



One Earth Solar Farm

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Volume 2: Aspect Chapters

Chapter 16: Human Health

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Glossary

Term	Definition
Access to Healthy Assets & Hazards Index	A health determinant comprised of four domains: access to retail services, access to health services, the physical environment and air pollution. Using the percentage of the population living in lower-layer super output areas in the worst quintile as the indicator focusses on the people exposed to the most health demoting environments.
Community Liaison Group	A Community Liaison Group will be set up in accordance with the relevant DCO requirement prior to construction and will continue through until final decommissioning of the Proposed Development as a formal forum for local issues to be raised.
Community Liaison Officer	A Community Liaison Officer will be appointed as a key role with the responsibility to lead discussions with local communities through the Community Liaison Group. The Community Liaison Officer will act as the primary point of contact should there be any queries or complaints relating to the management of environmental impacts.
Standardised Admission Ratio	A statistical measure to compare the hospital admission rate in a specific population to a standard population. In this chapter, England is used as the standard population and has a Standardised Admission Ratio of 100, indicating that the observed number of admissions is exactly what would be expected based on the standard population. A ratio greater than 100 suggests that the observed rate in the study population is higher than expected, while a ratio less than 100 suggests lower rates than expected.
Standardised Mortality Ratio	A statistical measure to compare the mortality rate in a specific population to a standard population. In this chapter, England is used as the standard population and has a Standardised Mortality Ratio of 100, indicating that the observed number of deaths is exactly what would be expected based on the standard population. A ratio greater than 100 suggests that the observed rate in the study population is higher than expected, while a ratio less than 100 suggests lower rates than expected.
Standardised Incidence Ratio	A statistical measure used to determine if the occurrence of cancer in a relatively small population is high or low to compare the incidence rate in a standard population. England has a Standardised Incidence Ratio of 100, indicating that the observed incidence of cancer is exactly what would be expected based on the standard population. A ratio greater than 100 suggests that the observed rate in the study population is higher than expected, while a ratio less than 100 suggests lower rates than expected.
Wider determinants of health	Biological, behavioural, socio-economic, cultural or environmental factors which contribute to the health status of individuals or populations.

List of Abbreviations and Acronyms

Term	Definition
AHAH	Access to Healthy Assets & Hazards
BESS	Battery Energy Storage System
EMFs	Electric and Magnetic Fields
IMD	Indices of Multiple Deprivation
IEMA	Institute of Environmental Management & Assessment
LSOA	Lower-layer Super Output Area
OHID	Office for Health Improvement and Disparities
PEIR	Preliminary Environmental Information Report
PRoW	Public Rights of Way
SMR	Standardised Mortality Ratio
SAR	Standardised Admission Ratio
WHIASU	Wales Health Impact Assessment Support Unit

16. Human Health

- 16.1.1 This Chapter of the Environmental Statement (ES) has been prepared by Icen Projects Ltd and presents an assessment of the likely significant environmental effects of the Proposed Development upon Human Health.
- 16.1.2 A description of the methods used in the assessment is set out in this Chapter. This is followed by a description of the relevant baseline conditions, future baseline conditions and sensitive receptors, together with an assessment of the likely significant effects of the Proposed Development during construction, operation and maintenance, and decommissioning. Consideration of the likely significant environmental effects has been undertaken throughout the design of the Proposed Development. Specific environmental measures relevant to Human Health have been identified and have been considered as part of the assessment. To conclude, a summary of the assessment is presented along with mitigation where applicable. Details of the cumulative effects assessment are presented separately within **ES Volume 2, Chapter 18: Cumulative Effects [EN010159/APP/6.18]**.
- 16.1.3 As was defined by the Scoping Opinion (see **ES Volume 3: Scoping Opinion [EN010159/APP/6.23]**), the following are the likely significant effects considered within this chapter:
- > Physical activity (during all phases)
 - > Community identity, culture, resilience and influence (during all phases)
 - > Employment and income for vulnerable groups (during all phases)
 - > Climate change mitigation and adaption (during all phases)
 - > Electro-magnetic fields (during all phases)
 - > Wider societal infrastructure and resource (during all phases)
 - > Health and social care services (during construction phase)
- 16.1.4 This Chapter is supported by the following figures located within **ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]** and further detailed information contained within the following appendices located within **Volume 3: Technical Appendices Supporting ES Volumes 1 and 2 [EN010159/APP/6.21]**:
- > ES Volume 3 [EN010159/APP/6.20]: Figures
 - Figure 16.1: Study Area.
 - Figure 16.2: Age Profile.
 - Figure 16.3: Self-Assessment General Health.

- Figure 16.4: Population Disability
- > ES Volume 3 [EN010159/APP/6.21]: Appendices
 - Appendix 16.1: Summary of Human Health Legislation, Policy and Technical Guidance

16.2 Relevant Legislation, Policy and Technical Guidance

16.2.1 A summary of the relevant documents for Human Health is provided in **ES Volume 3, Appendix 16.1: Summary of Human Health Legislation, Policy and Technical Guidance [EN010159/APP/6.21]**.

- > Legislation
 - Health and Care Act (2022)¹
- > Policy
 - Overarching National Policy Statement for Energy (EN-1) (2023)²
 - National Policy Statement for Renewable Energy Infrastructure (EN-3) (2023)³
 - National Policy Statement for Electricity Networks Infrastructure (EN-5) (2023)⁴
 - National Planning Policy Framework (2024)⁵
 - Newark and Sherwood District Council, Local Development Framework, Allocations and Development Management, Development Plan Document (2023)⁶
 - Central Lincolnshire Local Plan (2023)⁷

¹ The Stationery Office, 2022. *Health and Care Act 2022, Chapter 31*

² Department for Energy Security and Net Zero, 2023. *Overarching National Policy Statement for Energy (EN-1)*

³ Department for Energy Security and Net Zero, 2023. *National Policy Statement for Renewable Energy Infrastructure (EN-3)*

⁴ Department for Energy Security and Net Zero, 2023. *National Policy Statement for Electricity Networks Infrastructure (EN-5)*

⁵ Ministry of Housing, Communities & Local Government, 2024. *National Planning Policy Framework*

⁶ Newark and Sherwood District Council, 2023. *Local Development Framework: Allocations and Development Management, Development Plan Document*

⁷ Central Lincolnshire Joint Strategic Planning Committee, 2023. *Central Lincolnshire Local Plan*

- Bassetlaw Local Plan 2020 – 2038 (2024)⁸
- > Technical Guidance
 - Planning Practice Guidance (2023)⁹
 - IEMA Guide to Effective Scoping of Human Health in Environmental Impact Assessment (2022)¹⁰
 - IEMA Guide to Determining Significance for Human Health in Environmental Impact Assessment (2022)¹¹
 - IEMA Competent Expert for Health Impact Assessment including Health in Environmental Assessments (2024)¹²
 - Public Health England Spatial Planning for Health (2017)¹³
 - Central Lincolnshire Health Impact Assessment for Planning Applications Guidance Note (2023)¹⁴

16.3 Assessment Methodology and Significance Criteria

The Study Area

- 16.3.1 When considering baseline health conditions and assessing the effects on health (including mental wellbeing and health inequalities), statistical data is usually presented for Lower Layer Super Output Areas ('LSOA') which typically comprise between 400 and 1,200 households, and have a usual resident population of between 1,000 and 3,000 people. The four LSOAs where the Order Limits are located comprising: Bassetlaw 015D, Bassetlaw 015F, Newark and Sherwood 004C, West Lindsey 007C are to form the 'Local Study Area' for the assessment. This area is considered to represent the most appropriate statistical fit.
- 16.3.2 We acknowledge that some of the effects of the Proposed Development will be spread over a broader geographical area. For this reason, the wider local

⁸ Bassetlaw District Council, 2024. *Bassetlaw Local Plan 2020–2038*

⁹ Department for Levelling Up, Housing and Communities, 2024. *Planning Practice Guidance*

¹⁰ Institute of Environmental Management and Assessment, 2022. *Guide to Effective Scoping of Human Health in Environmental Impact Assessment*

¹¹ Institute of Environmental Management and Assessment, 2022. *Guide to Determining Significance for Human Health in Environmental Impact Assessment*

¹² Institute of Environmental Management and Assessment, 2024. *Competent Expert for Health Impact Assessment Including Health in Environmental Assessments*

¹³ Public Health England, 2017. *Spatial Planning for Health: An Evidence Resource for Planning and Designing Healthier Places*

¹⁴ Central Lincolnshire Joint Strategic Planning Committee, 2023. *Health Impact Assessment for Planning Applications: Guidance Note*

authority administrative areas of Bassetlaw, Newark and Sherwood and West Lindsey will be used as a 'Wider Study Area' and aligns with the socio-economics assessment (see **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]**).

- 16.3.3 These study areas are shown in **ES Volume 3, Figure 16.1: Study Area [EN010159/APP/6.20]**. Comparisons with Nottinghamshire, Lincolnshire and England are also used in some instances.

Establishing the Baseline

Existing Baseline

- 16.3.4 Baseline health conditions have been established by referencing demographic and public health data for the study areas from the Office for Health Improvement and Disparities (OHID), Census 2021 and NHS Digital. Reference is also made to the joint health and wellbeing strategies for Nottinghamshire (i.e. Bassetlaw and Newark and Sherwood) and for Lincolnshire (i.e. West Lindsey).

Future Baseline

- 16.3.5 Predicting the future health of a population is complex and dependent upon numerous factors such as advances in medical technology, lifestyle trends, socio-economic factors, and public health policies. Due to a lack of future projections for community health and the high levels of uncertainty for all parts of the country, for the purposes of this assessment, it is assumed the future baseline for the study areas would be unchanged from the current baseline.

Identifying Receptors and Receptor Sensitivity

- 16.3.6 In accordance with IEMA guidance¹¹, the assessment takes a 'population' health approach. For each determinant of health, the likely significant effects are considered on the populations that occur within the study areas¹⁵.
- 16.3.7 Analysis of the baseline conditions also enables vulnerable/priority groups to be identified. Appendix 2 of the Wales Health Impact Assessment Support Unit's¹⁶ (WHIASU) guidance¹⁷ and Annex 2: Table 9.2 of the IEMA guidance¹⁰ provide non-exhaustive lists of suggested vulnerable groups who may be more

¹⁵ EIA analysis at the level of individuals has not been undertaken as Paragraph 5.2 of the IEMA guidance¹¹ states that it "would likely mean that all determinants of health conclusions, positive or negative, would be significant on all projects because of the effects to some particularly sensitive individuals. This would be contrary to supporting decision-makers in identifying the material issues. Assessment of EIA significance at the level of individuals is not proportionate."

¹⁶ Whilst WHIASU was established in Wales to support the development of Health Impact Assessment (HIA) practice, the unit has an international reputation for best practice in Health Impact Assessments, and provides a range of resources which are applicable across the UK.

¹⁷ WHIASU, 2012. *Health Impact Assessment A Practical Guide*

disadvantaged by development, including age related groups, income related groups, groups who suffer discrimination or other social disadvantage and geographical groups. Depending on the determinant of health, these vulnerable groups are deemed more sensitive for the purpose of the assessment.

- 16.3.8 Sensitivity is based on the baseline conditions and the population or sub-population's capacity to adapt to change. The sensitivity criteria utilising guidance outlined by IEMA¹¹ is set out in Table 16.1 below.

