

Preliminary Environmental Information Report

Calderdale Energy Park

7 April 2026

Volume 2, Chapter 18 : Human Health

PINS Reference: EN0110023

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations
2009 – Reg 5 (2) (a)



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18 Human Health

18.1 Introduction

18.1.1 This Chapter of the PEIR has been prepared by Logika Group on behalf of the Applicant and presents the preliminary likely significant environmental effects of the Proposed Development upon Human Health. It is based on the environmental information available to date (which is detailed in this Chapter), as well as the current description of the Proposed Development as set out in **Chapter 4: The Proposed Development**.

18.1.2 This Chapter concludes there are no likely significant adverse population health effects of the Proposed Development during the construction, operation including maintenance and decommissioning phases. During operation there is anticipated to be a significant benefit to public health associated with improved renewable energy security.

18.1.3 The Human Health Chapter explains the public health implications of the Proposed Development and is informed by the findings of other technical aspect assessments. The conclusions of the following topic assessments are relevant to the receptors of this assessment, and have been taken into account in the assessment for Human Health:

- **Chapter 10: Hydrology and Hydrogeology, Geology and Peat;**
- **Chapter 11: Carbon and Climate Change;**
- **Chapter 12: Landscape and Visual;**
- **Chapter 13: Historic Environment;**
- **Chapter 14: Transport and Access;**
- **Chapter 15: Noise and Vibration;**
- **Chapter 16: Air Quality;**
- **Chapter 17: Socio-Economics and Tourism; and**
- **Chapter 21: Shadow Flicker.**

18.1.4 This Chapter is supported by:

- **Appendix 18-1: Baseline Data Tables.**

18.1.5 Supporting figures can be found at:

- **Figure 18-1: Index of Multiple Deprivation 2025;** and
- **Figure 18-2: Health and Disability Deprivation Domain Index of Multiple Deprivation 2025.**

18.2 Legislation, Policy and Guidance

18.2.1 Key policy, legislation and guidance relating to Human Health and of relevance to this preliminary assessment comprises of the following, as shown in **Table 18-1**.

Table 18-1: Legislation, Policy and Guidance

Type	Name	Relevance to Assessment
Legislation	The Infrastructure Planning (Environmental Impact Assessment) (EIA) Regulations 2017	The requirement to identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the Proposed Development on human health.
	The Environmental Protection Act 1990 (as amended)	Part III manages the control of emissions (including noise and light) that may be prejudicial to health or a nuisance.
	Health and Social Care Act 2012	Establishes local authority duties in relation to population health improvement.
	Health and Care Act 2022	Establishes the Integrated Care System, supporting joined-up health and social care, including strategic planning functions.
	Control of Pollution Act 1974	Makes provisions in relation to noise and public health. It describes licencing of certain activities to avoid danger to public health or serious detriment to the amenity of the locality affected. It also covers control of, and consent for, noise on construction sites (sections 60 and 61), including defining ‘best practicable means’ (section 72).
	Environment Act 2021	Sets targets in relation to particulate matter and establishes the Office for Environmental Protection, with a remit in

Type	Name	Relevance to Assessment
		relation to environmental legislation governance that includes the natural environment and human health.
	Health and Safety at Work Act 1974	Places duties on employers to ensure, ‘so far as is reasonably practicable,’ health, safety and welfare at work for employees and that other persons are not exposed to risks to their health or safety as a result of the activities undertaken.
National Planning Policy	Overarching National Policy Statement for Energy (EN-1) (2025) ¹	Section 4.4 sets out the assessment principles for health, and states that access to energy is clearly beneficial to society and to our health as a whole. Other sections with relevant considerations are 4.12 (pollution control), 5.2 (air quality, including 5.2.3 on non-threshold effects and vulnerable groups), 5.7 (dust and light), 5.10 (landscape and visual), 5.11 (land use and open space), 5.12 (noise), 5.13 (socio-economic), 5.14 (transport) and 5.16 (water quality).
	National Policy Statement for Renewable Energy Infrastructure (EN-3) (2025) ²	Relevant to the health assessment consideration of community identity and public health benefits of energy security, Section 2.3 sets out factors influencing site selection and design of renewable energy infrastructure. Section 2.12 refers to Noise and Vibration from wind turbines in relation to human health and sets out direction on the weighting which the Secretary of State should apply. For example, 2.12.165 states that no weight should be given to claims of harm to human health as a result of effects of ground transmitted vibration, infrasound or low frequency noise from wind turbines.

¹ Department for Energy Security & Net Zero. Overarching National Policy Statement for Energy (EN-1). December 2025. ISBN 978-1-5286-6066-2.

² Department for Energy Security & Net Zero. National Policy Statement for Renewable Energy Infrastructure (EN-3). December 2025. ISBN 978-1-5286-6067-9.

Type	Name	Relevance to Assessment
		<p>Section 2.12 also refers to Shadow Flicker, including: 2.12.166 that, where a wind turbine has the potential to affect a property but can be controlled to minimise shadow flicker, no weight be attached to shadow flicker impacts; 2.12.167 that beyond 10 rotor diameter no significant effects from shadow flicker could arise; and no weight is given to shadow flicker frequency effects, e.g. on epilepsy seizure risk, where the frequency of flicker flashes is below 3 hertz.</p>
	<p>National Policy Statement for Electricity Networks Infrastructure (EN-5) (2025)³</p>	<p>Provides the framework for decisions on nationally significant infrastructure projects related to electricity networks, with Section 2.9 to 2.11 having relevant considerations in relation to public health and electromagnetic field exposures. Which includes at 2.9.56 that government policy is that exposure of the public should comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998 guidelines. Furthermore, as confirmed in 2.11.9, the evidence acceptable to show compliance with ICNIPR 1998 is set out in the publication Code of Practice, 'Power Lines: Demonstrating compliance with electromagnetic field (EMF) public exposure guidelines – a voluntary Code of Practice'.</p>
	<p>National Planning Policy Framework (NPPF) (December 2024 publication, revised February 2025)</p>	<p>Section 8 sets out expectations in relation to promoting healthy and safe communities, including paragraphs 96a-c (general provisions), paragraph 103 (open space), paragraph 104 (public rights of way). Other relevant paragraphs of the NPPF include 7 and 8 (achieving sustainable development), 85 (building a strong, competitive economy), 124 (making</p>

³ Department for Energy Security & Net Zero. National Policy Statement for Electricity Networks Infrastructure (EN-5). December 2025. ISBN 978-1-5286-6068-6.

