6.1.8.2 Magnitude of Impact – All Scenarios

219. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. It is likely that for adverse economic effects prolonged disruption of local business would be the worst case, i.e. the sequential scenario. The worst case for beneficial employment opportunities would be either DBS East or DBS in isolation, as this would be a smaller scale of workforce with fewer job opportunities. The health effects of construction employment benefits of the concurrent and sequential scenarios are likely to be similar. In all scenarios the magnitude of change due to the Projects is **low**. This reflects a relatively *small* scale of change in direct and indirect employment, beneficial or adverse, in the context of the local labour market. The direct construction employment is likely to be *medium-term* and on a *continuous* basis, whether full-time or part-time. The duration of disruption that could adversely affect local businesses, whether related to leisure, tourism or fisheries, is likely to be shorter term due to the transitional nature of works at any given location. Where effects are localised, e.g. at landfall or the onshore substations there is unlikely to be a widescale adverse effect due to the works that could significantly affect population health. Employment and economic effects, both beneficial and adverse, are likely to be associated with *minor* changes in *morbidity* and *quality of life* for a *small minority* of the population.

27.6.1.8.3 Significance of Effect – All Scenarios

220. All scenarios have been considered by the assessment and the conclusion on significance is the same.
221. The effect is characterised as being *beneficial* and *adverse* in direction, *temporary* and *indirect*. The significance of the population health effect for this determinant of health is **minor** beneficial (not significant) and **minor** adverse (not significant). This conclusion reflects that employment has a *clear* association with better health outcomes in the scientific literature and the Projects are likely to make *slight* positive and negative contribution to the local health baseline. Such effects are likely to have a *marginal* effect on delivering health policy and on narrowing health inequalities.

27.6.1.8.4 Mitigation and Residual Significance of Effect – All Scenarios

222. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** beneficial. No additional mitigation is considered to be required.

27.6.2 Potential Effects During Operation

27.6.2.1 Impact 1: Bio-Physical Environment: Noise Disturbance

223. This section discusses operational changes in noise exposure at the onshore substations that may be detrimental to population health. Substations include fixed plant such as transformers and capacitors, which can cause community annoyance due to noise, including distinctive tonal characteristics. Noise effects from other operational activities are unlikely to have the potential to affect population health.
224. This section has been informed by **Chapter 25 Noise**, which explains that as the design and specifications of on-site fixed plant at the onshore substations is not yet confirmed, the operational noise effects have not been quantitatively assessed at this stage. **Chapter 25 Noise** does however explain the approach to assessment and the expectation that effects will be mitigatable to avoid significant adverse effects. Further assessment of operational substation noise will be reported in the ES.
225. The following paragraphs sets out the basis for the health assessment that will be reported in the ES, which will be informed by the quantitative ES noise assessment.
226. Potential effects on human health are considered plausible because there is a source-pathway-receptor relationship:
- The source is noise generated by substation electrical infrastructure.
 - The pathway is pressure waves through the air.
 - Receptors are residents and long-term occupiers of nearby properties and community buildings.
227. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
228. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.2.1.1 Sensitivity of Receptor – All Scenarios

229. The following conclusions on population sensitivity apply to all scenarios.
230. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. Most people live, work or study at a distance from the onshore substations where noise effects would be imperceptible.
231. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population sensitive for reasons discussed in section 27.6.1.2. Vulnerability particularly relates to those living south of Beverley close to the onshore substations, including those spending more time in affected dwellings, e.g. due to low economic activity, shift work or poor health.

27.6.2.1.2 Magnitude of Impact – All Scenarios

232. The following magnitude conclusion is preliminary and based on professional judgement in the absence of a **Chapter 25** quantitative operational noise assessment at this stage. In all scenarios the magnitude of change due to the operational activities is expected to be no greater than **low**, but this will be further considered and reported in the ES. The worst case is likely to be DBS East and DBS concurrently, as this would be a larger scale of new electrical infrastructure in operation with the greatest temporal overlap. In terms of population health, the expectation is that there would be a *small* scale of change in noise levels and, if this is the case, it would predominantly relate to a *minor* change in quality of life for a *very few people*. That level of change, whilst appropriate to mitigate, would be unlikely to constitute a population health effect. The change is expected to be *long-term* duration and *continuous*, potentially affecting daytime and night-time periods.

27.6.2.1.3 Significance of Effect – All Scenarios

233. A conclusion of population health significance is not reported at this stage. However, it is noted that the preliminary **Chapter 25 Noise** conclusion is that significant adverse effects are expected to be avoided, including through use of mitigation if required. That outcome would be likely to avoid significant adverse population health effects. A conclusion on population health significance will be reported in the ES.