Table 16.1 Human Health Sensitivity Criteria

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

Assessment Methodology

- 16.3.9 The best-known definition of health was produced by the World Health Organisation (WHO) as “*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*”¹⁸. Health is the result of a complex interaction of a wide range of different determinants, from an individual's genetic make-up, to lifestyles and behaviours, and the communities, local economy, built and natural environments to global ecosystem trends. IEMA have produced a non-exhaustive list of wider determinants of health associated with the WHO definition¹⁰. These include health related behaviours and the social, economic, bio-physical, institutional and built environments.

¹⁸ World Health Organisation, 1946. *Constitution of the World Health Organisation*

16.3.10 As there are a range of methodologies for assessing health effects, this assessment is cognisant of the criteria set out in the Rapid Health Impact Assessment Tool¹⁹; Health Impact Assessment - A Practical Guide²⁰; the Mental Wellbeing Impact Assessment Toolkit²¹ and Central Lincolnshire's Health Impact Assessment for Planning Applications Guidance Note²². Only the criteria relevant to the wider determinants which are scoped into the assessment from the Scoping Opinion issued by the Planning Inspectorate in December 2023 are considered. The methodology and considerations for these determinants are set out in Table 16-2 below and have been adapted from Annex 2 of the guidance outlined by IEMA¹⁰. These will apply to all phases of the Proposed Development, considering both physical and mental wellbeing.

Table 16.2 EIA Wider Determinants of Health

Determinant	Considerations
Physical activity	How the project affects physical activity levels, including opportunities to promote physical activity through: education; transportation and planning; planning and environment; workplaces; sport, parks and recreation; and in health promotion initiatives and services.
Community identity, culture, resilience and influence	How the project affects the way people feel about their community, including opportunities to contribute to a positive community identity, sense of belonging and sense of control. Consider how it can positively respond to its influence on the physical, economic, cultural and/or social landscape of communities. May include project-related change due to: population migration; visual landscape change; changes to the extent or setting of ecological or cultural assets; lighting changes, overshadowing and reflections; and the attractiveness of the area, public spaces and buildings. Consider how it can support community engagement at all stages of development. Consider influences on local pride and wellbeing; cultural and spiritual ethos and community sense of control over their living environments and workplaces.
Employment and income (for vulnerable groups)	How the project affects socio-economic status and working conditions, including opportunities to provide economic opportunities and resources that protect and promote good health. Reference how it can influence: the type, quality and quantity of employment during each phase; unemployment, including from displacement of existing businesses or services or following completion of a project phase; particular features of employment, such as shift work, job security, working conditions, or occupational hazards; targeted recruitment, procurement and investment within an area that may raise standards of living, including for areas that experience the adverse effects of the project. Consider how the project's employment profiles may affect: family structures, roles or relationships; poverty, social exclusion, social status or income disparities; and/or levels of economic activity/inactivity.

¹⁹ London Healthy Urban Development Unit, 2019. *Rapid Health Impact Assessment Tool*

²⁰ Wales Health Impact Assessment Support Unit, 2012. *Health Impact Assessment A Practical Guide*

²¹ National Mental Well-being Impact Assessment Collaborative (England), 2011. *Mental Well-being Impact Assessment*

²² Central Lincolnshire Local Plan Team, 2023. *Health Impact Assessment for Planning Applications Guidance Note*

Determinant	Considerations
Climate change mitigation and adaption	How the project affects climate altering pollutant emissions and climate adaptation strategies, including opportunities to positively respond to the challenges of climate change and global health inequalities. Reference how it contributes to an increase or decrease in incremental but long-term and escalating climatic change impacts that affect the current and future global populations in terms of: extreme weather, heat stress and flood risk and fire injury risk; exacerbation of chronic cardiovascular and respiratory conditions; exposure to food-, water- and vector-borne infection or toxins; food production and malnutrition; population displacement, labour productivity and economic loss. Consider effects to more sensitive populations, potentially geographically distant, including in low- and middle-income countries. Discuss sustainable design and management measures that support elimination or reduction in climate altering pollutant emissions, including through renewable energy sources, agricultural practices, transports choice, materials selection, construction techniques and procurement.
Electro-magnetic fields (EMFs)	How the project affects actual and perceived exposure to electromagnetic and ionising radiation risks, including opportunities to adopt exposure guidelines and design measures that avoid or minimise actual risks. Consider the mental health effects of widespread concerns about exposure from major electrical infrastructure. Note where there is the potential for high and/or prolonged exposure in close proximity to places where people spend extended periods of time.
Wider societal infrastructure and resource	The wider societal effects of the project for public health. Reference as relevant how the project contributes to: energy infrastructure; or other infrastructures on which society depends for good population health. Also consider its wider contribution to: economic development or GDP; climate change mitigation or adaption (including improved air quality and preparedness for extreme weather events such as heatwaves, storms and flooding); and protection or enhancement of the natural environment (e.g. biodiversity, access to natural spaces and habitats).
Health and social care services (for construction phase)	How the project affects provision or use of GP services during the construction phase. Due to the lack of residential population as part of the Proposed Development and users predominantly being employees, consideration will be given to how it affects the accessibility, capacity and quality of GP facilities.

16.3.11 Both physical and mental health effects are considered across the construction, operational and maintenance, and decommissioning phases of the Proposed Development.

16.3.12 As was accepted by PINS in their Scoping Opinion, the following cross-references to other ES chapters in **ES Volume 2: Aspect Chapters** are made (albeit are scoped out of further assessment in this health chapter):

- > **Chapter 7: Hydrology and Hydrogeology [EN010159/APP/6.7]** in terms of water resources;
- > **Chapter 8: Land and Soils [EN010159/APP/6.8]** in terms of land quality;
- > **Chapter 11: Landscape and Visual [EN010159/APP/6.11]** in terms of severance and quality of the built and natural environment;

- > **Chapter 12: Transport and Access [EN010159/APP/6.12]** in terms of workforce connections to jobs;
- > **Chapter 13: Air Quality [EN010159/APP/6.13];**
- > **Chapter 15: Noise and Vibration [EN010159/APP/6.15];** and
- > **Chapter 17: Socio-Economics [EN010159/APP/6.17]** in terms of education and training opportunities and local business activity.

Significance Criteria

16.3.13 As per IEMA's guidance¹¹, the significance of an effect is a matter of expert professional judgement informed by reference to an evidence base and to practitioner guidance. Analysis draws on qualitative and quantitative inputs and evidence, including from other topic chapters. The assessment of significance can be highly contextual and requires the assimilation and consideration of a range of information, such as:

- > scientific or academic literature;
- > baseline conditions for the population;
- > health priorities in the jurisdiction;
- > consultation for the project;
- > regulatory standards in the jurisdiction; and
- > health policy context in the jurisdiction.

Magnitude of Impact

16.3.14 Magnitude is based on several factors as set out in Table 16-3 below utilising guidance outlined by IEMA¹¹.

Table 16.3 Human Health Magnitude Criteria

Magnitude Level	Criteria
High	<i>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</i>
Medium	<i>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</i>
Low	<i>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</i>

Magnitude Level	Criteria
Very Low	<i>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.</i>

Defining the Effect

- 16.3.15 Significance of health effects reflects the relationship between the sensitivity of the relevant population health, and the magnitude of the impact. A tiered approach to defining the significance of effects is set out in Table 16.4 below, which utilises guidance outlined by IEMA¹¹ and will be applied as a guide alongside professional judgement.

Table 16.4 Human Health Significance Matrix

Magnitude	Sensitivity				
		High	Medium	Low	Very Low
	High	Major (Significant)	Major – Moderate (Significant)	Moderate - Minor (Significant)	Minor - Negligible
	Medium	Major – Moderate (Significant)	Moderate (Significant)	Minor	Minor - Negligible
	Low	Moderate - Minor (Significant)	Minor	Minor	Negligible
	Very Low	Minor - Negligible	Minor - Negligible	Negligible	Negligible

- 16.3.16 Effects classified as major or moderate are considered ‘significant’ to the receptor. Effects classified as minor or negligible are considered ‘not significant’ to the receptor. Where the effect is greater than negligible, the effect will then be identified as being either ‘beneficial’ or ‘adverse’ and defined as follows:

- > **Beneficial** - A positive and/or advantageous effect; or
- > **Adverse** - A negative and/or disadvantageous/detrimental effect.

- 16.3.17 As noted in Table 16.3, the reversibility or permanence of effects will factor into magnitude. To aid consistency across chapters, the duration can be determined as follows:

- > **Short term** - less than 3 years;
- > **Medium term** - 3-15 years; or
- > **Long term** - more than 15 years.

- 16.3.18 Where an impact is identified, enhancement and/or mitigation measures are recommended to either enhance/secure a positive impact, or mitigate against a negative impact. Mitigation measures can include planning or non-planning measures and actions. Monitoring of effects will be proposed where appropriate.

Consultation

- 16.3.19 As set out in **Volume 1, Chapter 2: EIA Methodology [EN010159/APP/6.2]**, a number of consultation activities have been undertaken. **ES Volume 3, Appendix 2.2: ES Response to PINs Scoping Opinion [EN010159/APP/6.21]** summarises the EIA Scoping Opinion for the Proposed Development and where elements have been agreed to be scoped out of the EIA.
- 16.3.20 Any consultation elements which have been raised and addressed post-scoping, are detailed within the **Consultation Report [EN010159/APP/5.1]**.
- 16.3.21 No further specific technical consultations have been undertaken, which have informed the technical assessment as presented in this Chapter.

Assumptions, Exclusions and Limitations

- 16.3.22 Construction activity is anticipated to commence in 2027 and will continue for a period of 2 years (24 months). The Proposed Development would be operational by 2030. At this stage phasing of works is unknown until a construction contractor has been appointed. The assessment assumes the maximum effect scenario of construction works happening across the whole Order Limits simultaneously for the full construction period, although this is unlikely. The effects as reported in this Chapter are therefore considered to be conservative.
- 16.3.23 For the purposes of assessment, the operational scenario has been considered at year 1 (2030) and, for relevant receptors where the effects of the Proposed Development may change subject to landscaping (as detailed in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**, again at year 15 where vegetation planting can be reasonably considered to be mature and may mitigate effects identified at year 1.
- 16.3.24 Both assumptions and limitations are highlighted where relevant throughout this assessment, with references to the sources being used. Government and Local Authority data has been used to inform this assessment. While the latest available data and statistics have been used, it should be noted that many data sources are frequently updated and could be subject to change albeit the data used in combination with professional judgement is considered to be a robust approach. It should be noted that the boundaries of the study areas may be adjusted for certain receptors depending on the availability of data, to align with other technical assessments or where alternative boundaries would be more appropriate and this is clarified where relevant.

16.4 Baseline Conditions

Current Baseline Conditions

Demographic and Socio-Economic Profile

- 16.4.1 Based on the Census 2021, the total population of the Local Study Area is 5,911 people and the Wider Study Area is 340,390 people. The Local Study Area (LSOAs Bassetlaw 015D, Bassetlaw 015F, Newark and Sherwood 004C, West Lindsey 007C) has a lower proportion of people aged below 45 and higher proportions aged 45+ compared to the Wider Study Area (Bassetlaw, Newark and Sherwood and West Lindsey) and England.
- 16.4.2 The English Indices of Multiple Deprivation (IMD) provides a ranking of LSOAs to compare levels of deprivation across the country. Seven domains - income, employment, education, health, crime, barriers to housing and living environment - are measured to produce an overall relative measure of deprivation.
- 16.4.3 Table 16.6 provides a breakdown of each domain of deprivation score. A score of one equates to being within the 10% most deprived areas in the country, whereas a score of ten is within the 10% least deprived. Compared with the rest of the country, the Local and Wider Study Areas display average levels of deprivation. However, in terms of the health domain, Bassetlaw is considered to be within the 30% most deprived authorities in England. This indicator measures morbidity, disability and premature mortality, as well as poor physical and mental health.