Type	Name	Relevance to Assessment
		effective use of land), 135 (place making), 162 (planning for climate change) and 198 (ensuring that new development is appropriate for its location taking into account the likely effects of pollution on health including noise).
	Fit for the future: 10 Year Health Plan for England (Published July 2025, Department of Health and Social Care)	Sets a new focus of the National Health Service (NHS) in taking an approach of moving from managing sickness to preventing ill health (e.g. through addressing inequalities in environmental conditions and the quality of jobs).
Local Planning Policy	Calderdale Local Plan 2018/19 – 2032/33 (adopted 2023). Relevant to: Turbine Area, Bradford West Cable Corridor, Eastern and Western Access Routes.	Strategic Objective 8: Communities and Narrowing the Gap (reducing health inequalities). Policy HW1: Impact of Development (promoting good population health and good access to healthcare services). Policy HW2 Health Impact Assessment (HIA) (HIA triggers, approach and scope, including refusing applications where adverse effects outweigh beneficial effects). Policy HW3: Wellbeing (encouraging walking and cycling and inclusive communities). EN Policies that include health as a consideration: EN1 Pollution Control, EN2 Air quality, EN3 Environmental Protection (water and soils).
	Bradford District Council Core Strategy to 2030 (adopted 2017). Relevant to: Bradford West Cable Corridor and Eastern and Western Access Routes.	Policy SC6 Green Infrastructure (encourage healthy living) Policy TR3: Public Transport, Cycling and Walking. Policy EN1: Protection and improvements in provision of Open Space and Recreation Facilities. Policy EN8: Environmental Protection (including health protection). Policy DS5: Safe and Inclusive Places (including amenity and social interaction).

Type	Name	Relevance to Assessment
	<p>Draft Bradford District Council Local Plan (Regulation 18 consultation version). Relevant to: Bradford West Cable Corridor and Eastern and Western Access Routes.</p>	<p>Policy SP1: Delivering Sustainable Development (healthy places and green spaces). Policy SP2: Spatial Priorities (reduce health inequalities through good design). SP15 Creating Healthy Places (active travel, open space, climate change, pollutant exposures, employment and HIA). Policy EN8: Air Quality. Policy EN9: Environmental Protection (including public health). Policy CO3: Health Impact Assessments (including triggers and reference to a future tool). Policy DS4: Streets and Movement (healthy lifestyles). Policy DS5: Safe and Inclusive Places (including amenity and social interaction).</p>
	<p>Draft Pendle Borough Council Local Plan Fourth Edition 2021-2040 (Adopted December 2025)</p>	<p>SP12: Healthy and vibrant communities (including inequalities, active travel and employment). SP13: Transport and connectivity (promoting sustainable travel). DM13: Environmental Protection. DM30: Healthy places and lifestyles (including HIA requirement and referencing PHE 2020 HIA in Spatial Planning for approach). DM32: Walking and cycling (public right of ways).</p>
	<p>Burnley's Local Plan 2012-2032</p>	<p>Policy SP6: Green Infrastructure (open space and public right of way network). Policy NE5: Environmental Protection (air quality, noise, light, water quality).</p>
National Guidance	<p>Planning Practice Guidance: Healthy and safe communities (2022)</p>	<p>Provides further guidance in relation to the NPPF on promoting health and safe communities. It states HIA is a useful tool to use where there are expected to be significant impacts.</p>
	<p>The Institute of Sustainability &</p>	<p>Provides guidance on consideration of Human Health as a topic within an EIA.</p>

Type	Name	Relevance to Assessment
	Environmental Professionals (ISEP) (formerly IEMA) Determining Significance for Human Health in Environmental Impact Assessment (2022) ⁴ .	This is the primary method source for the assessment.
	ISEP Effective Scoping of Human Health in Environmental Impact Assessment (2022) ⁵ .	Provides guidance on proportionate scoping of Human Health within an EIA.
	ISEP Competent Expert for Health Impact Assessment including Health in Environmental Assessments (2024) ⁶ .	Competency standards in relation to undertaking HIA, including Human Health in EIA.
	Institute of Public Health (IPH) Guidance, Standalone	Is the most comprehensive UK HIA guidance setting out supporting supplementary information relevant to

⁴ Pyper, R., Waples, H., Beard, C., Barratt, T., Hardy, K., Turton, P., Netherton, A., McDonald, J., Buroni, A., Bhatt, A., Phelan, E., Scott, I., Fisher, T., Christian, G., Ekermawi, R., Devine, K., McClenaghan, R., Fenech, B., Dunne, A., Hodgson, G., Purdy, J., Cave, B. (2022) IEMA Guide: Determining Significance for Human Health in Environmental Impact Assessment.

⁵ Pyper, R., Lamming, M., Beard, C., Waples, H., Birley, M., Buroni, A., Douglas, M., Turton, P., Hardy, K., Netherton, A., McClenaghan, R., Barratt, T., Bhatt, A., Fenech, B., Dunne, A., Hodgson, G., Gibson, G., Purdy, J., Cave, B. (2022) IEMA Guide: Effective Scoping of Human Health in Environmental Impact Assessment.

⁶ Pyper, R., Birley, M., Buroni, A., Gibson, G., Day, L., Waples, H., Beard, C., Dellafiora, S., Salder, J., Netherton, A., Green, L., Purdy, J., Douglas, M. (2024) IEMA Guide: Competent Expert for Health Impact Assessment including Health in Environmental Assessments.

Type	Name	Relevance to Assessment
	Health Impact Assessment and health in environmental assessment (2021) ⁷ .	meeting HIA requirements as part of this assessment.
	Public Health England, Health Impact Assessment in spatial planning (2020) ⁸ .	Directs that HIA requirements should be met through the EIA Human Health assessment. It states “ <i>First, establish whether the project is subject to EIA. If yes, follow health in EIA process.</i> ”
	Public Health England. Advice on the content of Environmental Statements (ES) accompanying an application under the Nationally Significant Infrastructure Planning (NSIP) Regime (2021) ⁹ .	Advice on coverage of public health matters as part of the EIA Human Health chapter.
Relevant Supplementary International Guidance	International Association for Impact Assessment (IAIA) and European Public Health Association. A	Source referenced by the ISEP guidance as providing additional supporting detail on coverage of Human Health in EIA.

⁷ Institute of Public Health, 2021. Health Impact Assessment Guidance: A Manual and Technical Guidance. Standalone Health Impact Assessment and health in environmental assessment.

https://www.publichealth.ie/sites/default/files/resources/guidance_2.pdf

⁸ Public Health England, 2020. Health Impact Assessment in spatial planning. A guide for local authority public health and planning teams. London.