27.6.2.2 Impact 2: Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks

234. This section considers the potential onshore operational population health effect due to electro-magnetic fields (EMF) exposure. All electrical systems, including natural processes and living organisms generate EMF. EMF effects diminish rapidly with distance, often requiring only a few metres, or less, to reach background levels.
235. In line with good practice, public understanding of risk in relation to operational EMF is assessed. This includes considering how mental health effects can be avoided or reduced through provisions of timely and non-technical information explaining on how actual health risks are mitigated.
236. As noted in section 27.2, the Planning Inspectorate and the UKHSA are satisfied with the actual risks of EMF to population health being scoped out of the health assessment based on the Projects' commitment to compliance with extant guidance and regulations. In this regard the Projects have adopted and implemented within their design relevant guidelines of the ICNIRP and the UK Government voluntary code of practice. This includes considerations in relation to both HVDC and HVAC.
237. The focus of this assessment section is therefore not on the actual risk, which are considered appropriately mitigated, but on people's understanding of risks (risk perception). This relates to the potential for community concern about their proximity the electrical infrastructure, including buried cables and onshore substations to affect mental health, even where relevant public EMF exposure guideline limits are met.
238. The potential health effect has a plausible source-pathway-receptor relationship:
- The source is electrical equipment introduced by the Projects;
 - The pathway is concern about field strength affecting mental health; and
 - Receptors are residents in the local community, particularly those living in close proximity to new electrical infrastructure.
239. The population groups relevant to this assessment are:
- The site specific population, see section 27.3.1; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.2.2.1 Sensitivity of Receptor – All scenarios

240. The following conclusions on population sensitivity apply to all scenarios.
241. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. Most people in the live, work or travel at a separation distance from the Project's electrical infrastructure where they would not be concerned about the potential for EMF risks. This group also includes that proportion of the population who are ambivalent or not concerned about EMF as a risk factor.
242. The sensitivity of the vulnerable sub-population is **high**. This reflects that the sub-population includes people who may be uncertain or concerned about EMF and this may exacerbate existing mental health conditions or be a source of stress and anxiety in itself. This may particularly be the case for people with near views and/or who live in close proximity to the onshore substations. Low incomes or existing deprivation may contribute to a limited sense of control and reduced capacity to obtain further information.

27.6.2.2.2 Magnitude of Impact – All Scenarios

243. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the project is **low**. The worst case is likely to be DBS East and DBS concurrently, as this would be a larger scale of new electrical infrastructure in operation with the greatest temporal overlap. The level of actual exposure is negligible, however the scale of change that may contribute to community concern about EMF is *medium, continuous and long-term*. The severity of the health outcome relates predominantly to a *minor* change in *mental health* related morbidity for a *very few* people within the population. Such individual level effects are unlikely to have implications for health service capacity. For many people there is likely to be a rapid reversal of effects should their concerns be responded to and resolved to their satisfaction.

27.6.2.2.3 Significance of Effect – All Scenarios

244. All scenarios have been considered by the assessment and the conclusion on significance is the same.

245. The significance of the population health effect is **minor** adverse (not significant). The professional judgment is that there could be a *slight* adverse change in the health baseline for the local population if concerns are widespread. This conclusion reflects scientific understanding of the impact of uncertainty or concern about environmental risks on mental health. It also reflects that the actual risks would be well within regulatory standards for EMF and that most members of the public would expect this to be the case. The context that electrical transmission infrastructure and substations are relatively common features would also be expected to inform population risk perception.

27.6.2.2.4 *Mitigation and Residual Significance of Effect – All Scenarios*

246. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** adverse.
247. The following mitigation is proposed. The sharing with communities, particularly those in south Beverley near the onshore substations, of non-technical summary information about EMF regulatory standards, the actual negligible EMF risks of the Projects. This information sharing to reduce uncertainty and support a shared understanding could be via a website and/or posted leaflets. Information relevant to both HVDC and HVAC would be included.
248. The residual significance of the effect on mental health from public uncertainty or concern about EMF risks would be **negligible** (not significant).

27.6.2.3 *Impact 3: Bio-Physical Environment: Climate Change*

249. This section considers the population health implications of the contribution of the Projects to reducing the effects of climate change.
250. If DBS East or DBS West were built in isolation there would be a total generating capacity of 1.5 GW from the installation of 100 turbines.
251. If DBS East and DBS West are built together there would be a total generating capacity of 3.0 GW from the installation of 200 turbines.
252. Renewable energy generation supports avoiding adverse health effects associated with climate change. These include extreme temperature effects, infectious diseases occurrence, food insecurity and injury. These effects relate to the UK population, but also the global population, particularly deprived populations in low- and middle-income countries.

253. There are important global inequalities in the effects of climate change, with the greatest adverse effects on health expected in the some of the poorest and least economically developed populations. In contrast, populations that benefit from rapid social and economic development are expected to experience reduced (but not eliminated) adverse effects to health from climate change. Changes in health outcomes related to climate change are therefore expected to be relatively small in the UK. When considering health and well-being, there is a global responsibility to reduce the effect of climate-altering pollutants that are expected to reduce health outcomes in low- and middle-income countries. The Intergovernmental Panel on Climate Change states that there are opportunities to achieve co-benefits from actions that reduce emissions of climate altering pollutants and at the same time improve health.
254. This section is informed by **Chapter 30 Climate Change**, which concludes:
- The Projects would result in a reduction in the release of GHG's to the atmosphere by approximately 181 million tonnes CO₂e, compared to the without-project baseline (i.e. electricity produced by gas), and will provide a renewable source of electricity which beneficially contributes to the UK's goal of achieving net zero emissions by 2050.
255. A potential population health effect is considered plausible because there is a source-pathway-receptor relationship:
- Source: renewable energy created during the operation of the wind farms.
 - Pathway: reduction in climate-altering pollutants contribute to climate change, which is associated with global changes in temperature, crop yields, productivity and disease prevalence.
 - Receptor: international global population, particularly deprived populations in low- and middle-income countries.
256. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
257. The population groups relevant to this assessment are:
- The national population of England
 - The international population globally
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.2.3.1 Sensitivity of Receptor – All Scenarios