Table 16.5 Indices of Multiple Deprivation²³

Domain of Deprivation	Local Study Area				Wider Study Area		
	Bassetlaw 015D	Bassetlaw 015F	Newark & Sherwood 004C	West Lindsey 007C	Bassetlaw	Newark & Sherwood	West Lindsey
Income	8	7	8	7	4	6	5
Employment	6	7	7	6	3	4	4
Education, Skills and Training	7	7	7	5	3	4	6
Health	6	4	7	6	3	5	5
Crime	8	8	8	8	5	7	9

²³ Ministry of Housing, Communities and Local Government, 2019. *English Indices of Deprivation*

Domain of Deprivation	Local Study Area				Wider Study Area		
	Bassetlaw 015D	Bassetlaw 015F	Newark & Sherwood 004C	West Lindsey 007C	Bassetlaw	Newark & Sherwood	West Lindsey
Barriers to Housing and Services	3	1	1	1	6	6	5
Living Environment	3	3	1	2	8	7	5
Overall IMD	6	5	5	5	4	5	5

Health Profile

- 16.4.4 Census 2021 data provide estimates of the general health of usual residents (self-assessed). As shown in **ES Volume 3, Figure 16.3: Self-Assessment General Health [EN010159/APP/6.20]**, 81% of residents consider themselves to have 'very good' or 'good' health in the Local Study Area, compared to 79% in the Wider Study Area and 82% in England. 6% of residents in both the Local and Wider Study Areas consider themselves to have 'very bad' or 'bad' health, compared to 5% in England.
- 16.4.5 As shown in **ES Volume 3, Figure 16.4: Population Disability [EN010159/APP/6.20]**, according to the Census 2021, 19% of residents in the Local Study Area have their day-to-day activities limited by long-term physical or mental health conditions or illnesses, and are therefore considered disabled. This compares to 20% in the Wider Study Area and 17% in England.
- 16.4.6 Public health data provided by the Office for Health Improvement and Disparities ('OHID'), compares the health of the residents in a certain area with trends across England for a range of indicators. Data is not available for each village in the Local Study Area due to the small population size, and the corresponding need to maintain confidentiality. As such, the electoral wards of Tuxford & Trent, Torksey and Collingham have been considered.

Table 16.6 Public Health Indicators²⁴

Health Indicator	Local Study Area			Wider Study Area			England
	Tuxford & Trent	Collingham	Torksey	Bassetlaw	Newark & Sherwood	West Lindsey	
Male life expectancy (years)	80.8	79.4	81.1	78.8	79.7	79.7	79.5
Female life expectancy (years)	82.6	83.0	88.3	82.1	82.8	83.5	83.2
All deaths from circulatory diseases (Standardised Mortality Ratio 'SMR')	115.9	81.8	73.1	103.1	98.4	109.2	100.0
All deaths from respiratory diseases (SMR)	68.6	68.7	83.3	101.0	97.3	83.5	100.0
Emergency hospital admissions for intentional self-harm (Standardised Admission Ratio 'SAR')	58.8	50	N/A	98.0	104.7	71.3	100.0
Incidence of all cancers (Standardised Incidence Ratio)	110.9	99.6	97.8	99.5	91.9	95.4	100.0
Reception: Prevalence of obesity (%)	9.1	7.1	N/A	11.0	10.1	10.9	9.9
Year 6: Prevalence of obesity (%)	22.6	22.1	N/A	24.2	20.5	18.8	21.6
People aged 65+ living alone (%)	27.1	24.7	19.8	29.6	29.7	27.3	31.5
Physically active adults (%)	-	-	-	66	64.7	71.5	67.1
Physically inactive adults (%)	-	-	-	22.4	27.8	20.6	22.6

²⁴ OHID, 2024. *Public Health Data for Small Geographic Areas*

- 16.4.7 Where health data is available, the Local Study Area is either generally better or not significantly worse than England. However, the rate of deaths caused by circulatory disease is significantly worse in the Tuxford & Trent Ward (SMR of 116 compared to 100 nationally). Circulatory diseases are typically caused by a combination of genetic, behavioural, and environmental factors including, physical inactivity. The prevalence of obesity in Year 6 pupils is also slightly higher than the national rate.
- 16.4.8 OHID also publishes data on wider determinants of health, which encompass a broad range of factors beyond individual behaviours and genetics that influence health outcomes and well-being. As can be seen in the table below, violent crime and access to healthy assets & hazards (AHAH) is lower in the Wider Study Area compared to national rates. Conversely fuel poverty is slightly higher.

Table 16.7 Public Health Indicators²⁵

Wider Determinant	Wider Study Area			England
	Bassetlaw	Newark & Sherwood	West Lindsey	
Average Weekly Earnings (£)	414.7	449.0	500.0	496.0
Pupil Absence (%)	8.7	7.5	7.6	7.6
Violent Crime (offences per 1,000 population)	29.2	24.0	25.3	34.4
Fuel Poverty (%)	14.2	13.5	14.4	13.1
People in Employment (%)	78	77.9	82.3	75.6
AHAH Index (%)	12.3	6.6	N/A	22.6

- 16.4.9 Mental wellbeing is difficult to capture and is poorly measured at a local level. However, OHID's Public Mental Health Dashboard²⁶ provides data on mental health and wellbeing at higher levels.

²⁵ OHID, 2024. *Wider Determinants of Health*

²⁶ OHID, 2022. *Public Mental Health Dashboard*

Table 16.8 Public Mental Health and Wellbeing Indicators²⁷

Measurement	Wider Study Area			Nottinghamshire	Lincolnshire	England
	Bassetlaw	Newark & Sherwood	West Lindsey			
Anxiety (2022/23) ^{28 29}	3.0	2.4	2.9	2.9	2.7	3.2
Happiness (2022/23) ^{30 31}	7.4	7.6	7.5	7.3	7.5	7.4
Prevalence of common mental disorders (16+) (2017)	17.7%	16.1%	15.5%	16.2%	15.8%	16.9%
Estimated incident rate of new psychosis cases	-	16.9 per 100,000	15.3 per 100,000	17.8 per 100,000	17.4 per 100,000	-

16.4.10 As illustrated in the table above, anxiety and happiness levels are generally similar or better compared to England. Where data is available most measurements are similar to the national average. The prevalence of common mental disorders is higher in Bassetlaw than compared to England, whilst Newark & Sherwood and West Lindsey have lower rates than England.

16.4.11 The most recent Opinions and Lifestyle Survey³² covering people's worries about climate change was undertaken in 2022. 75% of adults in England aged 16+ years said they were (very or somewhat) worried about climate change. This reduced to 69% in the East Midlands. Climate change was identified as the second greatest concern facing British adults, after rising costs of living. Rising UK temperatures were the most frequently reported expected impact among 75%

²⁷ OHID, 2024. *Wider Determinants of Health* – note that a dash indicates no data presented

²⁸ ONS, 2023. *Local indicators – Anxiety*

²⁹ This indicator shows the average rating of those that felt anxious yesterday (where 0 is 'not at all anxious' and 10 is 'completely anxious'), for adults aged 16 years and over, in the UK, for periods 04/2011-03/2012 to 04/2022-03/2023.

³⁰ ONS, 2023. *Local Indicators – Happiness*. Available at: <https://explore-local-statistics.beta.ons.gov.uk/indicators/wellbeing-happiness>

³¹ This indicator shows the average rating of those that felt happy yesterday (where 0 is 'not at all happy' and 10 is 'completely happy'), for adults aged 16 years and over, in the UK, for periods 04/2011-03/2012 to 04/2022-03/2023.

³² Office for National Statistics, 2022. [Worries about climate change, Great Britain: September to October 2022](#)

of adults. 62% of adults think they will be affected by water supply shortages, and 53% think they will have reduced access to safe and affordable food.

16.4.12 OHID also publishes data on the prevalence of dementia and associated metrics for each county in England, as set out in the table below.

Table 16.9 Dementia Profile³³

Measurement	Nottinghamshire	Lincolnshire	England
Recorded Prevalence (aged 65+ years)	4.35%	3.95%	3.97%
Crude Recorded Prevalence (aged under 65 years) per 10,000 (Value)	4.35	4.78	3.05
Direct standardised rate of emergency admissions (aged 65+ years) (Value)	4,643	2,996	3,517
Direct standardised rate of mortality for people with dementia (aged 65+ years) (Value)	1,061	843	849

16.4.13 The administrative areas of Bassetlaw, and Newark and Sherwood are covered by the Nottinghamshire Joint Health and Wellbeing Strategy 2022-2026³⁴. Following detailed research and community consultation across Nottinghamshire, it sets out the factors which are having the greatest impact on people's health and wellbeing, and which account for some of the biggest variations or inequalities. The key challenges and areas of focus are identified as (i) child health, (ii) mental health, (iii) good food, (iv) homelessness, (v) tobacco, (vi) reducing alcohol, (vii) domestic abuse, (viii) healthy weight and (ix) air quality.

16.4.14 West Lindsey is covered by the 2024 Lincolnshire Joint Health and Wellbeing Strategy³⁵. The priorities which are highlighted as being the most important health and wellbeing issues facing the county are (i) carers, (ii) healthy weight, (iii) homes for independence, (iv) mental health and dementia, and (v) physical activity.

³³ OHID, 2024. *Public Health Profiles – Dementia Profile*

³⁴ Nottinghamshire Health and Wellbeing Board, 2022. *Nottinghamshire Joint Health and Wellbeing Strategy 2022-2026*

³⁵ Lincolnshire Health and Wellbeing Board, 2024. *Lincolnshire Joint Health and Wellbeing Strategy*

Social Infrastructure

- 16.4.15 Access to social infrastructure including education, health provision, community facilities, play space, open-space, and sports and recreational facilities can have a significant impact on the health and well-being of the population. Strong, vibrant, sustainable and cohesive communities require good quality, accessible social and community infrastructure.
- 16.4.16 Primary schools, sports pitches, churches and community halls are located within the villages in the Local Study Area. The nearest hospitals with Accident & Emergency departments are Lincoln County Hospital, located 11 miles (18km) east and Bassetlaw Hospital located 15 miles (24km) northwest. The nearest pharmacy is in Tuxford, located 3 miles (4.5km) west. As outlined in the table below, the two nearest GP facilities to the Order Limits are located just beyond the Local Study Area. Both are currently accepting new patients, and Hounsfield Surgery is currently operating significantly below the nationally recognised benchmark ratio of one GP per 1,800 patients³⁶.

Table 16.10 General Practice Facilities³⁷

GP Facility	Distance from Order Limits	Number of GPs (FTE)	Number of Patients	GP to Patient Ratio	Accepting New Patients?
Tuxford Medical Centre	3.8km west	3.2	6,021	1:1,882	Yes
Hounsfield Surgery	4km south	2.8	4,420	1:1,579	Yes

- 16.4.17 As set out in full in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**, several PRowWs, which provide a recreational and amenity resource, pass through or close to the Order Limits. The Sustrans Cycle National Cycle Route (NCR) 647 runs east-west through the south of the Order Limits along the disused railway line associated with the former Lancashire, Derbyshire and East Coast Railway.