<https://www.gov.uk/government/publications/health-impact-assessment-in-spatial-planning>

⁹ Public Health England, 2021. Advice on the content of Environmental Statements accompanying an application under the Nationally Significant Infrastructure Planning Regime.

Type	Name	Relevance to Assessment
	reference paper on addressing Human Health in EIA (2020) ¹⁰ and academic discussion of the same (Cave et al., 2021) ¹¹ .	
	International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles, (2021) ¹² .	General HIA best practice principles informing the assessment.
	World Health Organisation (WHO) guidelines on air quality and noise (Berglund et al., 1999) ¹³ ;	International targets and supporting evidence taken into account as part of the assessment

¹⁰ Cave, B., Claßen, T., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martin-Olmedo, P., Mekel, O., Pyper, R., Silva, F., Vilianni, F., Xiao, Y., 2020. Human health: Ensuring a high level of protection A reference paper on addressing Human Health in Environmental Impact Assessment As per EU Directive 2011/92/EU amended by 2014/52/EU.

¹¹ Cave, B., Pyper, R., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martin-Olmedo, P., 2021. Lessons from an International Initiative to Set and Share Good Practice on Human Health in Environmental Impact Assessment. *Int J Env. Res Public Health* 18. <https://doi.org/10.3390/ijerph18041392>

¹² Winkler, M., Villani, F., Knoblauch, A., Cave, B., Divall, M., Ramesh, G., Harris-Roxas, B., Furu, P., 2021. Health impact assessment international best practice principles, Special Publication Series. International Association of Impact Assessment. <https://iaia.org/wp-content/uploads/2025/02/BEST-PRACTICE-HIA.pdf>

¹³ Berglund, B., Lindval, T., Schwela, D.H., Organization, W.H., 1999. Guidelines for community noise. WHO Occupational and Environmental Health Team, Geneva.

Type	Name	Relevance to Assessment
	WHO 2019 ^{14,15} WHO, 2009 ¹⁶ ; WHO, 2021 ¹⁷).	
Local Guidance, including as to health-related priorities	Calderdale Council Health and Wellbeing Strategy (HWS) 2022-2027.	Local health priorities of action across the life-course, including: A focus on prevention; Addressing health inequalities; and Empowered and resilient communities.
	Calderdale Council Joint Strategic Needs Assessment (JSNA) (no date).	This resource has informed the assessment identification of vulnerable groups and baseline population health sensitivities. It describes the health, care and wellbeing needs of the population of Calderdale. Local building blocks of good health include: Culture; Inclusive Economic Strategy; Air quality; Health benefits of access to natural environments; and Safer active travel.
	Our Plans for health, care and wellbeing in Bradford District and Craven (September 2025)	This plan aims to create a health and care system across Bradford District and Craven that is increasingly neighbourhood-focussed, integrating services to enable people to lead healthier, more independent lives. , The plan creates a holistic framework to address health outcomes and wider determinants such as employment, housing, and education, taking a whole population health, care and wellbeing approach.
	Bradford Council JSNA	The Public Health Intelligence Team produces Public Health Resource Packs

¹⁴ WHO, 2018. Environmental Noise Guidelines for the European Region. World Health Organization Regional Office for Europe, Copenhagen. ISBN: 9789289053563

¹⁵ Guski, R., Schreckenberg, D., Schuemer, R., 2017. WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Annoyance. Int J Env. Res Public Health 14. <https://doi.org/10.3390/ijerph14121539>

¹⁶ WHO, 2009. Night Noise Guidelines for Europe. World Health Organization. Regional Office for Europe. ISBN: 9789289041737

¹⁷ World Health Organization, 2021. WHO global air quality guidelines. World Health Organization, Geneva. ISBN: 9789240034228

Type	Name	Relevance to Assessment
		on a variety of topics summarising key information. This resource has informed the assessment identification of vulnerable groups and baseline population health sensitivities.
	Pendle Health and Well Being Action Plan 2024-2026	Priorities include improving health outcomes for children and young people through increasing physical activity.
	Pendle and Burnley as part of the Lancashire Health and Wellbeing Strategy (Public Health Strategy for 2024-2030)	The strategy provides a single point of reference on the council’s public health priorities, which are to: promote wellbeing for all; protect lives and economy; and prevent disease, disability and demand.
	Pendle and Burnley as part of the Lancashire JSNA	Lancashire Insight host the JSNA, which includes an annual commentary report (latest 2023/4) that includes relevant Pendle information. This resource has informed the assessment identification of vulnerable groups and baseline population health sensitivities.
	NHS West Yorkshire Health and Care Partnership, Joint Forward Plan 2024	The integrated care system (ICS) priorities include: improving health and tackling inequalities; delivering responsive joined up services; and building and retaining the NHS workforce. NHS challenges and pressures are highlighted. Benefits of supporting the West Yorkshire Economic Strategy are noted, as are opportunities for engaging with employers on health promotion.

18.3 Stakeholder Engagement and Consultation

2025 Scoping Opinion

- 18.3.1 In September 2025, a request for a scoping opinion was submitted alongside a Scoping Report. **Table 18-2** presents the details of the Planning Inspectorate (PINS) Scoping Opinion relevant to Human Health and confirms how the response is considered within the proposed scope of assessment (as set out below).

Table 18-2: Consideration of PINS Scoping Opinion

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
PINS	3.11.1 to 3.11.8	Scoping Opinion statements in relation to matters agreed as scoped out of the Human Health assessment.	These are discussed in Table 18-16 .
	3.11.9 (and 2.1.2)	The approach to study areas should be agreed with relevant consultation bodies and should not be based on an arbitrary radius.	Human Health study areas are defined (Section 18.4) for a range of site-specific locations based on relevant populations and areas of impact, as well as wider local, regional and national study areas. This approach is being discussed with consultees as part of the PEIR consultation and the findings will be incorporated into the ES.
	3.11.10 (and 2.1.6)	Approach to assessing the decommissioning phase.	The decommissioning phase is assessed within Section 18.8 and will be reported within the ES.

18.3.2 No other consultation for Human Health has been undertaken to date, but consultation is planned with the following health stakeholders to inform the ES, with this PEIR Human Health Chapter as a basis for discussion:

- The Directors of Public Health (DPH), and their public health teams, for Calderdale Metropolitan Borough Council, City of Bradford Metropolitan District Council and Lancashire County Council DPH (for Pendle Borough).
- National statutory public health consultees UK Health Security Agency (UKHSA) and Department of Health and Social Care Office for Health Improvement and Disparities (OHID).
- West Yorkshire Health and Care Partnership (as the relevant ICS).