258. The following conclusions on population sensitivity apply to all scenarios.
259. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. England is a developed economy and has comparatively high resilience and capacity to adapt, so in general the national population can be considered to be of low sensitivity.
260. The sensitivity of the vulnerable group population is **high**. This reflects that the adverse effects would fall most heavily on the poorest and most vulnerable members and regions of society (globally). Disproportionate effect on the most disadvantaged in society are likely to widen health inequalities. Although people in England are generally less vulnerable, as they are able to get support to cope with the effects of climate change, some may still be at greater risk (e.g. low incomes or age making it harder to cope with heatwaves or flooding).

27.6.2.3.2 Magnitude of Impact – All Scenarios

261. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **low**. The worst case would be either DBS East or DBS in isolation, as this would be a smaller scale of renewable energy generation. The magnitude conclusion reflects that the scale of change would be *small* within the national energy sector emissions context, albeit *continuous* and *long-term*. The health effect likely represents a *very minor* change in the risk of mortality and morbidity linked to a range of health determinants influenced by a changing climate for a *large minority* of the global population and a *small minority* of the national population. Relevant effects include population displacement, food insecurity, shifts in communicable illness ranges and exposure to extreme meteorological conditions. Whilst the concurrent or sequential scenarios represent a larger renewable energy contribution to the in isolation scenarios, the magnitude of effect for health remains low, rather than medium, within the national energy sector emissions context.

27.6.2.3.3 Significance of Effect – All Scenarios

262. All scenarios have been considered by the assessment and the conclusion on significance is the same.

263. The effect is characterised as being *beneficial* in direction, *permanent* and due to a range of *direct* and *indirect* health pathways. The significance of the population health effect is **minor** beneficial (significant) effect. This reflects a *very limited* effect on the global or national health baseline with long-term inter-generational effects; the scientific literature supports a *causal* relationship between climate altering pollutants and climate change; and the Projects support a *marginal* narrowing of inequalities nationally and globally. The conclusion reflects that climate change is a *general* public health priority issue, with *consensus* from stakeholders as to its importance for public health.

27.6.2.3.4 Mitigation and Residual Significance of Effect – All Scenarios

264. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** beneficial. No additional mitigation is considered to be required.

27.6.2.4 Impact 4: Economic Environment: Workforce Upskilling

265. This section considers the population health implications of additional upskilling and educational support to the operational workforce.
266. Increased educational attainment is associated with better health outcomes as set out in section 27.6.1.7.
267. The Projects are associated with general operational workforce upskilling opportunities.
268. This section has been informed by **Chapter 28 Socio-Economics**, which sets out relevant assessment findings and mitigation measures that have been taken into account. In the ES further consideration will be given to specific commitments which may be made in relation to apprenticeships, education or training opportunities.
269. A potential population health effect is considered likely following the same source-pathway-receptor model as set out in section 27.6.1.7.
270. The population groups relevant to this assessment are the same as set out in section 27.6.1.7.

27.6.2.4.1 Sensitivity of Receptor – All Scenarios

271. The following conclusions on population sensitivity apply to all scenarios.
272. The sensitivity of the general population is **low** and the sensitivity of the vulnerable group population is **high** on the same basis as set out in section 27.6.1.7.

27.6.2.4.2 *Magnitude of Impact – All Scenarios*

- 273. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **negligible** on the same basis as set out in section 27.6.1.7 Significance of Effect – All Scenarios
- 274. All scenarios have been considered by the assessment and the conclusion on significance is the same.
- 275. The effect is characterised as being *beneficial* in direction, *permanent* in supporting ongoing future career progression and *indirect*. The significance of the population health effect for this determinant of health is **negligible** beneficial (not significant). The rationale for this conclusion is as set out in section 27.6.1.7.

27.6.2.4.3 *Mitigation and Residual Significance of Effect – All Scenarios*

- 276. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **negligible** beneficial. No additional mitigation is proposed at PEIR but this issue will be further considered in the ES.

27.6.2.5 *Impact 5: Economic Environment: Employment and Investment*

- 277. This section considers the population health implications of increased employment and economic impacts during operation.
- 278. If DBS East or DBS West were built in isolation, operation and maintenance is expected to support a total of 400 jobs across Humberside and 580 jobs across the UK.
- 279. If DBS East and DBS West are built together, operation and maintenance is expected to support a total of 810 jobs across Humberside and 1,120 jobs across the UK.
- 280. Employment is an important determinant of health and well-being as set out in section 27.6.1.8. Adverse effects on local businesses and livelihoods, including commercial fisheries, leisure and tourism are not expected.
- 281. This section has been informed by **Chapter 28 Socio-Economics**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

282. **Chapter 28 Socio-Economics** concludes:

- DBS East or DBS West in isolation
 - The effect on expenditure and employment is assessed as **minor** beneficial with respects to the Humberside economy and as **negligible** with respects to the UK economy.
- DBS East and DBS West together (concurrently or sequentially)
 - The effect on expenditure and employment is assessed as **minor** beneficial with respects to the Humberside economy and as **negligible** with respects to the UK economy.