Sensitive Receptors

- 16.4.18 Analysis of the existing baseline conditions above enables vulnerable groups to be identified. These vulnerable groups are likely to be more sensitive to changes to health determinants than the general populations of the Local and Wider Study Areas, and are identified as follows:

³⁶ Recommended benchmark as set by the Royal College of General Practitioners.

³⁷ NHS England, 2024. *General Practice Workforce*, 31 August 2024

- > Older People – The Local Study Area has a higher proportion of older people compared to the Wider Study Area and England as a whole, and this is particularly pronounced in the 65-79 age cohorts. The Parish Council of Dunham with Ragnall, Fledborough and Darlton identified dementia as a key issue to be considered in the assessment. Whilst age is a significant risk factor for dementia, it should be noted that genetics and lifestyle can also play a role in its development.
- > Unemployed People – The Wider Study Area is more deprived in terms of employment.
- > People with poor mental or physical health – There are higher proportions of people with long-term physical and mental health conditions living in the Local Study Area compared to England. The Parish Council of Dunham with Ragnall, Fledborough and Darlton identified mental health as a key issue to be considered. There are significantly higher rates of circulatory disease in the Tuxford and Trent Ward. Additionally, obesity is a significant risk factor for circulatory disease, and the prevalence of obesity in year 6 pupils is higher in the Local Study Area compared to national rates.

16.4.19 Depending on the determinant, these vulnerable groups are considered and deemed more sensitive for the purpose of the assessment, given they are likely to have less capacity to adapt to change.

Future Baseline Conditions

16.4.20 Predicting the future health of a population is complex and dependent upon numerous factors such as advances in medical technology, lifestyle trends, socio-economic factors, and public health policies. Without the implementation of the Proposed Development, a key trend likely to continue in the surrounding area is a growing demographic shift towards an aging population, along with an increased prevalence of age-related conditions such as dementia, osteoporosis, and cardiovascular diseases. However, it should be noted that developments such as the Proposed Development are not linked to these wider demographic trends and the assessment assumes that the future baseline for the study areas would be unchanged from the current baseline.

16.5 Environmental Measures

- 16.5.1 The following specific environmental measures relevant to Human Health have been identified and have been considered as part of the assessment. To ensure clarity as to how these Environmental Measures are secured, a **Commitments Register [EN010159/APP/7.15]** has been included within the submission (see **Volume 7: Other Documents**).
- 16.5.2 The Applicant has sought to maximise community engagement at all stages of the project, enabling local communities to positively influence the design evolution of the Proposed Development which affects all phases of the Proposed

Development. Community engagement for the Proposed Development has been ongoing since non-statutory consultation commenced in Autumn 2023.

- 16.5.3 As outlined by IEMA¹⁰, early and meaningful engagement activities can be considered primary mitigation as it improves community understanding of the project and practitioner understanding of the community. Engagement can also actively alleviate particular impacts upon mental health, by providing a sense of control, inclusion and participation. In terms of statutory consultation, five in-person events, two webinars, 20 home visits and three Parish Council meetings were undertaken in Spring 2024.
- 16.5.4 The design has evolved to reflect feedback received concerning assets and environmental matters which are considered to be important locally (see **ES Volume 1, Chapter 4: Alternatives and Design Evolution [EN010159/APP/6.4]**). In addition to numerous offsets from individual properties in response to feedback received as detailed in full in the **Consultation Report [EN010159/APP/5.1]** and its supporting Applicant Response Tables, the design of the Proposed Development now incorporates the following embedded design measures:
- > A break in the arrays at the northeastern boundary, allowing The Woodland Trust access to Road Wood and to retain ecological connectivity.
 - > Removal of arrays to maintain visual connectivity between the Fledborough Viaduct and Fledborough Village.
 - > Setbacks to the south of Ragnall Village and offsets of up to 50 metres from Main Street.
 - > Land between North Clifton and South Clifton removed from the Proposed Development to maintain perceived connectivity between the villages.
 - > Bespoke buffers and setbacks to individual properties based on the home visits and consultation responses.
 - > Solar arrays offset by at least 15 metres and up to 180 metres from PRowS.
- 16.5.5 These measures affect all phases of the Proposed Development. As a consequence, the participatory approach has resulted in various embedded mitigation and enhancement areas being proposed and contributing towards mitigation of adverse mental health effects. These are set out in the **Design Approach Document [EN010159/APP/5.8]** (DAD) and the **Outline Design Parameters [EN010159/APP/5.9]** and will be secured via DCO requirement.

Construction

- 16.5.6 The Proposed Development incorporates embedded environmental measures including the adoption of an **Outline Construction Environment Management**

Plan [EN010159/APP/7.4] (oCEMP) and an **Outline Construction Traffic Management Plan [EN010159/APP/7.9]** (oCTMP) to minimise sources of environmental pollution and potential for disruption during the construction works, as well as an **Outline Skills, Supply Chain and Employment Plan [EN010159/APP/7.8]** (oSSCEP) to maximise local employment and skills benefits. These documents include good design and best practice measures to ensure that adverse impacts to air quality, noise and traffic are avoided, reduced or mitigated, which is important for human health. Poor air quality, excessive noise, and traffic congestion can contribute to respiratory issues, stress, cardiovascular problems and other health conditions. By addressing these factors, these measures help maintain healthy environments, improving overall well-being and reducing the risk of chronic diseases.

Operational and Maintenance

- 16.5.7 The Proposed Development has been designed as much as possible to account for human health through the positioning of the BESS, substations and other infrastructure, including setbacks from residential properties, PRoWs (including Bridle Paths) and facilities as well as the provision of new landscaping and green infrastructure.
- 16.5.8 Specific design and management measures to mitigate human health risks are covered in the following chapter in **ES Volume 2, Chapter 7: Hydrology and Hydrogeology [EN010159/APP/6.7]**, **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**, **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]**, **ES Volume 2, Chapter 13: Air Quality [EN010159/APP/6.13]**, **ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]**, **ES Volume 2, Chapter 15: Noise and Vibration [EN010159/APP/6.15]** and **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]**.
- 16.5.9 Included as embedded environmental measures are the number of ecological enhancements and green infrastructure to aid well-being as well as promoting biodiversity. This includes new hedgerows with tree planting and the wildflower meadows and species-rich grassland in the field margins and offsets from PRoWs.
- 16.5.10 There will be new permissive paths to enhance the existing PRoW network, as shown on the workplans **Works Plan [EN010159/APP/2.3]**. These permissive paths will be wide and multi-usage, as they are intended to be for a broad range of activities including horse-riding, dog walking and recreation. To the east of the River Trent, the permissive paths will connect Newton on Trent (which is currently isolated from the PRoW network) to the Sustrans route and onto the Trent Valley Way. To the west of the River Trent, a new circular route to/from Ragnall and Fledborough will be introduced.

- 16.5.11 The Applicant is also committed to the One Earth Community Fund to support local projects led by registered community groups, local charities, social enterprises and parish councils.

Decommissioning

- 16.5.12 The Proposed Development incorporates the adoption of an **Outline Decommissioning Environment Management Plan [EN010159/APP/7.6]** (oDEMP) to minimise sources of environmental pollution and potential for disruption during the decommissioning works (see introductory chapters for details relating to these management plans, and the **Commitments Register [EN010159/APP/7.15]** for specific environmental measures to be included during decommissioning. These documents include good design and best practice measures to ensure that adverse impacts to air quality, noise and traffic are avoided, reduced or mitigated, which is important for human health. Poor air quality, excessive noise, and traffic congestion can contribute to respiratory issues, stress, cardiovascular problems and other health conditions. By addressing these factors, these measures help maintain healthy environments, improving overall well-being and reducing the risk of chronic diseases.

16.6 Assessment of Likely Significant Effects

- 16.6.1 The Proposed Development has the potential to impact human health during the construction, operation and decommissioning phases, due to impacts on the following wider determinants of health:
- > Physical activity (during all phases)
 - > Community identity, culture, resilience and influence (during all phases)
 - > Employment and income for vulnerable groups (during all phases)
 - > Climate change mitigation and adaption (during all phases)
 - > Electro-magnetic fields (during all phases)
 - > Wider societal infrastructure and resource (during all phases)
 - > Health and social care services (during construction phase)
- 16.6.2 Other relevant environmental assessment matters are cross-referenced where relevant, from other ES Chapters but are not subject to specific assessment within this Chapter.

Construction

Physical activity

- 16.6.3 A key matter to consider in terms of physical activity is the ability to access and use the PRoW network to exercise and make journeys using active travel modes, which are beneficial to both mental and physical health. Potential disruption to

walking, horse riding, dog walking and cycling routes was identified as a key concern raised by members of the local communities during the consultation process. Encouraging physical activity is a key health priority in Lincolnshire, whilst supporting healthy weight is identified as a priority in both Nottinghamshire and Lincolnshire health and wellbeing strategies.

- 16.6.4 The proportion of physically active adults in the Wider Study Area is similar to national rates (with the exception of West Lindsey, which is noticeably higher than England)³⁸. As such, the sensitivity of the general population with respect to physical activity is medium.
- 16.6.5 Notwithstanding, the sensitivity of some vulnerable groups is likely to be increased compared to the general population. People with poor mental health have been identified as a vulnerable group following stakeholder consultation, and there is a higher prevalence of common mental disorders in Bassetlaw when compared to England. Physical activity has a well-documented positive impact on mental health as it can help maintain healthy routines, enhance cognitive function, lower cortisol levels and boost mood³⁹. As such, this determinant of health is particularly beneficial for individuals with poor mental health. People with circulatory disease are also identified as being of higher sensitivity, with noticeably higher rates in the Tuxford and Trent Ward. Physical activity is linked to enhanced heart function, reduced blood pressure and cholesterol regulation.
- 16.6.6 Reflecting the rural nature of the Local Study Area, the Proposed Development may affect users of the PRowS in the Local Study Area during the Construction Phase. Whilst all PRowS will remain open during this phase, the construction works may discourage their use due to journey diversion or disruption, or due to adverse changes to amenity as set out in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**. However, the **Outline Construction Traffic Management Plan [EN010159/APP/7.9]** sets out how construction traffic is managed and the **Outline Public Rights of Way Management Plan [EN010159/APP/7.14]** sets out how the PRowS will be managed; these management plans ensure that residents of the Local Study Area can continue to partake in physical activity using the PRow network. Moreover, and as a result, **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]** finds no significant impacts to PRow users following mitigation. All other formal sports and recreation facilities in the study areas will be unaffected. As such, the magnitude of effect is assessed as very low due to the short-term duration, temporary nature and low frequency of potential disruptions.
- 16.6.7 Overall, the likely effect on the physical activity determinant of human health during the construction phase is assessed to be a **temporary, short-term effect**

³⁸ Data for the Local Study Area is not available.

³⁹ NHS, undated. *Be active for your mental health*. Available at: <https://www.nhs.uk/every-mind-matters/mental-wellbeing-tips/be-active-for-your-mental-health>

in the Local Study Area of minor – negligible adverse significance (not significant).

- 16.6.8 A Detailed Construction Traffic Management Plan will be agreed with host authorities prior to the commencement of works as a requirement of the Development Consent Order and be complied with during this phase. This secures the precise measures for minimising disruption construction traffic effects to the existing PRoW network in terms of access and use.