18.3.3 At the ES stage, the health assessment will also be informed by community consultation undertaken for the Proposed Development, including where

communities have provided feedback in relation to health, issues that concern them or particular vulnerabilities.

18.4 Assessment Methodology

Study Area

- 18.4.1 Two types of study area are used by the Human Health assessment. Firstly, the health assessment is informed by the study areas used by other EIA topic Chapters and other assessments. These study areas primarily relate to understanding the extent and nature of potential impacts due to the Proposed Development. These study areas are not repeated here but are cross-referenced within the assessment as appropriate.
- 18.4.2 Secondly, the Health Chapter uses public health data related to geographical study areas, to define representative population groups in a consistent way across a range of health determinants. Characterising these populations informs decisions on sensitivity and supports the analysis of combined impacts across multiple health determinants (intra-project effects). These health study areas reflect the locations where the great majority of the impact is anticipated to occur. Any effects beyond these study areas would not change the conclusions reached in relation to sensitivity or the likely significant population health effects of the Proposed Development.
- 18.4.3 Site-specific, local, regional and national human health study areas are defined, which is the approach recommended by ISEP 2022 guidance⁵. These allow a focus on localised effects, including health inequalities, as well as consideration of wider influences on population health.
- 18.4.4 Five site-specific study areas are defined to discuss localised effects. The areas are based on ward boundaries for which public health statistics are available.
- For each site-specific area, indicative communities (based on Google Earth labels at a 20km eye altitude) are listed to provide context to the settlements in the vicinity of the Proposed Development. Whilst these are not exhaustive lists of all communities within a ward, the assessment does take the entire population of a ward into account.
 - For each site-specific area, relevant areas of deprivation are also noted, focusing on areas of higher (worse) deprivation. These are taken into account in determining the sensitivity of the population to accommodate change due to the Proposed Development (with more detail on sensitivity criteria set out in **Table 18-8**). Areas of elevated deprivation can indicate a population is already stressed by limited resources or high burdens as well as affected by reduced

access to services. Pockets of deprivation are assumed even in areas of low deprivation.

18.4.5 The five site-specific study areas are:

- Turbine Area Human Health study area, defined in **Table 18-3**;
- Bradford West Cable Corridor Human Health study area (from southwest of Walshaw Dean Reservoirs to Bradford West Substation connection), defined in **Table 18-4**;
- Bradford West Substation connection Human Health study area, defined in **Table 18-5**;
- Western Access Route Human Health study area, defined in **Table 18-6**; and
- Eastern Access Route Human Health study area, defined in **Table 18-7**.

18.4.6 The Human Health local study area is defined as the wider area effects for the population of Calderdale Metropolitan Borough, City of Bradford Metropolitan District, Burnley Borough Council and Pendle Borough.

18.4.7 The Human Health regional study area is defined as the wider area effects for the population of the North West and Yorkshire and the Humber.

18.4.8 The Human Health national study area is defined as the wider area effects for the population of England and the UK.

Table 18-3: Turbine Area Human Health site-specific study area

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
The population of Calder ward (2021 boundary) E05001372 (the location of the turbines and areas to the south and east)	Hebden Bridge, Slack, Heptonstall, Old Town, Colden, Blackshaw Head, Walshaw, Shackleton, Pecket Well and Widdop (and associated isolated dwellings).	Sensitivity takes into account Lower Layer Super Output Area (LSOA) Calderdale 004D, as the most geographically relevant to the turbine locations, which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 20% least deprived for the health domain of deprivation.

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
		<p>LSOA Calderdale 004F, the southern area of Hebden Bridge is also noted as an area of higher deprivation in the ward, which is in the 40% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 30% most deprived for the health domain of deprivation.</p>
<p>The population of Worth Valley ward (2021 boundary) E05001369 (to the northeast of the Turbine Area)</p>	<p>Oxenhope, Leeming and Stanbury (and associated isolated dwellings).</p>	<p>Sensitivity takes into account LSOA Bradford 023D which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 50% least deprived for the health domain of deprivation.</p>
<p>The population of Boulsworth & Foulridge ward (2021 boundary) E05013202 (to the northwest of the Turbine Area)</p>	<p>Wycoller, Trawden and Hollin Hall (and associated isolated dwellings)).</p>	<p>Sensitivity takes into account LSOA Pendle 006C which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 40% least deprived for the health domain of deprivation.</p>
<p>The population of Briercliffe ward (2021 boundary) E05005151 (to the west of the Turbine Area)</p>	<p>Thursden (and associated isolated dwellings)).</p>	<p>Sensitivity takes into account LSOA Burnley 009A which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), however it is in the 40% most deprived for the health domain of deprivation. LSOA Burnley 001A, to the west at Haggate is also noted as an area of higher deprivation in the ward, which is in the 40% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025),</p>

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
		including in the 30% most deprived for the health domain of deprivation.
The population of Cliviger with Worsthorne ward (2021 boundary) E05005153 – (to the southwest of the Turbine Area)	Worsthorne, Hurstwood, Mereclough, Cliviger and Holme Chapple (and associated isolated dwellings).	Sensitivity takes into account LSOA Burnley 009B which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), however it is in the 40% most deprived for the health domain of deprivation.

Table 18-4: Bradford West Cable Corridor Human Health site-specific study area

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
The population of Calder ward (2021 boundary) E05001372 (west cable corridor section)	Widdop and Walshaw (and associated isolated dwellings).	Sensitivity takes into account LSOA Calderdale 004D which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 20% least deprived for the health domain of deprivation.
The population of Bingley Rural ward (2021 boundary) E05001343 (east cable corridor section)	Harecroft and Denholme (and associated isolated dwellings).	Sensitivity takes into account LSOA Bradford 031D which is in the 20% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including the 30% most deprived for the health domain of deprivation.
The population of Worth Valley ward (2021 boundary)	Oxenhope and Leeming (and associated	Sensitivity takes into account LSOA Bradford 023D which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
E05001369 (central cable corridor section)	isolated dwellings).	(IMD 2025), including in the 50% least deprived for the health domain of deprivation.