283. **Chapter 13 Commercial Fisheries** concludes:

- The impact on supply chain opportunities during operation and maintenance is considered **negligible** to **minor** beneficial for all receptor groups for all project scenarios.

284. A potential positive population health effect is considered likely following the same source-pathway-receptor model as set out in section 27.6.1.8.

285. The population groups relevant to this assessment are the same as set out in section 27.6.1.8.

27.6.2.5.1 Sensitivity of Receptor – All Scenarios

286. The following conclusions on population sensitivity apply to all scenarios.

287. The sensitivity of the general population is **low** and the sensitivity of the vulnerable group population is **high** on the same basis as the discussion of positive effects set out in section 27.6.1.8.

27.6.2.5.2 Magnitude of Impact – All Scenarios

288. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Projects is **low**. The worst case for beneficial employment opportunities would be either DBS East or DBS in isolation, as this would be a smaller scale of workforce with fewer job opportunities. The magnitude conclusion reflects that a relatively *small* scale of change in operational employment in the context of the local labour market. These opportunities would be of *long-term* duration and reflect employment that is on a *continuous* basis, whether full-time or part-time. Such jobs are likely to be associated with *minor* changes in *morbidity* and *quality of life* for a *small minority* of the population due to improved socio-economic status and increased spend on health supporting resources and activities.

27.6.2.5.3 Significance of Effect – All Scenarios

289. All scenarios have been considered by the assessment and the conclusion on significance is the same.
290. The effect is characterised as being *beneficial* in direction, *permanent* and *indirect*. The significance of the population health effect for this determinant of health is **minor** beneficial (not significant). The rationale for this conclusion is as for the discussion of positive effects set out in section 27.6.1.8.

27.6.2.5.4 Mitigation and Residual Significance of Effect – All Scenarios

291. Based on the low magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **minor** beneficial. No additional mitigation is considered to be required.

27.6.2.6 Impact 6: Wider Social Infrastructure and Resources

292. The Projects support UK energy security, which is important for maintaining continuity and affordability of electricity supplies. Public health has a high reliance on electricity supplies. This includes power to safely cook and refrigerate food, regulate the temperature and lighting of homes and schools, operate health and social care services, maintain economic productivity and employment, and operate technologies that improve quality of life and social networking. Sustained interruption of supply or rapid increases in costs would both be expected to result in reductions in health and well-being outcomes.
293. The potential health effect is considered plausible because there is a source-pathway-receptor relationship:
 - Source: renewable electricity generation.
 - Pathway: energy security providing continuity of services and infrastructure that supports public health and healthcare.
 - Receptor: population connected to the national power grid.
294. Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.
 - The population groups relevant to this assessment are:
 - The national population of England; and
 - The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

27.6.2.6.1 Sensitivity of Receptor – All Scenarios

295. The following conclusions on population sensitivity apply to all scenarios.
296. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 27.4.3.5. The general population comprise those members of the community in good physical and mental health and with greater resources to respond to the costs of energy or to interruptions in supply.
297. The sensitivity of the vulnerable group population is **high**. This reflects the sub-population on low incomes for whom energy security, and interruption of energy supplies, pose a greater risk. This is particularly the case for dependants at risk during temperature extremes, including heatwaves and cold weather, as well as people in poor health, including when accessing healthcare.

27.6.2.6.2 Magnitude of Impact – All Scenarios

298. Magnitude of change has been considered for all the scenarios of DBS East and DBS West in isolation, concurrently or sequentially. In all scenarios the magnitude of change due to the Project's contribution to renewable electricity is **medium**. The worst case would be either DBS East or DBS in isolation, as this would be a smaller scale of renewable energy generation. The magnitude conclusion is driven by the *long-term* and *continuous* public health benefits to energy security, despite the scale of the Project's contribution being relatively *small* within the national energy generation context. The effects are likely to provide a *minor* reduction in risks for population *mortality* (e.g. reducing excess winter deaths) and *morbidity* of physical and mental health outcomes related to standard of living and access to health supporting infrastructure. Such an effect may extend via the national grid to a *large minority* of the national population. Such effects may bring *small* benefits to healthcare service quality by avoiding or reducing capacity burdens due to the direct and indirect effects of energy security of health. Whilst the concurrent or sequential scenarios represent a larger renewable energy contribution of up to 3GW of renewable electricity (powering up to around 3.4 million households a year) compared to the in isolation scenarios, the magnitude of effect for health remains medium, rather than large, within the national electricity supply context.

27.6.2.6.3 Significance of Effect – All Scenarios

299. All scenarios have been considered by the assessment and the conclusion on significance is the same.

300. The significance of the population health effect for this determinant of health is **moderate** beneficial (significant). The professional judgment is that the Projects provide a protective effect on the health baseline and that this would be important for public health. This conclusion reflects the scientific literature establishes a clear association between energy security and health outcomes. The Projects are likely to be *influential* to delivering health policy, including in narrowing inequalities that are at risk of widening due to reduced national energy security.

27.6.2.6.4 *Mitigation and Residual Significance of Effect – All Scenarios*

301. Based on the medium magnitude and high sensitivity in the vulnerable group population (which is used to reflect the role of potential inequalities, see paragraph 63), the significance of effect would be **moderate** beneficial. No additional mitigation is considered to be required.