Community identity, culture, resilience and influence

- 16.6.9 The Proposed Development has potential to affect the way people feel about their community, through changes to the physical, economic, cultural or social landscape of the communities in the Local Study Area.
- 16.6.10 The sensitivity of the general population with respect to community identity, culture, resilience and influence is considered to be medium in the Local Study Area. This is based on the moderate levels of overall deprivation and most general public health indicators being better or broadly similar to national rates.
- 16.6.11 Older people are considered to be a vulnerable group who may be of a higher sensitivity to change. There is a higher proportion of residents aged 65+ (particularly in the 65-79 age cohort) living within the Local Study Area compared to the Wider Study Area and England. Whilst the proportion of older people aged 65+ living alone in the Local Study Area is noticeably lower than England, a sense of community and inclusion is particularly important in addressing diminishing social networks, loneliness and isolation as people age. These factors are associated with increased risks of poor mental health and cognitive decline, including dementia.

Physical Health

- 16.6.12 In terms of the physical health effects associated with this determinant, construction activities would have limited direct impact, as there would be no changes to the provision of community facilities and activities. As outlined under the 'Physical Activity' determinant, there could be some perceived severance between settlements resulting from temporary disruption or diversion to the PRoWs linking the villages in the Local Study Area. This could affect how residents access existing social infrastructure and/or community facilities. The **Outline Public Rights of Way Management Plan [EN010159/APP/7.14]** sets out how the ProWs will be managed, consequently **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]** assesses the potential for severance and finds no significant impacts following mitigation.
- 16.6.13 As detailed in the **Outline Construction Environmental Management Plan [EN010159/APP7.4]**, a Community Liaison Group is secured as a formal forum for local issues to be raised. A Community Liaison Officer will be appointed to lead discussions with local communities, and act as the primary point of contact

should there be any queries or complaints. Such measures can foster meaningful dialogue and improved outcomes for communities.

Mental Health

- 16.6.14 In terms of mental health effects from this determinant, the consequences for some residents living within the Local Study Area are twofold. Firstly, there may be worry and anxiety associated with a loss of sense of control over their living environment (often exacerbated by the consultation exercises and the public engagement process itself). Secondly, how the introduction of the Proposed Development in the area would change how the physical landscape of communities is experienced.
- 16.6.15 The approach undertaken by the Applicant has been to maximise community engagement at all stages of the development, enabling local communities to positively influence the design evolution of the Proposed Development. The design has changed significantly in response to feedback received concerning assets and environmental matters which are considered to be important locally. As a consequence, a participatory approach can increase the sense of control within a community and result in various embedded mitigation measures and enhancement areas being secured. Adverse mental health effects will be mitigated by several factors including numerous offsets from individual properties and community assets. These are outlined in section 16.5 above and detailed in full in the **Consultation Report [EN010159/APP/5.1]**.
- 16.6.16 The Applicant has sought to reduce adverse mental health effects by maintaining open communication, as demonstrated through the embedded environmental measures in response to feedback and preservation of key assets valued as important to the community. Moreover, existing vegetation along the Order Limits boundaries will be retained and managed where practicable to ensure that it is strengthened and to aid the screening of low-level views. The **Outline Landscape and Ecology Management Plan [EN010159/APP/7.7]** sets out proposed measures to mitigate the impacts and effects on landscape (and biodiversity) features, and to enhance the landscape and biodiversity value of the Order Limits. As assessed in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**, significant adverse visual effects are expected during this phase. However, these will be limited to the residential receptors and recreational receptors in close proximity to the Order Limits, being a minority of the Local Study Area.
- 16.6.17 Additionally, the Applicant has established a new Community Fund to support local projects led by registered community groups, local charities, social enterprises and parish councils within the Local Study Area and the Wider Study Area. Whilst the Community Fund is already being administered by Nottinghamshire Community Foundation, the beneficial effects will continue during the construction phase and will support community resilience.

- 16.6.18 Taking into account the anticipated physical and mental health effects for this determinant, the magnitude of effect is assessed as low due to the short-term duration, temporary nature and accounting for the embedded design measures.
- 16.6.19 Overall, the likely effect on the community identity, culture, resilience and influence determinant of human health during the construction phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor adverse significance (not significant)**.
- 16.6.20 A Detailed Landscape Environment Management Plan and Detailed Construction Environment Management Plan will be agreed with host authorities prior to the commencement of works and be complied with throughout this phase. The Detailed Landscape Environment Management Plan secures the precise measures for maximising biodiversity gains and minimising landscape effects. The Detailed Construction Environment Management Plan secures the precise measures to minimise adverse effects for local communities during construction and provide the contact details of the Community Liaison Group.

Employment and income (for vulnerable groups)

- 16.6.21 Access to appropriate employment opportunities is generally associated with better health outcomes. It can be beneficial for physical health through good working conditions and raising living standards, as well as mental wellbeing through enhanced socio-economic status and social inclusion by providing income security, sense of purpose and social interaction.
- 16.6.22 The baseline data shows that the Local Study Area experiences lower levels of deprivation in terms of employment and income, albeit the Wider Study Area is marginally more deprived regarding these two domains compared to national levels. The average weekly earnings in Bassetlaw and Newark & Sherwood are noticeably lower compared to England, whilst in West Lindsey they are marginally higher. Overall the sensitivity is considered to be medium as there is capacity to benefit from additional and/or higher-paid employment opportunities. The positive health impacts associated with the employment and income determinant would most benefit unemployed or under-employed members of the population (as well as their dependents), by providing opportunities to upskill or move into higher paid roles.
- 16.6.23 As outlined in **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]**, the total number of temporary construction employees are estimated to peak at over 750, with the average number of construction employees being 554. These jobs would include a range of trades and require different skill levels, and it is likely that many of these roles would include an element of physical activity which can support active lifestyles. The job opportunities available on the Order Limits would constitute an increase of 190% in 2022 construction employment in the Local Study Area or 8% of construction employment in the Wider Study Area. There would also be indirect and induced jobs supported across the supply chain. The **Outline Skills, Supply Chain and**

Employment Plan [EN010159/APP/7.8] (oSSCEP) sets out the measures to maximise opportunities for residents and businesses.

- 16.6.24 Whilst the increase in job opportunities during the Proposed Development's construction phase is of a significant scale, the duration would be short-term and it is likely that jobs would be filled by employees drawn from the broader labour catchment area. The magnitude is therefore considered to be low.
- 16.6.25 Overall, the likely effect on the employment and income determinant of human health during the construction phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor beneficial significance (not significant)**.
- 16.6.26 A Detailed Employment Skills and Supply Chain Management Plan will be agreed with host authorities as a requirement of the Development Consent Order prior to the commencement of works for this phase, and will be complied with. This secures the precise measures to employ, upskill and utilise local residents and businesses throughout this phase.

Climate change mitigation and adaption

- 16.6.27 Greenhouse gas emissions do not affect specific locations, but lead to effects by contributing to climate change. For the purpose of this assessment, the population health of the study areas is considered, albeit the assessment is cognisant that the nature of greenhouse gas emissions means the Proposed Development would have global effects.
- 16.6.28 Climate change threatens the health, safety, and security of people worldwide. It is associated with an increased frequency of extreme weather events which poses a threat to food production, labour productivity and economic gains. As such, inaction in responding to the challenges of climate change can impact physical health through changes to quality of life, living conditions and global health inequalities. The threat to living conditions and local economies can also impact mental health with anxiety about the future in the face of global environmental challenges. This chronic worry can lead to feelings of hopelessness, despair and depression. As outlined in the baseline section, climate change was identified as the second greatest concern facing British adults, after rising costs of living.
- 16.6.29 The sensitivity of the local population with respect to climate change effects is considered to be medium. This takes into account the population's concerns about climate change.
- 16.6.30 There are higher proportions of older people and disabled people living within the Local Study Area compared to England, who may be more sensitive to the physical health effects of climate change. These groups may be more vulnerable to extreme weather events such as flooding, storms and heatwaves which can

exacerbate pre-existing cardiovascular and respiratory conditions. People with lower incomes are also considered to be more sensitive as they often have fewer resources to adapt to climate-related disruptions. **ES Volume 2, Chapter 7: Hydrology and Hydrogeology [EN010159/APP/6.7]** considers flood risk and ensures there will be no increase off-site.

- 16.6.31 As outlined in **ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]**, the majority of greenhouse gas emissions associated with the Proposed Development are linked to the embodied carbon in the construction phase. These result from the mining, refining and processing of metals and minerals used in the manufacture of solar panels, frames, cables, batteries and other components. There would also be emissions associated with transport and installation works during this phase.
- 16.6.32 It is noted that there will be more than 580,000 tonnes of CO₂ emissions associated with the construction phase, which would be of a long-term duration (due to the nature of emissions) and have adverse effects for the climate change determinant of health. However, there is expected to be a large net saving over the lifetime of the Proposed Development when considering its carbon efficiency and the long-term cumulative nature of emissions. The construction phase of the Proposed Development would also lead to a large net positive impact on the UK's ability to meet its 2050 emissions targets and decarbonise the grid network. As such, the perception that the construction phase is a positive action towards addressing the challenges of climate change, could have positive mental health effects for some members of the community. Overall the magnitude is considered to be very low.
- 16.6.33 Overall, the likely effect on the climate change determinant of human health during the construction phase is assessed to be a **permanent, long-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Electro-magnetic fields

- 16.6.34 The Proposed Development will not be generating electricity or exporting electricity to the grid during this phase. As such, there would be no noticeable electro-magnetic field effect and therefore magnitude of change would be very low.
- 16.6.35 In terms of sensitivity, the local population is considered to be medium. This takes into consideration the relatively average levels of overall deprivation and overall health experienced across the Local Study Area and Wider Study Area compared to England.
- 16.6.36 Consequently, the likely effect on the electro-magnetic fields determinant of human health during the construction phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Wider societal infrastructure and resource

- 16.6.37 The construction of the solar farm and BESS will help progress towards a more reliable and resilient grid network to provide the energy infrastructure on which society depends for good population physical and mental health.
- 16.6.38 The magnitude of change would be very low during this phase as it is not yet operational. The sensitivity of the local population is considered to be medium. This takes into consideration the relatively average levels of overall deprivation and overall health experienced across the Local Study Area and Wider Study Area compared to England.
- 16.6.39 Overall, the likely effect on human health during the construction phase is assessed to be a **short-term effect in the Local Study Area of minor - negligible beneficial significance (not significant)**.