Table 18-5: Bradford West Substation connection Human Health site-specific study area

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
The population of Thornton and Allerton ward (2021 boundary)	Thornton, Allerton and Sandy Lane (and associated isolated dwellings)).	Sensitivity takes into account into account LSOA Bradford 036D which, whilst not adjacent, is in the 10% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including the 10% most deprived for the health domain of deprivation.
The population of Bingley Rural ward (2021 boundary) E05001343	Wilsden, Harecroft and Denholme (and associated isolated dwellings)).	Sensitivity takes into account into account LSOA Bradford 022F which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), however it is in the 30% most deprived for the health domain of deprivation.

Table 18-6: Western Access Route Human Health site-specific study area

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
The population of Boulsworth & Foulridge ward (2021	Wycoller and Laneshawbridge (and associated isolated dwellings).	Sensitivity takes into account LSOA Pendle 006B which is in the 40% most deprived neighbourhoods in the country in relation to the index of multiple

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
boundary) E05013202		deprivation (IMD 2025), including the 40% most deprived for the health domain of deprivation.
The population of Worth Valley ward (2021 boundary) E05001369	Oldfield and Stanbury (and associated isolated dwellings).	Sensitivity takes into account LSOA Bradford 023B which is in the 50% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 40% most deprived for the health domain of deprivation.

Table 18-7: Eastern Access Route Human Health site-specific study area

Ward (2021 definition)	Illustrative communities in relation to potential effects (not exhaustive)	Relevant areas of overall deprivation and health deprivation
The population of Worth Valley ward (2021 boundary) E05001369	Oxenhope and Leeming (and associated isolated dwellings).	Sensitivity takes into account LSOA Bradford 023D which is in the 50% least deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 50% least deprived for the health domain of deprivation.
The population of Luddendenfoot ward (2021 boundary) E05001377	Wainstalls and Mount Tabor (and associated isolated dwellings).	Sensitivity takes into account LSOA Calderdale 007E which is in the 30% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 30% most deprived for the health domain of deprivation.
The population of Illingworth and Mixenden ward (2021 boundary) E05001376	Mixenden and Moor End (and associated isolated dwellings).	Sensitivity takes into account LSOA Calderdale 002D which is in the 10% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 10% most deprived for the health domain of deprivation.
The population of Warley ward (2021	Mount Tabor, Fountainhead, New	Sensitivity takes into account LSOA Calderdale 009B which is in the 10%

boundary) E05001387	Pellion and Thrum Hall (and associated isolated dwellings).	most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 10% most deprived for the health domain of deprivation.
The population of Park ward (2021 boundary) E05001380	King Cross (and associated isolated dwellings).	Sensitivity takes into account LSOA Calderdale 014D which is in the 10% most deprived neighbourhoods in the country in relation to the index of multiple deprivation (IMD 2025), including in the 10% most deprived for the health domain of deprivation.

Sources

18.4.9 The health assessment is informed by data collected by other EIA topic Chapters and assessments, which is not repeated here. The health assessment is also informed by public health baseline data relevant to each study area, using the most recent data available. Sources comprise the following, and are referenced throughout the Chapter, where required:

- Office of Health Improvement and Disparities, Fingertips online public health data tool¹⁸ for small area health data, including indicators such as: Local Health; Public Health Outcomes Framework (PHOF); Local Authority Health Profiles; Wider determinants of health; and Obesity, physical activity and nutrition. Ward data (October 2025) downloads were used, which relates to 2021 Electoral Ward boundary definitions.
- Office for National Statistics (ONS) / Nomis¹⁹ online data tool for small area demographics and statistics, including Census 2021, which relates to 2022 Electoral Ward boundary definitions.
- Ministry of Housing, Communities and Local Government Indices of Multiple Deprivation 2025²⁰, including health deprivation at LSOA level.
- Local authority HWSs and JSNAs, as listed in the Local Guidance section of **Table 18-1**.

¹⁸ OHID. Fingertips tool. Online. Available at: <https://fingertips.phe.org.uk/profiles>

¹⁹ ONS. Census 2021 tool. Online. Available at: https://www.nomisweb.co.uk/sources/census_2021

²⁰ Ministry of Housing, Communities and Local Government. English indices of deprivation 2025. Published 30 October 2025. Online. Available at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2025>

- NHS England, NHS Digital, General Practice Workforce²¹, monthly NHS Workforce Statistics for England, September 2025 (27 November 2025 publication). Relevant General Practitioner (GP) surgery full time equivalent (FTE) number of GPs, and patient list sizes, to inform assessment of capacity.
- NHS services²². Online location resource for identifying healthcare services.

18.4.10 A virtual walkover of the Proposed Development was also undertaken using Google Earth Pro to indicatively identify relevant communities and structures, routes, spaces or amenities associated with them or relevant vulnerable groups.

Methodology

Public Health Approach

- 18.4.11 The health assessment considers the effects reported within other EIA topic Chapters and assessments after they have taken account of relevant mitigation measures that they set out. The health assessment then explains the public health implications, applying the methodology set out below.
- 18.4.12 The methodology outlined in this section appropriately integrates HIA guidance such that the EIA Human Health assessment is also an integrated HIA. This follows the recommend approach⁸.
- 18.4.13 The Human Health assessment follows the Institute of Sustainability and Environmental Professionals (ISEP) 2022 guidance (Determining Significance for Human Health in Environmental Impact Assessment) qualitative framework approach⁴ and this aligns to the HIA approach set out by the Institute of Public HIA. This draws on qualitative and quantitative inputs from other EIA topic Chapters and assessments. This is advocated by the guidance as the most appropriate methodology for assessing wider determinants of health proportionately, consistently and transparently.
- 18.4.14 Following principles of public health set out by the guidance, the assessment takes a population health approach. The conclusions of this Chapter therefore relate to the health outcomes to defined populations, not the health outcomes of individuals.

²¹ NHS England. NHS Digital. General Practice Workforce, 31 October 2025. Published 27 November 2025. Practice Level CSVs data file, detailed results. Dataset columns K and CI. Available at: <https://digital.nhs.uk/data-and-information/publications/statistical/general-and-personal-medical-services>

²² NHS, Find Services Near You. Online. Available at: <https://www.nhs.uk/nhs-services/services-near-you/>

- 18.4.15 Health is a “*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*”²³. Mental health is a “*state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*”²⁴. ‘Population health’ refers to the health outcomes of a group of individuals, including the distribution of such outcomes within the group²⁵.
- 18.4.16 For the purpose of the assessment, health effects have been identified when an environmental, social or economic factor that influences health and wellbeing is potentially impacted, and the number of people exposed to this change is considered sufficient to cause a change in health at population level.
- 18.4.17 Health and wellbeing are influenced by a range of factors, termed the ‘wider determinants of health’. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.
- 18.4.18 Impacts of the Proposed Development that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly, indirectly or in-combination. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility and exposure.
- 18.4.19 A change in a determinant of health effects does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Development. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.
- 18.4.20 As noted within the ISEP 2022 guidance⁴, typically, the change in a risk factor would need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

²³ World Health Organization, 1948. The Preamble of the Constitution of the World Health Organization. Bulletin of the World Health Organization, New York.