27.6.3 Potential Effects During Decommissioning

302. Effects are likely to be very similar to those described for construction. To avoid duplication such effects are not restated.

27.7 Preliminary Assessment of Cumulative Effects

303. As detailed in section 27.4.5, this section presents a preliminary assessment of cumulative effects in relation to **Human Health**. The final CEA will be undertaken within the ES chapter.

27.7.1 Initial Screening for Cumulative Effects

304. **Table 27-14** below details the potential cumulative effects that may occur between the Projects and other plans, projects and activities. Only potential impacts assessed in section 27.6 where the potential for cumulative effects has been identified (minor, moderate or major) will be taken forward to the final CEA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

Table 27-14 Potential Cumulative Effects

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Construction			
Impact 1: Health Related Behaviours: Physical Activity, Open Space and Leisure (Section 27.6.1.1)	No	Moderate	Plans and projects currently in planning have limited potential to have cumulative effects on health related behaviours due to limited expected overlap in the very localised effects where the population undertakes physical activity and leisure based activities.
Impact 2: Social Environment: Transport Modes, Access and Connections (Section 27.6.1.2)	Yes	Moderate	Plans and projects currently in planning have potential to affect transport infrastructure capacity and thus outcomes such as access, road safety and travel times.
Impact 3: Bio-Physical Environment: Air Quality (Section 27.6.1.3)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to changes in local air quality where their activities or transport routes coincide or are in close proximity.
Impact 4: Bio-Physical Environment: Water (Section 27.6.1.4)	Yes	Low	Plans and projects currently in planning have potential to contribute to changes in water quality where the same onshore catchments or aquifers are affected, or offshore works are in close proximity and sufficiently close to the shore.

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Impact 5: Bio-Physical Environment: Soil Contamination (Section 27.6.1.5)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to mobilisation of soil contamination affecting landowners, land users and neighbouring land users where their activities are in close proximity.
Impact 6: Bio-Physical Environment: Noise Disturbance (Section 27.6.1.6)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to changes in local noise disturbance where their activities or transport routes coincide or are in close proximity.
Impact 7: Economic Environment: Workforce Upskilling (Section 27.6.1.7)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to new training opportunities, locally and regionally.
Impact 8: Economic Environment: Employment and Investment (Section 27.6.1.8)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to new jobs opportunities and affect local supply chains locally and regionally.

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Operation & Maintenance			
Impact 1: Bio-Physical Environment: Noise Disturbance (Section 27.6.2.1)	No	Moderate	Plans and projects currently in planning have limited potential to have cumulative effects from noise from other substations as such effects are typically highly localised and would require very close proximity to act cumulatively.
Impact 2: Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks (Section 27.6.2.2)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to concern about EMF, where other projects include electrical infrastructure that is visible within the same landscape and visual study area.
Impact 3: Bio-Physical Environment: Climate Change (Section 27.6.2.3)	No	Low	Plans and projects currently in planning have potential to contribute to the overall scale of renewable energy generation, e.g. other wind farms. However, cumulative assessment is not considered appropriate as such an assessment should account for all development that affects the global atmosphere as a receptor. This is not a feasible activity for EIA.
Impact 4: Economic Environment: Workforce Upskilling (Section 27.6.2.4)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to new training opportunities, locally and regionally.

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Impact 5: Economic Environment: Employment and Investment (Section 27.6.2.5)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to new jobs opportunities and affect local supply chains locally and regionally.
Impact 6: Wider Social Infrastructure and Resources (Section 27.6.2.6)	Yes	Moderate	Plans and projects currently in planning have potential to contribute to the overall scale of renewable energy generation that supports public health through energy security, regionally and nationally.
Decommissioning			
N/A			

27.7.2 Plans/Projects Considered for Cumulative Impacts

305. A high-level list of plans/projects that may result in cumulative effects with the Projects is detailed in **Table 27-15** (offshore) and **Table 27-16** (onshore). For Human Health, a search distances consistent with the inter-related technical disciplines set out in section 27.1 have been used to determine the initial list of projects considered for the CEA.
306. Plans / projects have been assigned a tier level between 1 and 7, based on the most recent guidance (see **Chapter 6 EIA Methodology**). For the final CEA at ES, this high-level list will be reviewed and screened to ensure all relevant plans / projects are considered in the final assessment. All listed plans / projects will be re-examined at ES to ensure each assigned tier remains accurate at the time of writing.

Table 27-15 High-Level List of Plans/Projects Screened For Further Assessment in the Final CEA

Tier	Plan / Project	Distance to Offshore Development Area (km)
Strategic Plans		
7	East Inshore, North East Inshore, East Offshore and North East Offshore Marine Plans	Within offshore development area
Offshore Wind Farms		
2	Dogger Bank A	7
2	Dogger Bank B	17
Carbon Capture and Storage		
3	Northern Endurance CCS	2
7	CCS North Sea Leasing Round – SNS Areas 1 & 3	Within array areas
Subsea Cables		
2	Viking Link Interconnector	29

Tier	Plan / Project	Distance to Offshore Development Area (km)
6	Eastern Link 2	2
7	Third Eastern Link HVDC cable (TGDC)	Crosses offshore export cable corridor
7	Fourth Eastern Link HVDC cable (E4L5)	Crosses offshore export cable corridor