Healthcare services

- 16.6.40 As previously mentioned, to enable construction a significant number of workers will be required on the Order Limits. This may place extra demand on healthcare services if employees move to the area or should urgent treatment be required.
- 16.6.41 As outlined in the baseline analysis, there are two GP practices located just beyond the boundary of the Local Study Area, both of which are accepting new patient registrations. As such, the sensitivity of this receptor is considered to be medium, as there is some surplus capacity to accommodate additional patients. Some vulnerable groups within the local population who could be more likely to require increased access to healthcare services include older people and people with poor mental or physical health.
- 16.6.42 Hounsfield Surgery is operating significantly below the recommended capacity levels as set by the Royal College of General Practitioners. The practice could register an additional 620 patients before it reaches the recommended benchmark ratio of 1,800 patients per full-time GP. Whilst it is expected the vast majority of employees would remain registered with their existing GP facility (or may already live locally), should a minority register with Hounsfield Surgery the magnitude of change would remain very low.
- 16.6.43 Overall, the likely effect on the healthcare determinant of human health during the construction phase is assessed to be a **short-term, temporary effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Other Environmental Matters

- 16.6.44 Whilst not considered for further assessment in this section, cross-references to effects assessed in other ES chapters in Volume 2 which could have implications for human health are provided as follows:

- > **ES Volume 2, Chapter 7: Hydrology and Hydrogeology**
[EN010159/APP/6.7] considers the effects in terms of water resources. No significant effects are identified during this phase, subject to the adoption of the **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**;
- > **ES Volume 2, Chapter 8: Land and Soils [EN010159/APP/6.8]**
considers the effects in terms of land, groundwater and soils and agricultural land. No significant effects are identified during this phase, subject to the adoption of the **Outline Soil Management Plan [EN010159/APP/7.10]** and **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**;
- > **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**
considers the effects on a range of receptors. During the construction phase, significant landscape effects which adversely affect the quality of the natural environment are identified as a result of alteration to the landform, vegetation cover and land use activity. Significant adverse visual effects are identified for people walking along PRowS within and around the Order Limits due to potential for views of the construction activities. The setting of villages in proximity to the Order Limits, including their relationship to one another, has been a key consideration throughout the iterative design process. In response, the Proposed Development has embedded substantial offsets from all villages, as secured in the **Works Plan [EN010159/APP/2.3]**. The Proposed Development also includes areas of openness (c.50m) flanking road corridors and existing PRowS (a minimum of 15 metres and extending up to 180 metres) to minimise perceptual changes experienced when travelling between villages and retain a sense of continuity;
- > **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]**
considers construction traffic during this phase and does not identify any significant effects in terms of access or use of the highway network and PRowS subject to adoption of the **Outline Construction Traffic Management Plan [EN010159/APP/7.9]**;
- > **ES Volume 2, Chapter 13: Air Quality [EN010159/APP/6.13]** considers the generation of dust and human health effects from traffic during this phase. No significant effects are identified subject to adoption of the **Outline Construction Environmental Management Plan [EN010159/APP/7.4]** and best-practice dust control measures;
- > **ES Volume 2, Chapter 15: Noise and Vibration [EN010159/APP/6.15]**
considers the effects from construction activities and traffic. No significant effects are identified subject to adoption of the **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**; and

- > **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]** sets out the educational opportunities through apprenticeships and training during this phase and confirms that the Applicant is committed to working with local educational institutions to identify how the Proposed Development can support and provide suitable skilled training opportunities. It also assesses the impact on business activity such as tourism. One significant effect is identified in terms of employment (beneficial) during this phase;

Operational and Maintenance

Physical activity

- 16.6.45 During the operational and maintenance phase, there will be no temporary or permanent diversions to the existing PRoW network. The importance of walking, horse riding, dog walking and cycling routes was highlighted by members of the local communities during the consultation process. Approximately 6km of new permissive routes will therefore be created connecting Fledborough FP8 to Fledborough FP10, as well as North Clifton BW11 to Newton on Trent, with a branch connection to North Clifton FP3. This represents a significant increase of approximately 25% in the length of available active travel routes within the redline boundary. These new permissive routes will provide additional opportunities for exercise as they are designed to be wide and accessible for a broad range of activities including dog walking, horse riding and recreation. They will enhance connectivity with the wider existing PRoW network, particularly with regards to Newton on Trent. They will also provide additional direct and safe active travel routes within the Local Study Area, including for journeys such as Ragnall to/from Fledborough through a new circular route, and Newton on Trent to North Clifton or National Cycle Route no.647 (Sustrans route) and onto the Trent Valley Way. There will be offsets from the solar panels to the new permission paths and existing PRoWs. These offsets will be at least 15 metres and up to 180 metres in some cases, and comprise species-rich grassland, wildflower meadows, hedges and tree planting to maintain openness and scale.
- 16.6.46 It is worth noting these beneficial effects can be expected to be reduced in the short-medium term as some individuals may not choose to use these routes until the soft landscaping has established and visual screening of the Proposed Development is provided. In this instance, it is likely alternative routes or physical activities may be undertaken instead as sports and recreation facilities in the study areas will not be affected. Taking into account these factors and considering there is likely to be only minor changes in physical activity, the magnitude of effect is assessed as very low.
- 16.6.47 As previously outlined, the sensitivity of the general population with respect to physical activity is medium, and would be high for certain vulnerable groups such as people with poor mental health and circulatory disease.
- 16.6.48 Overall, the likely effect on the physical activity determinant of human health during the operational and maintenance phase is assessed to be a **long-term**

effect in the Local Study Area of minor – negligible beneficial significance (not significant).

Community identity, culture, resilience and influence

- 16.6.49 Once operational, the Proposed Development has potential to affect the way people feel about their community, through changes to the physical, economic, cultural or social landscape of the communities in the Local Study Area.
- 16.6.50 As outlined above, the sensitivity of the general population with respect to community identity, culture, resilience and influence is considered to be medium in the Local Study Area, whilst people with poor mental or physical health and older people are considered to be vulnerable groups with higher sensitivity.

Physical Health

- 16.6.51 In terms of the physical health effects associated with this determinant, there is likely to be limited direct impact as there would be no changes to the provision of community facilities and activities. There will be new permissive paths available for use to travel between settlements to access social infrastructure or community facilities. Due to the low trip rates associated with the operation and maintenance of the Proposed Development, there would be no significant traffic impact to the road connections between settlements.

Mental Health

- 16.6.52 In terms of mental health effects from this determinant, the consequences for some residents living within the Local Study Area primarily relate to the stress and anxiety associated with changes to the physical landscape. Open communication can mitigate adverse mental wellbeing effects over the longer term. As previously outlined, the design of the Proposed Development has evolved in response to stakeholder feedback to embed sufficient mitigation into the proposals. This includes various setbacks to preserve key views and assets considered important by local communities, as well as offsets from individual properties.
- 16.6.53 Adverse mental health effects are likely to be most pronounced at the beginning of the phase and gradually reduce over time as the population becomes more accustomed to the changes, in parallel with the establishment of the biodiversity enhancement measures and planting to screen low-level views (as set out in the **Outline Landscape and Ecology Management Plan [EN010159/7.7]**). As assessed in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**, significant adverse visual effects are expected for the first 15 years of operation. However, these will be limited to the residential receptors and recreational receptors in close proximity to the Order Limits, a minority of the Local Study Area. There would be no significant visual effects on residential receptors by Year 15 of operation given the establishment of mitigation planting. Recreational receptors walking across the Order Limits would experience

residual significant adverse effects for a short duration as they move through the Order Limits.

- 16.6.54 The Applicant will facilitate continued open dialogue with local communities throughout the entirety of the operation and maintenance phase. A Community Liaison Officer will be appointed to lead discussions with local communities, and act as the primary point of contact should there be any queries or complaints. This can foster meaningful dialogue and improved outcomes for communities.
- 16.6.55 Additionally, the beneficial effects of the aforementioned Community Fund will continue throughout this phase to support community resilience within the Local Study Area and the Wider Study Area over the long-term.
- 16.6.56 Taking into account the anticipated physical and mental health effects for this determinant, the magnitude of effect is assessed as low accounting for the embedded design measures and the reduction of effects over time.
- 16.6.57 Overall, the likely effect on the community identity, culture, resilience and influence determinant of human health during the operation and maintenance phase is assessed to be a **long-term effect in the Local Study Area of minor adverse significance (not significant)**.
- 16.6.58 A Detailed Landscape Environment Management Plan will be agreed with host authorities as a requirement of the Development Consent Order and complied with during this phase. It secures the precise measures for maximising biodiversity gains and minimising landscape effects.

Employment and income (for vulnerable groups)

- 16.6.59 As outlined in **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]**, the direct employment expected to arise from the management, maintenance and oversight of the Proposed Development once operational is estimated 15 full-time equivalent (FTE) jobs (excluding non-local roles including administration, HR and Health and Safety). There would also be additional indirect jobs that may be created along supply chains. After accounting for displacement, the overall net uplift in employment is estimated to be up to 17 full-time equivalent jobs. Despite the long-term nature of these jobs, it is considered to be of very low magnitude due to the small number of jobs that will be created, although the few opportunities that do exist have most potential to positively affect the health of unemployed or under-employed members of the population (as well as their dependents), through improvements in quality of life, social inclusion and sense of purpose. The **Outline Skills, Supply Chain and Employment Plan [EN010159/APP/7.8]** sets out the measures to maximise opportunities for residents and businesses.
- 16.6.60 As outlined above, the sensitivity is considered to be medium. Combined with a very low magnitude, the overall likely effect on the employment and income

determinant of human health during this phase is assessed to be a **long-term effect in the Local Study Area of minor – negligible beneficial significance (not significant)**.

- 16.6.61 A Detailed Employment Skills and Supply Chain Management Plan will be agreed as a requirement of the Development Consent Order with host authorities by the contractor prior to the commencement of this phase and complied with. This secures the precise measures to employ, upskill and utilise local residents and businesses throughout this phase.

Climate change mitigation and adaption

- 16.6.62 As outlined in **ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]**, during this phase there would be some CO₂ emissions from operational transport and embodied carbon associated with replacement and maintenance of the solar infrastructure. However, there is expected to be a large net saving over the lifetime of the Proposed Development.
- 16.6.63 The Proposed Development could supply up to 740MW of clean renewable energy to the National Grid. In accordance with IEMA guidance, **ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]** identifies this as a significant beneficial effect. This would represent a large net positive impact on the UK's ability to meet its 2050 emissions targets and decarbonise the grid network.
- 16.6.64 In doing so, the Proposed Development contributes towards avoiding the adverse physical health effects associated with climate change through an increase in the frequency of extreme weather events, decrease in standards of living and increase in global health inequalities. The Proposed Development also contributes towards avoiding the adverse mental health effects associated with climate change by directly addressing the challenge.
- 16.6.65 Overall, this is considered to be of medium magnitude. As previously outlined, the sensitivity of the local population with respect to this determinant is also considered to be medium, albeit older people, disabled people and people with lower incomes would be considered more sensitive.
- 16.6.66 Consequently, the likely effect on the climate change determinant of human health during the operation and maintenance phase is assessed to be a **long-term effect in the Local Study Area of moderate beneficial significance (significant)**.

Electro-magnetic fields

- 16.6.67 No overhead electricity cables will be used or constructed as part of the Scheme. Except for relatively short lengths of Onsite Electrical Cabling connecting the solar panels and the inverters (which is typically above ground level and fixed to

the mounting structure, or to other parts of nearby components), all cables will be buried underground. The dimensions of the trenches will vary depending on the number of cables or ducts they contain as are further described in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**. Underground cables eliminate the electric field altogether as it is screened out by the sheath around the cable.

- 16.6.68 Onsite Electrical Cabling is required to connect the solar panels to inverters and the inverters to the transformers. These low voltage cables are all <1.5 kilovolts (kV). They are anticipated to have a typical maximum installation depth of up to 0.8 metres.
- 16.6.69 The medium voltage 33kV Interconnecting Cables are then required to transfer electricity between the transformers/switchgear at Field Inverters and one of the two 33/400kV Grid Connection Substations. The typical installation depth is expected to be 1.2 metres (although potentially deeper at crossings). This is further described in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**. The routes of the Interconnecting Cables have been designed to avoid sensitive receptors as far as possible. The majority of Interconnecting Cables lie within the Solar PV Site and Grid Connection Corridor. The electricity is then exported from the two 33kV / 400kV Grid Connection Substations to National Grid High Marnham by 400kV Grid Connection Cables. The typical installation depth is expected to be up to 2.0 metres and utility surveys will inform positioning. This is further described in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**.