²⁴ World Health Organization, 2022. Mental health: strengthening our response. Retrieved Sept. 2022.

²⁵ Kindig, D., Stoddart, G., 2003. What Is Population Health? Am J Public Health 93, 380–383.

Vulnerable Groups and Health Inequalities

- 18.4.21 For each determinant of health, this health assessment identifies relevant inequalities through consideration of the differential effect, to the 'general population' of the relevant study area, when compared to the effects to the 'vulnerable population group' of that study area. The vulnerable population group being comprised of relevant sensitivities for that determinant of health. The differentiation of the general population from the vulnerable group population, allows a discussion of any likely significant health inequalities and the targeting of any mitigation.
- 18.4.22 The following population groups have been considered:
- The 'general population' including residents, visitors, workers, service providers, and service users.
 - The 'vulnerable group population' comprised of the vulnerabilities due to young age, older age, income, health status, social disadvantage and access or geographic reasons.
- 18.4.23 The variation between different types of people and how they perceive change, is widely acknowledged in public health. Public health frames this variation in terms of a likely distribution of effects within a population. This distribution can be applied conceptually or statistically but tends to show that most individuals are likely to experience an average level of change. This links to the 'general population' analysis.
- 18.4.24 Because there are invariably people towards the extremes of the distribution, e.g. experiencing much smaller or larger effects, it is relevant to also consider sub-populations who may be more likely to experience such extremes because of certain characteristics. This links to the 'vulnerable group' analysis.
- 18.4.25 The methods draw on the list of vulnerable population groups set out in ISEP 2022 Scoping Table 9.2. The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the assessment. People falling into more than one group may be especially sensitive:
- Young age: Children and young people (including pregnant women and unborn children).
 - Old age: Older people (particularly frail elderly).
 - Low income: People on low income, who are economically inactive or unemployed/workless.

- Health status: People with existing poor health; those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities; people who identify as neurodivergent.
- Social disadvantage: People who suffer discrimination or other social disadvantage, including relevant protected characteristics or groups who may experience low social status or social isolation for other reasons.
- Access and geographical factors: People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and/or health indicators.

18.4.26 The following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring sensitivity (this relates to the criteria in **Table 18-8**). These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction, operation and decommissioning.

- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).
- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status. Vulnerability may also relate to conditions or a health status with hyper sensitivities, for example associated with autism, a health condition or neurodiversity.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.

- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Proposed Development. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources (e.g. fewer road network alternatives where they are living in close proximity to the Proposed Development).
- The general population includes the proportion of the community whose outlook on the Proposed Development includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Proposed Development.

Assessment Approach

18.4.27 The assessment of EIA health significance is an informed expert judgement about what is important, desirable or acceptable for public health with regards to changes triggered by the Proposed Development. These judgements are: value dependant (underpinned by scientific data, but also informed by professional perspectives); and are context-dependent (judgements reflect relevant social, economic and political factors for the population)²⁶.

18.4.28 The determination of significance has two stages:

- Firstly, the sensitivity of the receptor affected, and the magnitude of the impact upon it are characterised. This establishes whether there is a relevant population and a relevant change to consider; and
- Secondly, a professional judgement is made as to whether the expected change in a population's health outcomes would be significant in public health terms. This judgement is explained using an evidence-based narrative, setting out reasoned conclusions.

18.4.29 **Table 18-8**, **Table 18-9** and **Table 18-11** together summarise the assessment methodology that has been adopted. Terms in bold within these tables show indicative qualitative terminologies to indicate levels (e.g. high, medium, low or negligible) within the criteria described by the ISEP 2022 guidance⁴. This approach shows how the general EIA methods of using sensitivity and magnitude to inform a judgement of significance, are applied for human health. The approach uses professional judgement, drawing on consistent and transparency criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain

²⁶ European Commission, Directorate-General for Environment, McGuinn, J., McNeill, A., Banfi, P., Lantieri, A., 2017. Environmental impact assessment of projects : guidance on scoping (Directive 2011/92/EU as amended by 2014/52/EU).

what significance means for public health in terms of a change in population health outcomes.

Sensitivity

- 18.4.30 Within a defined population, individuals will range in level of sensitivity due to a series of factors such as age, socio-economic deprivation, and the prevalence of any pre-existing health conditions which could become exacerbated. Sensitive individuals can be considered particularly vulnerable to changes in environmental and socio-economic factors (both adversely and beneficially), whereby they could experience disproportionate effects when compared to the general population.
- 18.4.31 The criteria for receptor sensitivity are outlined in **Table 18-8**. Judgements are based on the most relevant criteria as it is likely in any given analysis that some criteria will span categories.

Table 18-8: Human Health Sensitivity Criteria

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

18.4.32 During the assessment the sensitivity is determined for both the ‘general population’ and the ‘vulnerable group population’. In the determination of significance, the vulnerable group population sensitivity score drives the professional judgement to ensure an appropriate consideration of health inequalities.

Magnitude

18.4.33 The criteria for receptor sensitivity are outlined in **Table 18-8**. Judgements are based on most relevant criteria as it is likely in any given analysis that some criteria will span categories.

Table 18-9: Human Health Magnitude Criteria

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

18.4.34 During the assessment a single magnitude score is derived and applied to the significance determination. The magnitude score is informed by other EIA topic Chapters and assessments, so this is the point within the assessment at which those findings are summarised. The health magnitude assessment explains the implications of those impacts for population health, notably driven by the relationship between severity of the predominant health outcomes and the extent of the population affected.

18.4.35 In considering magnitude, the following duration of impact definitions guide the Human Health assessment:

- Long-term: relates to impacts predominantly experienced over years or decades. Typically, operational effects.
- Medium-term: relates to impacts predominantly experienced over months or years. Typically, overall construction, maintenance or decommissioning effects at a given location.
- Short-term: relates to impacts predominantly experienced over months. Typically, localised construction, maintenance or decommissioning effects at a given location.
- Very-short-term: relates to impacts predominantly experienced over hours, days or weeks. Typically, highly localised construction, maintenance or decommissioning effects at a given location.