Table 27-16 High-Level List of Plans/Projects Screened For Further Assessment in the Final CEA

Tier	Plan / Project	Distance to Onshore Development Area (km)
2	Dogger Bank A & B Offshore Wind Farm	Crosses onshore export cable corridor
3	A164 and Jock Lodge Junction Improvement Scheme	Crosses onshore export cable corridor
3	Solar Farm – Land south of Creyke Beck Substation, 4875 Park Lane, Cottingham	Within Onshore Development Area
3	Solar Farm – Land east and west of West of Tickton Bridge Plantation, Main Road, Routh	Adjacent to the Onshore Development Area
4	Hornsea Project Four Offshore Wind Farm	Adjacent to onshore export cable corridor
4	Scotland England Green Link 2	3.5
4	Solar Farm – Land north east and west of Carr Plantation, Ferry Road, Wawne	1.5
4	Household Recycling Centre – Land north west of Ings Road Picnic Site, Molescroft	Within Onshore Development Area
6	Solar Farm – Robson & Co, White Hall, Shepard Lane, Woodmansey	Within Onshore Development Area

Tier	Plan / Project	Distance to Onshore Development Area (km)
7	New National Grid Substation (Birkill Wood)	Within Onshore Development Area
7	North Humber to High Marnham	Within Onshore Development Area
7	Creyke Beck Substation Extension	400m from Onshore Development Area

27.8 Transboundary Impact/Effect Assessment Methodology

307. The transboundary assessment considers the potential for transboundary effects to occur on human health receptors as a result of the Projects; either those that might arise within the Exclusive Economic Zone (EEZ) of European Economic Area (EEA) states or arising on the interests of EEA states e.g. a non UK fishing vessel. **Chapter 6 EIA Methodology** provides further details of the general framework and approach to the assessment of the transboundary effects.
308. For human health, the potential for transboundary effects has been identified in relation to port activities, where there is the potential for these to be within other jurisdictions.

27.9 Assumptions and Limitations

309. This preliminary assessment is considered to be an interim stage in the EIA process. The results presented in the following sections are based on early design assumptions and initial assessments which will be refined and presented in the final ES to be submitted as part of the DCO application.
310. This assessment is based on publicly available statistics and evidence sources. No new primary research or bespoke analysis of non-public data was undertaken for the health assessment.
311. The health and wellbeing assessment partially draws from and builds upon, the technical outputs from inter-related technical disciplines, listed in section 27.1.
312. As a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter (e.g. for modelling work undertaken). It is, however, considered that the information available provides a suitable basis for assessment.
313. All decision making is within the context of imperfect information and therefore uncertainty. Reducing uncertainty is a key element of the assessment. Whilst not all uncertainty can be removed, the following steps have been taken to allow confidence in the health assessment conclusions:
- Methods are used that triangulate evidence sources and professional perspectives;
 - The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence;
 - Quantitative inputs for other assessments have been used, which included model validation, as described in other chapters;
 - The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings;
 - Monitoring and adaptive management is conditioned as part of ongoing compliance; and
 - The health assessment has been transparent in its analysis and follows good practice.

27.10 Potential Monitoring Requirements

- 314. Monitoring requirements will be described in the In-Principle Monitoring Plan (IPMP) submitted alongside the DCO application and further developed and agreed with stakeholders prior to construction based on the IPMP and taking account of the final detailed design of the Projects.
- 315. During operation monitor the proportion of local people with long-term unemployment, high job instability or low income who enter good quality stable employment with the Projects in order to confirm the expected benefit and further tailor the targeting of local vulnerable groups.
- 316. During operation monitor of the proportion of NEETs taking up, and completing, training opportunities with the Projects in order to confirm the expected benefit and further tailor the targeting of local vulnerable groups.

27.11 Transboundary Effects

- 317. There are no transboundary effects with regard to human health as the Onshore Development Area and the Offshore Development Area would not be sited in proximity to any international boundaries. Transboundary effects are therefore scoped out of this assessment and not considered further.

27.12 Interactions

- 318. The effects identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between effects are presented in **Table 27-17**. This provides a screening tool for which effects have the potential to interact. **Table 27-18** and **Table 27-19** provide an assessment for each receptor group as related to these impacts.
- 319. Within **Table 27-20** the effects are assessed relative to each development phase to see if multiple effects could increase the significance of the effect upon a receptor. Following this a lifetime assessment is undertaken which considers the potential for effect to affect receptors across all development phases.