Physical Health

- 16.6.70 The Government sets guidelines for exposure to EMFs in the UK on advice from UK Health Security Agency (previously Public Health England), and has adopted the 1998 guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)⁴⁰ and is referenced in the National Policy Statement for Electricity Networks Infrastructure (EN-5)⁴¹. The ICNIRP 'reference levels' for the public are 100 microteslas for magnetic fields and 5000 volts per metre for electric fields. These are the levels above which more investigation is needed if this level of exposure is likely to occur; the permitted levels of exposure are somewhat higher, 360 microteslas and 9000 volts per metre. They apply where the time of exposure is significant, for instance in a residence^{42 43}. As a worst-case the lower 'reference level' of 100 microteslas (μT) is used in the assessment as the threshold at which likely significant effects could occur.

⁴⁰ ICNIRP, 1998. *Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (Up To 300 GHz)*

⁴¹ Department for Energy Security & Net Zero, 2023. *National Policy Statement for Electricity Networks Infrastructure (EN-5)*

⁴² National Grid, 2015. *Undergrounding high voltage electricity transmission lines*

⁴³ Energy Networks Association, 2017. *Electric and Magnetic Fields*

- 16.6.71 The DECC guidance document⁴⁴ states that underground cables at voltages up to and including 132kV are considered not capable of exceeding the ICNIRP exposure guidelines for electro-magnetic fields⁴⁰ and that compliance with exposure guidelines for such equipment can be assumed unless evidence is brought to the contrary in specific cases. The Onsite Electrical Cabling (less than 1 kV) and the intermediary voltage level Electrical Cabling (33kV) are therefore not considered further. The planned grid connection for the Proposed Development is at a new proposed 400 kV National Grid substation. As this is higher than 132kV it is necessary to perform an evaluation as to whether the exposure limitations stated in ICNIRP 1998 are likely to be exceeded.
- 16.6.72 The National Grid guidance document⁴² states that for a 400kV cable buried at 0.9 m depth, the typical magnetic field is 24 microteslas (μT) when on the centre line of cable, 3 microteslas (μT) at 5 m from the cable centreline, and 0.9 microteslas (μT) at 10 m the cable centreline, with the maximum known by National Grid being 96 microteslas (μT) on top of the cable, 13 microteslas (μT) at 5 m, and 3.6 microteslas (μT) at 10 m. The maximum recorded levels of electro-magnetic field directly above an underground 400kV cable are therefore less than 30% of the permitted levels and 96% of the reference levels set by ICNIRP⁴⁰.
- 16.6.73 For context, the Energy Networks Association publication 'Electric and Magnetic Fields'⁴³ states that in the vast majority of homes in the UK, the magnetic field, averaged over 24 hours, is between 0.01 and 0.2 microteslas (μT), but goes on to note that exposure to electro-magnetic fields from a vacuum cleaner is 800 microteslas (μT), reducing to two microteslas (μT) at one metre away, and for a TV, washing machine or microwave exposure is 50 microteslas (μT) next to these appliances and 0.2 microteslas (μT) at one metre distance.
- 16.6.74 Using National Grid's maximum known levels of electro-magnetic field generation for 400kV cables, the assessment considers that as a worse case a residential receptor would need to be within 5 m of the centreline of a 400kV Grid Connection Cable, and for the cable to be overlapped by other electricity infrastructure, for the 100 microteslas (μT) threshold to be approached and for likely significant effects to occur.
- 16.6.75 In line with PINS Technical Advice page for scoping solar development, **ES Volume 3, Appendix 2.4: Electro-Magnetic Fields Impact Report [EN010159/APP/6.21]** has been produced which details the type and locations of proposed cables within the Proposed Development (including those over 132kV). This includes the location, routing and voltages of cables, along with a risk assessment to any human and ecological sensitive receptors. The assessment

⁴⁴ Department of Energy & Climate Change, 2012. *Power Lines: Demonstrating Compliance with EMF public exposure guidelines*

shows there are no likely significant effects from EMF associated with the Proposed Development.

- 16.6.76 There are no residential properties within the Order Limits. The nearest properties are at least 5 m from the Order Limits and it is unlikely that cables will be installed that close to any property due to the need for construction vehicles to manoeuvre both sides of the trench within the working width. Cables would be installed at a minimum of 10 m from the façade of any residential dwelling, as confirmed in the **Outline Design Parameters [EN010159/APP/5.9]**. Therefore, no significant effects to residential receptors are predicted to occur.
- 16.6.77 Some PRowS do cross over the proposed Interconnecting and Grid Connection Cable Corridors, and may also pass over the Interconnecting and Grid Connection Cables where they are routed within the Solar PV Site. The presence of the public either directly above or adjacent to underground cables associated with the Scheme would be transient, with the individuals using the PRow exposed to electro-magnetic fields from the cables for only very short periods of time. It is considered that the level of exposure to users of PRow would be similar to that associated with general household appliances (and noticeably less than associated with the exposure when using a vacuum cleaner). Therefore, no significant effects to users of PRow are predicted to occur.
- 16.6.78 It is assumed the equipment used will be compliant with the exposure guidelines as stated in the Code of Practice, published jointly by the Energy Networks Association and the then Department for Energy and Climate Change⁴⁵. As such, there would be no effect on physical health.

Mental Health

- 16.6.79 Notwithstanding the above on physical health, there is a possibility of adverse mental health effects resulting from concerns that EMFs could be bad for health. For example, despite no recorded instance in the UK of harm resulting from power lines causing interference with active implanted medical devices⁴⁶, health risks from EMFs have been raised as a concern by members of the community through the statutory and non-statutory stakeholder consultation exercises. In this regard, there could be adverse effects if the safety risks are not fully understood. Older people (who are more likely to have pacemakers implanted) may be considered more vulnerable as there are higher proportions of older people in the Local Impact Area.
- 16.6.80 Taking into account the possible physical and mental health effects from EMFs, the magnitude is considered to be low. In terms of sensitivity, the local population

⁴⁵ Department of Energy & Climate Change, 2012. *Power Lines: Demonstrating compliance with EMF public exposure guidelines*

⁴⁶ Energy Networks Association, 2017. *Electric and Magnetic Fields: The Facts*

is considered to be medium. This takes into consideration the relatively average levels of overall health experienced across the Local Study Area and Wider Study Area compared to England.

- 16.6.81 Consequently, the likely effect on the electro-magnetic fields determinant of human health during this phase is assessed to be a **long-term effect in the Local Study Area of minor adverse significance (not significant)**.

Wider societal infrastructure and resource

- 16.6.82 During the operation and maintenance phase, the Proposed Development could supply up to 740MW (AC) to the National Grid. The solar farm and BESS will contribute towards a more reliable and resilient grid network to provide the energy infrastructure on which society depends for good population physical and mental health.
- 16.6.83 A reliable supply of clean energy is required in relation to numerous societal factors such as food production and safety, thermal comfort, healthcare, education, income generation and socialising. The Proposed Development would produce locally-generated electricity, enhancing the country's energy security. As such, the Proposed Development could provide significant contributions in terms of economic development, climate change mitigation; and protection or enhancement of the natural environment (e.g. biodiversity, access to natural spaces and habitats). These matters are all important for sustaining a high standard of living.
- 16.6.84 The Proposed Development could generate enough clean renewable energy to meet the equivalent needs of more than 200,000 homes. As such, the magnitude of change would be high.
- 16.6.85 The sensitivity of the local population with respect to wider societal infrastructure and resource is considered to be medium. This takes into consideration the relatively average levels of overall deprivation and overall health experienced across the Local Study Area and Wider Study Area compared to England.
- 16.6.86 Some sub-population groups are more susceptible to changes in energy infrastructure and therefore would be more sensitive. This includes people who may have health requirements causing them to be higher energy consumers (either to power medical equipment or environmental control such as air purifiers or heating).
- 16.6.87 Lower income groups are disproportionately affected by the energy price volatility associated with fossil fuels and global market dynamics. The Proposed Development will be unsubsidised which can contribute towards generating electricity at cheaper rates and help to reduce energy costs for consumers. The Department for Energy Security and Net Zero confirms large-scale solar as one

of the cheapest sources of power⁴⁷ and solar on farmland could save households between around £100 and £180 per year (compared to gas and dependent on future power prices)⁴⁸. Lower consumer electricity bills are particularly important given the higher rates of fuel poverty in the Wider Impact Area compared to England. It can also provide more disposable income for consumers to spend in the broader economy, which also gives rise to induced employment impacts.

- 16.6.88 With a high magnitude and medium sensitivity for the population, the likely effect on human health during this phase is assessed to be a **long-term effect in the Local Study Area of major - moderate beneficial significance (significant)**.

Other Environmental Matters

- 16.6.89 Whilst not considered for further assessment in this section, cross-references to effects assessed in other ES chapters in **ES Volume 2: Aspect Chapters** which could have implications for human health are provided as follows:
- > **ES Volume 2, Chapter 7: Hydrology and Hydrogeology**
[EN010159/APP/6.7] considers the effects in terms of water resources. No significant effects are identified to users of the Order Limits or areas off-site, subject to following the principles of the **ES Volume 3, Appendix 7.2: Flood Risk Assessment (FRA) and Outline Drainage Strategy [EN010159/APP/6.21]**;
 - > **ES Volume 2, Chapter 8: Land and Soils [EN010159/APP/6.8]**
considers the effects in terms of land, groundwater and soils and agricultural land. No significant effects are identified during this phase, subject to the adoption of the **Outline Soil Management Plan [EN010159/APP/7.10]** and best-practice measures to control pollution;

⁴⁷ The Department for Energy Security and Net Zero, 2023. [Electricity generation costs 2023](#)

⁴⁸ Energy & Climate Intelligence Unit, 2023. [Blocking new solar farms could cost bill payers around £5bn a year](#)

- > **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]** considers the effects on a range of receptors. During Year One of this phase, significant landscape effects which adversely affect the quality of the natural environment are identified as a result of alteration to the landform from arable land use. Significant adverse visual effects are identified for people walking along PRowS within and around the Order Limits due to potential for views of the solar PV panels and substations. This may result in perceived severance between the villages. By Year 15, the quantity of significant adverse effects will be reduced once screening has established. The setting of villages in proximity to the Order Limits, including their relationship to one another, has been a key consideration throughout the iterative design process. In response, the Proposed Development has embedded substantial offsets from all villages, as secured in the **Works Plan [EN010159/APP/2.3]**. The Proposed Development also includes areas of openness (c.50m) flanking road corridors and existing PRowS (a minimum of 15 metres often extending to over 100 metres) to minimise perceptual changes experienced when travelling between villages and retain a sense of continuity;
- > **ES Volume 2, Chapter 15: Noise and Vibration [EN010159/APP/6.15]** considers the operational noise effects of the Proposed Development. Due to the design principles and embedded mitigation, no significant effects are identified;
- > **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]** sets out the educational opportunities through apprenticeships and training during this phase to increase the likelihood that the jobs can be filled by local people during its lifetime and/or for future Proposed Developments in the area. One significant effect is identified in terms of new permissive paths (beneficial) during this phase.

Decommissioning

Physical activity

- 16.6.90 In terms of physical activity, potential disruption to walking, horse riding, dog walking and cycling routes was identified as a key concern raised by members of the local communities during the consultation process.
- 16.6.91 All PRowS will remain open during the decommissioning phase, albeit the works may discourage their use due to pedestrian delay or fear and intimidation from traffic and physical conditions, or due to adverse changes to amenity as set out in **ES Volume 2, Chapter 11: Landscape and Visual [EN010159/APP/6.11]**. However, **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]** sets out how decommissioning traffic will be managed to ensure that residents of the Local Study Area can continue to partake in physical activity using the PRow network. Moreover, **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]** finds no residual significant impacts to PRow users following mitigation. All other formal sports and recreation facilities in the study areas will not be affected. As such, the magnitude

of effect is assessed as very low due to the short-term duration, temporary nature and low frequency of potential inconveniences.