18.4.36 In considering magnitude, the following frequency of impact definitions guide the Human Health assessment:

- Continuous: relates to impacts characterised as experienced on an ongoing basis, without interruption. Typically, where there is a dominant influence from operational infrastructure or activities at permanently occupied locations with no respite and no meaningful variation; or atypical construction, maintenance or decommissioning activities undertaken on a 24hr basis for a specified period.
- Frequent: relates to impacts characterised as experienced on a regular basis but where planned schedules provide respite, or normal behaviours in the receiving population provide meaningful variation. Typically, construction, operation and maintenance or decommissioning activities undertaken during normal work hours; or experiences of infrastructure or activities that are common but interspersed by other influences and time at other locations.
- Occasional: relates to impacts characterised as seldom experienced or only experienced on a transitory basis. Typically, planned construction, operation and maintenance or decommissioning occurring as irregular events; or fleeting experiences of infrastructure or activities from time-to-time, for example whilst passing along a transport route.
- One-off: relates to impacts characterised as experienced rarely or only once. Typically, a temporary but noteworthy event during construction or decommissioning; or relating to a mitigated but still foreseeable atypical events occurring, such as an accident or unplanned repair.

18.4.37 In considering magnitude, the following scale of change definitions guide the Human Health assessment (including in relation to social and economic factors, as well as services, facilities and amenities):

- High scale: relates to profound change in conditions, or availability of a resource, that influences risk factors for health outcomes. Integrity of the resource is contingent on (+) or compromised by (-) the change. Typically, the addition or removal of the majority, or entirety, of an influential resource. Change is dominant.
- Medium scale: relates to notable change in conditions, or availability of a resource, that influences risk factors for health outcomes. Integrity of resource maintained but influentially strengthened by (+) or weakened by (-) the change. Typically, the addition or removal of a sizable component of an influential resource. Change is prominent.
- Small scale: relates to marginal change in conditions, or availability of a resource, that influences risk factors for health outcomes. Integrity of resource maintained with limited strengthening (+) or weakening (-) by the change. Typically, the modification of a small part of an influential resource, or larger change to a resource that has limited influence in the context. Change is noticeable but generally unobtrusive unless scrutinised.
- Negligible scale: relates to no discernible change in conditions or availability of a resource that influences risk factors for health outcomes. Integrity of resource unaffected. Typically, the modification of a small part of a resource that has limited influence in the context. Change is generally indiscernible.

18.4.38 In considering magnitude, the following exposure definitions guide the Human Health assessment (including in relation to factors such as air, water and soil quality, as well as noise, vibration, radiological and chemical exposures):

- High exposure: relates to a substantial change from baseline environmental conditions, that influences risk factors for health outcomes, at locations where the general public spend extended periods of time. Health protection standards applicable to the context and population would be (newly or further) met (+) or exceeded (-) to a marked degree due to the change. Typically, the addition or removal of a major source with high emission levels (or combined effect of multiple smaller sources) that in the context results in concentrations that drive the exceedance of health protection standards for the jurisdiction.
- Low exposure: relates to a modest, but still important, change from baseline environmental conditions, that influences risk factors for health outcomes, at locations where the general public spend extended periods of time. Health protection standards applicable to the jurisdiction and population would be (newly or further) met (+) or exceeded (-) to a small degree due to the change; or for the context the degree of change, even within applicable health protection standards, is the main driver for notable exposures in relation to non-threshold

health effects. Typically, the incremental effect on ambient conditions from the addition or removal of multiple smaller emission sources (fixed or mobile) that results in an influential effect on health protection standards and health outcomes for the jurisdiction.

- Very low: exposure relates to a slight change from baseline environmental conditions, that influences risk factors for health outcomes, at locations where the general public spend extended periods of time. The change is not an influential factor in the achievement of health protection standards applicable to the jurisdiction and population; and for the context the degree of change, even within applicable health protection standards, is not an influential factor in relation to non-threshold health effects. Typically, the incremental effect on ambient conditions from the addition or removal of multiple smaller emission sources (fixed or mobile) that results in a marginal effect on health protection standards and health outcomes for the jurisdiction.
- Negligible: exposure relates to no discernible change from baseline environmental conditions, that influence risk factors for health outcomes, at locations where the general public spend extended periods of time. For the context the change neither discernibly affects health protection standards nor non-threshold health effects. Typically, minimal new emissions sources or substitution of existing sources with very similar exposures and consequently, very similar health risk profiles.

18.4.39 Severity for public health is complex, multifactorial, context specific and issue specific. It includes considerations in relation to the following factors:

- Population health outcome changes in: patterns of incidence (new cases) or prevalence (total cases); seriousness of outcomes, symptoms or complications; rate of chronic progression; rate of multi-morbidity; all-cause or cause-specific mortality trends; life expectancy; or healthy life expectancy (the number of years spent in good health).
- Population health risk-factor changes associated with: knowledge, awareness, beliefs, attitudes, motivation or behaviour patterns that mediates a medical condition or health status; or prevalence of conditions that are health-risk factors for other health outcomes, for example, blood pressure or body mass index.
- Service demand or capacity changes in: GP appointments, ambulance callouts, emergency department attendances, hospital admissions or allied service usage; or in the types, frequency, duration or level of medical or care interventions required. Also relevant are staff recruitment, retention and training.

- Population changes in: general state of physical and mental health, wellbeing and quality-of-life; daily functioning; long-term care dependency; degree of unpaid care provision; or medication reliance or adherence.
- Public health events, such as a major incidents or infectious disease outbreaks; or important shifts in health inequalities between population groups.
- The efficacy of existing public health interventions across: health promotion; primary, secondary and tertiary health prevention (including screening and immunisation); health protection; and strategic service planning.

18.4.40 In considering magnitude, the following severity of health outcome definitions guide the Human Health assessment:

- High severity: is predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/injury outcomes. Typically, these relate to substantial shifts in the short-term and long-term trends for the factors discussed in the paragraph above, often associated with sudden or erratic transitions. Prevalent and profound changes in population health status.
- Medium severity: is predominantly related to moderate changes in morbidity or major change in quality-of-life. Typically, these relate to modest shifts in long-term trends for the factors discussed in the paragraph above, often associated with sizable but gradual transitions that are foreseen, planned for and adapted to as new norms are established. Prevalent and influential changes in population health status, which remains important for public health.
- Low severity: is predominantly related to minor change in morbidity or moderate change in quality-of-life. Typically, these relate to slight shifts in the factors discussed in the paragraph below, often as a minor factor in relation to existing transitions or trends. Limited instances of influential change to health status in the population, with the great majority of change relating to marginal effects.
- Negligible severity: is predominantly related to a minor change in quality-of-life. Typically, these relate to no discernible shifts in the factors discussed in the paragraph below, often associated with usual care and routine self-management. No discernible change in population health status.