Table 27-17 Interactions Between Impacts – Screening

Potential Interactions between Impacts							
Construction							
	Physical Activity	Transport	Air Quality	Water	Noise	Upskilling	Employment
Physical Activity		Yes	Yes	Yes	Yes	No	No
Transport	Yes		Yes	No	Yes	No	No
Air Quality	Yes	Yes		No	No	No	No
Water	Yes	No	No		No	No	No
Noise	Yes	Yes	No	No		No	No
Upskilling	No	No	No	No	No		Yes
Employment	No	No	No	No	No	Yes	
Operation							

Potential Interactions between Impacts						
	Noise	EMF	Climate Change	Upskilling	Employment	Wider Societal
Noise		Yes	No	No	No	No
EMF	Yes		No	No	No	No
Climate Change	No	No		No	No	Yes
Upskilling	No	No	No		Yes	No
Employment	No	No	No	Yes		No
Wider Societal	No	No	Yes	No	No	

Table 27-18 Interaction Between Impacts by Geographic Populations – Construction and Decommissioning

	Site Specific	Local	Regional	National	International
Physical Activity	Yes	Yes	No	No	No
Transport	Yes	Yes	No	No	No
Air Quality	Yes	Yes	Yes	No	No
Water	Yes	Yes	No	No	No
Noise	Yes	Yes	No	No	No
Upskilling	Yes	Yes	Yes	No	No
Employment	Yes	Yes	Yes	No	No

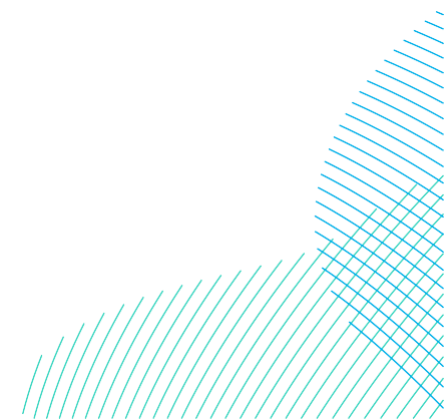


Table 27-19 Interaction Between Impacts by Geographic Populations – Operation

	Site Specific	Local	Regional	National	International
Noise	Yes	No	No	No	No
EMF	Yes	No	No	No	No
Climate Change	No	No	No	Yes	Yes
Upskilling	Yes	Yes	Yes	No	No
Employment	Yes	Yes	Yes	No	No
Wider Societal	No	No	No	Yes	No

Table 27-20 Interaction Between Impacts - Phase and Lifetime Assessment

Receptor	Highest Significance Level				
	Construction	Operation	Decommissioning	Phase Assessment	Lifetime Assessment
Site-specific population	Minor adverse (multiple determinants)	Minor adverse (public concern of EMF driven)	Minor adverse (multiple determinants)	No change	No change
Local population	Minor adverse (multiple determinants)	Minor beneficial (employment driven)	Minor adverse (multiple determinants)	No change	No change
Regional population	Minor beneficial (employment driven)	Minor beneficial (employment driven)	Minor beneficial (employment driven)	No change	No change
National population	N/A	Moderate beneficial (wider societal benefits driven)	N/A	No change	No change

Receptor	Highest Significance Level				
	Construction	Operation	Decommissioning	Phase Assessment	Lifetime Assessment
International population	N/A	Moderate beneficial (wider societal benefits driven)	N/A	No change	No change

27.13 Inter-relationships

320. There are clear inter-relationships cited within this chapter between the human health topic and other topics that have been considered within this PEIR. These interrelationships have been assessed in this chapter where there is the potential for likely significant effects. Relevant chapters referenced are:

- **Chapter 8 Marine Physical Environment;**
- **Chapter 13 Commercial Fisheries;**
- **Chapter 14 Shipping and Navigation;**
- **Chapter 16 Infrastructure and Other Users;**
- **Chapter 19 Geology and Land Quality;**
- **Chapter 20 Flood Risk and Hydrology;**
- **Chapter 21 Land Use;**
- **Chapter 23 Landscape and Visual Impact Assessment;**
- **Chapter 24 Traffic and Transport;**
- **Chapter 25 Noise;**
- **Chapter 26 Air Quality;**
- **Chapter 28 Socio-Economics;**
- **Chapter 29 Tourism and Recreation; and**
- **Chapter 30 Climate Change.**

27.14 Summary

321. This assessment considers potential impacts on population health from changes due to the Projects. The assessment considers the scenarios of DBS East and DBS West in isolation, concurrently or sequentially.
322. Population health varies given factors such as personal choice, location, mobility and exposure. These factors that influence health are called determinants of health and they span environmental, social, behavioural, economic and institutional aspects. The Projects have the potential to change determinants of health, with beneficial and adverse effects, either directly, indirectly or cumulatively.
323. The methodology for assessing human health as part of the EIA follows guidance and good practice. The assessment identifies any likely significant effects on population health. Consideration is given to physical health, mental health and health inequalities.
324. The health assessment is informed by the findings of other EIA chapters, including:
- **Chapter 8 Marine Physical Environment;**
 - **Chapter 13 Commercial Fisheries;**
 - **Chapter 14 Shipping and Navigation;**
 - **Chapter 16 Infrastructure and Other Users;**
 - **Chapter 19 Geology and Land Quality;**
 - **Chapter 20 Flood Risk and Hydrology;**
 - **Chapter 21 Land Use;**
 - **Chapter 23 Landscape & Visual Impact Assessment;**
 - **Chapter 24 Traffic;**
 - **Chapter 25 Noise;**
 - **Chapter 26 Air Quality;**
 - **Chapter 28 Socio Economics;**
 - **Chapter 29 Tourism and Recreation;** and
 - **Chapter 30 Climate Change.**
325. The health assessment has also been informed by a review of relevant public health evidence sources, including scientific literature, baseline data, health policy, local health priorities and health protection standards.