- 16.6.92 Overall, the likely effect on the physical activity determinant of human health during the decommissioning phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor – negligible adverse significance (not significant)**.
- 16.6.93 A Detailed Decommissioning Traffic Management Plan will be agreed with host authorities prior to the commencement of works and complied with throughout this phase. This secures the precise measures for minimising decommissioning traffic effects to the existing PRow network in terms of their access and use.

Community identity, culture, resilience and influence

Physical Health

- 16.6.94 During the decommissioning phase, a key factor impacting physical health would relate to perceived severance between settlements resulting from temporary pedestrian delays or fear and intimidation from traffic and physical conditions along the PRowS linking the villages in the Local Study Area. This could affect how residents access existing social infrastructure or community facilities (albeit there would be no changes to the provision of existing community facilities and activities). **ES Volume 2, Chapter 12: Transport and Access [EN010159/APP/6.12]** assesses the potential for severance and finds no residual significant impacts following mitigation. As detailed in the Outline Decommissioning Environment Management Plan, a Community Liaison Group will be established and a Community Liaison Officer will be appointed to lead discussions with local communities, acting as the primary point of contact should there be any queries or complaints.

Mental Health

- 16.6.95 In terms of mental health effects associated with this determinant during the decommissioning phase would predominantly relate to changes in the physical landscape of communities. However, by the time this phase commences, all visual screening would have been fully established meaning there would be only two residential receptors (residents of Ragnall and Skegby) with significant visual effects at decommissioning. This is on the assumption that decommissioning works and activity would still be perceived above the mature mitigation planting. The decommissioning works will only relate to the areas of built infrastructure, which have been designed to embed visual mitigation measures following an extensive community consultation programme.
- 16.6.96 Taking into account the anticipated physical and mental health effects for this determinant, the magnitude of effect is assessed as very low due to the short-term duration, temporary and reversible nature, and accounting for the embedded design measures.

- 16.6.97 As above, the sensitivity of the general population with respect to community identity, culture, resilience and influence is considered to be medium in the Local Study Area, albeit older people are considered to be a vulnerable group who may be of a higher sensitivity.
- 16.6.98 Overall, the likely effect on the community identity, culture, resilience and influence determinant of human health during the construction phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Employment and income (for vulnerable groups)

- 16.6.99 As outlined in **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]**, the decommissioning phase would support direct employment for a short-term duration, albeit the operation and maintenance jobs would be lost or displaced to another site. Quantitative estimates of employment are not available but are assumed to be lower than the construction phase, and higher than the operation and maintenance phase. As per the previous phases, these job opportunities would most positively affect the health of unemployed or under-employed members of the population.
- 16.6.100 On this basis and assuming a worst-case scenario, the magnitude of effect on human health is considered to be very low. Combined with a medium sensitivity, the overall likely effect on the employment and income determinant of human health during this phase is assessed to be a **temporary, short-term effect in the Local Study Area of minor – negligible beneficial significance (not significant)**.
- 16.6.101 A Detailed Employment Skills and Supply Chain Management Plan will be agreed with host authorities by the contractor prior to the commencement of works and complied with. This secures the precise measures to employ, upskill and utilise local residents and businesses throughout this phase.

Climate change mitigation and adaption

- 16.6.102 Effects on the climate change determinant of health during this phase can be expected to be similar or no worse than during the construction phase, albeit it is assumed in **ES Volume 2, Chapter 14, Carbon and Climate Change [EN010159/APP/6.14]** that all of the solar PV Modules and batteries will be recycled during the decommissioning phase. Considering the long-term duration of the previous phase, it is assumed that by the time the decommissioning works commence, the associated cessation of renewable energy generation from the Proposed Development will be compensated for by alternative generation elsewhere in the country. The likely effect during the decommissioning phase is assessed as a **long-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Electro-magnetic fields

16.6.103 It is anticipated that the cable route may remain in situ as part of decommissioning, albeit it would cease to be operational and therefore its potential to generate or export electricity to the grid would cease. As such, effects on the electro-magnetic fields determinant of health during this phase can be expected to be similar or no worse than during the construction phase. As such, the likely effect is assessed to be a **temporary, short-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Wider societal infrastructure and resource

16.6.104 Effects on the wider societal infrastructure and resource determinant of health during this phase can be expected to be similar or no worse than during the construction phase. As such, the likely effect during the decommissioning phase is assessed as a **short-term effect in the Local Study Area of minor - negligible adverse significance (not significant)**.

Other Environmental Matters

16.6.105 Whilst not considered for further assessment in this section, cross-references to effects assessed in other ES chapters in **ES Volume 2: Aspect Chapters**, which could have implications for human health are provided as follows:

- > **ES Volume 2, Chapter 7: Hydrology and Hydrogeology**
[EN010159/APP/6.7] considers the effects in terms of water resources. No significant effects are identified during this phase, subject to the adoption of the **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**;
- > **ES Volume 2, Chapter 8: Land and Soils [EN010159/APP/6.8]**
considers the effects in terms of land, groundwater and soils and agricultural land. No significant effects are identified during this phase, subject to the adoption of the **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]** and best-practice measures to control pollution;
- > **ES Volume 2, Chapter 11: Landscape and Visual**
[EN010159/APP/6.11] considers the effects on a range of receptors. During this phase, significant landscape effects which adversely affect the quality of the natural environment are identified as a result of alteration to the landform, vegetation cover and land use activity. Significant adverse visual effects are identified for people walking along PRowWs within and around the Order Limits due to potential for views of the decommissioning activities. However, as the Proposed Development includes areas of openness (c.50m) flanking road corridors and existing PRowWs (a minimum of 15 metres often extending to over 100 metres), perceptual changes experienced when travelling between villages will be minimised and retain a sense of continuity;

- > **ES Volume 2, Chapter 12: Transport and Access**
[EN010159/APP/6.12] considers decommissioning traffic during this phase and does not identify any significant effects in terms of access or use of the highway network and PRoWs subject to adoption of the **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**.
- > **ES Volume 2, Chapter 13: Air Quality [EN010159/APP/6.13]** considers the generation of dust and human health effects from traffic during this phase. No significant effects are identified subject to adoption of the **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]** and best-practice dust control measures;
- > **ES Volume 2, Chapter 15: Noise and Vibration [EN010159/APP/6.15];** considers the effects from decommissioning activities and traffic. No significant effects are identified subject to adoption of the **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**;
- > **ES Volume 2, Chapter 17: Socio-Economics [EN010159/APP/6.17]** sets out the educational opportunities through apprenticeships and training during this phase to increase the likelihood that the jobs can be filled by local people for any future Proposed Developments in the area. One significant effect is identified in terms of employment (beneficial) during this phase.

16.7 Summary

- 16.7.1 **Table 16.11** sets out a summary of the likely significant environmental effects considered.



Table 16.11 Summary of Significant Environmental Effects

Receptor	Embedded Measures	Description of the Effect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Construction Phase							
Physical Activity	oCTMP	Impacts on levels of physical activity including active travel modes	Short-Term	Local	Minor – Negligible Adverse	Not Significant	Approval of Detailed Construction Traffic Management Plan prior to commencement of authorised development.
Community identity, culture, resilience and influence	Outline Landscape Environment Management Plan and oCEMP	Impacts on changes to the landscape, views and amenity, as well as accessibility between settlements and to community facilities	Short-Term	Local	Minor Adverse	Not Significant	Approval of Detailed Landscape Environment Management Plan and Detailed Construction Environment Management Plan prior to commencement of authorised development.
Employment and income (for vulnerable groups)	oSSCEP	Job opportunities and changes to socio-economic status	Short-Term	Local	Minor Beneficial	Not Significant	Approval of Detailed Employment Skills and Supply Chain Management Plan prior to commencement of authorised development.



Receptor	Embedded Measures	Description of the Effect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Climate change mitigation and adaption	-	Impacts of responding to the challenges of climate change	Long-Term	Local	Minor – Negligible Adverse	Not Significant	-
Electro-magnetic fields	-	Impact of electro-magnetic fields	Short-Term	Local	Minor – Negligible Adverse	Not Significant	-
Wider societal infrastructure and resource	-	Contribution towards energy infrastructure and impact on standard of living	Short-Term	Local	Minor – Negligible Beneficial	Not Significant	-
Health and social care services	-	Ability of local GP facilities to accommodate additional patients	Short-Term	Local	Minor – Negligible Adverse	Not Significant	-
Operational and Maintenance Phase							
Physical Activity	None	Impacts on levels of physical activity including active travel modes	Long-Term	Local	Minor – Negligible Beneficial	Not Significant	None



Receptor	Embedded Measures	Description of the Effect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Community identity, culture, resilience and influence	Outline Landscape Environment Management Plan	Impacts on changes to the landscape, views and amenity, as well as accessibility between settlements and to community facilities	Long-Term	Local	Minor Adverse	Not Significant	Approval of Detailed Landscape Environment Management Plan prior to commencement of authorised development.
Employment and income (for vulnerable groups)	oSSCEP	Job opportunities and changes to socio-economic status	Long-Term	Local	Minor – Negligible Beneficial	Not Significant	Approval of Detailed Employment Skills and Supply Chain Management Plan prior to commencement of authorised development.
Climate change mitigation and adaption	-	Impacts of responding to the challenges of climate change	Long-Term	Local	Moderate Beneficial	Significant	-
Electro-magnetic fields	Cables buried underground as per Outline Design Parameters	Impact of electro-magnetic fields	Long-Term	Local	Minor Adverse	Not Significant	-



Receptor	Embedded Measures	Description of the Effect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Wider societal infrastructure and resource	-	Contribution towards energy infrastructure and impact on standard of living	Long-Term	Local	Major – Moderate Beneficial	Significant	-
Decommissioning Phase							
Physical Activity	Outline Decommissioning Traffic Management Plan	Impacts on levels of physical activity including active travel modes	Short-Term	Local	Minor – Negligible Adverse	Not Significant	Approval of Detailed Decommissioning Traffic Management Plan prior to commencement of authorised development.
Community identity, culture, resilience and influence	Outline Decommissioning Environment Management Plan	Impacts on changes to the landscape, views and amenity, as well as accessibility between settlements and to community facilities	Short-Term	Local	Minor – Negligible Adverse	Not Significant	Approval of Detailed Decommissioning Environment Management Plan prior to commencement of authorised development.



Receptor	Embedded Measures	Description of the Effect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Employment and income (for vulnerable groups)	oSSCEP	Job opportunities and changes to socio-economic status	Short-Term	Local	Minor – Negligible Beneficial	Not Significant	Approval of Detailed Employment Skills and Supply Chain Management Plan prior to commencement of authorised development.
Climate change mitigation and adaption	-	Impacts of responding to the challenges of climate change	Long-Term	Local	Minor – Negligible Adverse	Not Significant	-
Electro-magnetic fields	-	Impact of electro-magnetic fields	Short-Term	Local	Minor – Negligible Adverse	Not Significant	-
Wider societal infrastructure and resource	-	Contribution towards energy infrastructure and impact on standard of living	Short-Term	Local	Minor – Negligible Adverse	Not Significant	-



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