326. The health assessment looks at the potential effects for both the general population and for vulnerable groups. Vulnerability relates to experiencing effects differently due to age, income level, health status, degree of social disadvantage or ability to access services or resources. The health assessment considers localised effects as well as effects to the wider community in East Riding of Yorkshire, Yorkshire and Humber and the city of Hull. National and international effects relating to health effects of climate change and the public health benefits of energy security are also discussed.
327. The health of people in the localised study area where the majority of the Projects' impacts would be experienced is generally better than the national average. The presence of vulnerable groups and pockets of deprivation is however noted and taken into account.
328. During construction and decommissioning the Projects have the potential to adversely affect: use of open space for recreation; journey times, road safety and active travel; air, water and soil quality; noise levels; and existing businesses. For population health these effects are found to be **minor** adverse, which are not significant in EIA terms. Construction and decommissioning employment opportunities are considered and found to be **minor** beneficial.
329. During operation the potential for the Projects' onshore substations to cause community concern about electromagnetic fields has been considered. Such an effect is expected to be **negligible**, including due to the sharing of non-technical information with local communities about how electromagnetic field standards for public health protection would be met. The potential for the Projects' onshore substations to cause noise disturbance has not been assessed at this stage but will be reported in the ES. The expectation is that significant adverse effects to population health would not arise. The benefits of the Projects to public health are noted. This includes how renewable energy generation both provides a **moderate** beneficial (significant) effect in supporting many health promoting aspects of life (such as food safety, thermal comfort and operation of healthcare) and also provides a **minor** beneficial effect through reducing climate change related extreme temperatures and spread of infectious disease. Job opportunities associated with operation and maintenance of the Projects are noted and expected to provide **minor** beneficial population health effects locally and regionally. Monitoring will consider vulnerable group access to these job opportunities.

- 330. The potential for transboundary effects has been considered and excluded. The potential for interaction between the various health effects has also been considered and it is concluded that any interactions would not change the conclusions reached.
- 331. Next steps include further consultation with health stakeholders and ongoing consideration through the assessment process of operational noise effects, as well as opportunities to further reduce the impact of adverse effects and further enhance the potential for beneficial effects.
- 332. **Table 27-21** provides a summary of the assessment findings.

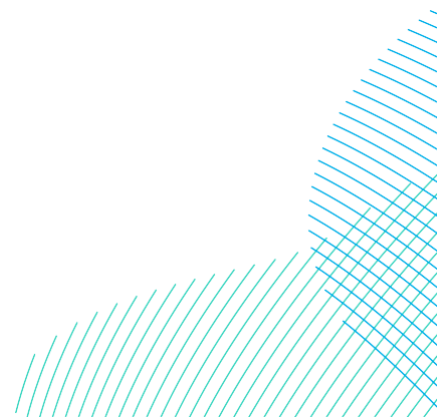


Table 27-21 Summary of Potential Likely Significant Effects on Human Health

Potential Impact	Receptor	Sensitivity	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect
Construction and Decommissioning						
Physical Activity, open space and leisure	General Population	Low	Low	Minor adverse (not significant)	None	Minor adverse (not significant)
	Vulnerable Group Population	High				
Transport modes, access and connections	General Population	Low	Low	Minor adverse (not significant)	None	Minor adverse (not significant)
	Vulnerable Group Population	High				
Air Quality	General Population	Low	Low	Minor adverse (not significant)	None	Minor adverse (not significant)
	Vulnerable Group Population	High				
Water	General Population	Low	Low	Minor adverse (not significant)	None	Minor adverse (not significant)

Potential Impact	Receptor	Sensitivity	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect
	Vulnerable Group Population	High				
Soil Contamination	General Population	Low	N/A	N/A	N/A	N/A
	Vulnerable Group Population	High				
Noise Disturbance	General Population	Low	Low	Minor adverse (not significant)	None.	Minor adverse (not significant)
	Vulnerable Group Population	High				
Workforce Upskilling	General Population	Low	Negligible	Negligible beneficial (not significant)	None.	Negligible beneficial (not significant)
	Vulnerable Group Population	High				
Employment and Investment	General Population	Low	Low	Minor beneficial (not significant)	None.	Minor beneficial (not significant)

Potential Impact	Receptor	Sensitivity	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect
	Vulnerable Group Population	High		and minor adverse (not significant)		and minor adverse (not significant)
Operation						
Noise Disturbance	General Population	Low	Low	Not assessed at this stage.	None at this stage.	Not assessed at this stage.
	Vulnerable Group Population	High				
Public concern and understanding of EMF	General Population	Low	Low	Minor adverse (not significant)	Non-technical information sharing	Negligible (not significant)
	Vulnerable Group Population	High				
Climate Change	General Population	Low	Medium	Minor beneficial (not significant)	None.	Minor beneficial (not significant)
	Vulnerable Group Population	High				

Potential Impact	Receptor	Sensitivity	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect
Workforce Upskilling	General Population	Low	Negligible	Negligible beneficial (not significant)	None.	Negligible beneficial (not significant)
	Vulnerable Group Population	High				
Employment and Investment	General Population	Low	Low	Minor beneficial (not significant)	None.	Minor beneficial (not significant)
	Vulnerable Group Population	High				
Wider Societal Infrastructure	General Population	Low	Medium	Moderate beneficial (significant)	None	Moderate beneficial (significant)
	Vulnerable Group Population	High				

References

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