18.4.41 The following population extent definitions guide the Human Health assessment (extent is closely linked in the assessment with severity):

- Majority of the population of the relevant study area affected: Typically, impacts are widespread and experienced in full across the area; or critically impacts a key service covering that area for which there is no alternative. Indicatively more

than 50% of the study area population experiencing relevant health outcome or risk-factor changes applicable to the severity level.

- Large minority of the population of the study area affected: Typically, impacts are widespread but experienced variably across the area; or markedly impacts a key service covering that area for which there are limited alternatives. Indicatively between 25% and 50% of the study area population experiencing relevant health outcome or risk-factor changes applicable to the severity level.
- Small minority of the population of the study area affected: Typically, impacts are localised and experienced variably across the area; or marginally impacts a key service covering that area for which there are no or limited alternatives. Indicatively between 5% and 25% of the study area population experiencing relevant health outcome or risk-factor changes applicable to the severity level.
- Very few people of the study area affected: Typically, impacts are highly localised; or relate to very specific users of an impacted service covering that area for which there are no alternatives. Indicatively 1% to 5% of the study area population experiencing relevant health outcome or risk-factor changes applicable to the severity level. Often relating to a small number of dwellings that are in proximity to construction, operation and maintenance or decommissioning activities.

Significance

- 18.4.42 Determination of the likely significance of population health effects, including health inequalities for vulnerable groups is an evidence and context based professional judgment. To guide the professional judgment a matrix is used (see **Table 18-10**).
- 18.4.43 Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.
- 18.4.44 Effects of moderate and above are considered significant in terms of the EIA Regulations.

Table 18-10: Human Health Indicative Assessment Matrix

Magnitude of Impact	Sensitivity of Population or Sub-population			
	High	Medium	Low	Very low
High	Major	Moderate or major	Moderate or minor	Minor or negligible
Medium	Moderate or major	Moderate	Minor	Minor or negligible

Magnitude of Impact	Sensitivity of Population or Sub-population			
	High	Medium	Low	Very low
Low	Moderate or minor	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or negligible	Negligible	Negligible

18.4.45 The narrative accompanying the significance conclusion is informed by the criteria set out in **Table 18-11**. Judgements are based on most relevant criteria as it is likely in any given analysis that some criteria will span categories.

Table 18-11: Human Health Significance Criteria

Level	Indicative criteria
Major (significant)	<p>The narrative explains that this is significant for public health because:</p> <ul style="list-style-type: none"> • Changes, due to the Proposed Development, have a substantial effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show consensus on the importance of the effect. • Changes, due to the Proposed Development, could result in a regulatory threshold or statutory standard being crossed (if applicable). • There is likely to be a substantial change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a causal relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of specific relevance to the determinant of health or population group affected by the Proposed Development.
Moderate (significant)	<p>The narrative explains that this is significant for public health because:</p> <ul style="list-style-type: none"> • Changes, due to the Proposed Development, have an influential effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show mixed views.

Level	Indicative criteria
	<ul style="list-style-type: none"> • Change, due to the Proposed Development, could result in a regulatory threshold or statutory standard being approached (if applicable). • There is likely to be a small change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a clear relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of general relevance to the determinant of health or population group affected by the Proposed Development.
<p>Minor (not significant)</p>	<p>The narrative explains that this is not significant for public health because:</p> <ul style="list-style-type: none"> • Changes, due to the Proposed Development, have a marginal effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that no relevant consultation themes emerge among stakeholders. • Change, due to the Proposed Development, would be well within a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable). • There is likely to be a slight change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a suggestive relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of low relevance to the determinant of health or population group affected by the Proposed Development.
<p>Negligible (not significant)</p>	<p>The narrative explains that this is not significant for public health because:</p> <ul style="list-style-type: none"> • Changes, due to the Proposed Development, are not related to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the Proposed Development having no responses on this issue among stakeholders. • Change, due to the Proposed Development, would not affect a regulatory threshold, statutory standard or guideline (if applicable). • There is likely to be a very limited change in the health baseline of the population, including as evidenced by the

Level	Indicative criteria
	<p>effect size and/or scientific literature showing there is an unsupported relationship between changes that would result from the Proposed Development and changes to health outcomes.</p> <ul style="list-style-type: none"> • In addition, health priorities for the relevant study area are not relevant to the determinant of health or population group affected by the Proposed Development.

- 18.4.46 As all development has the potential for adverse effects to some particularly vulnerable individuals, the role of EIA health significance conclusions is not to set a threshold of ‘no harm’ from development, but to show where, at a population level, the harm should weigh strongly in the balance alongside the development’s benefits for health and other outcomes (para 5.8 of the ISEP 2022 guidance⁴).
- 18.4.47 Furthermore, where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. ‘Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change’ (para 8.18 of the ISEP 2022 guidance⁴).
- 18.4.48 The health methods triangulate relevant evidence sources, including scientific literature, health policy, local health priorities, baseline data, regulatory standards and consultation responses. In this regard health in EIA is like other aspects of public health, where the scientific literature and WHO position statements are important but must be applied within the local context. The health assessment therefore has regard to WHO advisory guidelines but acknowledges that they are not always the most appropriate reference point in UK planning decisions. Where there are national health protection standards these are given weight, to do otherwise would undermine public confidence in them and the institutions that set them. In adopting this context-based approach, the health assessment follows guidance and good practice that is itself advocated by the WHO²⁷.
- 18.4.49 In relation to regulatory thresholds or statutory standards the ISEP 2022 guidance states that the *“regulatory thresholds, or statutory standards ... cover the formal standards adopted by national jurisdictions. This may include statutory air quality standards, as well as standards set by, or commonly adopted in relation to, government noise policy. Where thresholds have been set these do not mean that there would be no health effect below these levels. ... In such cases an informed discussion about what is acceptable for the jurisdiction is appropriate. For example,*

²⁷ World Health Organization, Learning from Practice: Case Studies of Health in Strategic Environmental Assessment and Environmental Impact Assessment across the WHO European Region.

giving the public confidence in thresholds and standards set by government for the purpose of health protection having taken into account other social, economic and environmental considerations". (para 8.19 of the ISEP 2022 guidance⁴).

Limitations and Assumptions

- 18.4.50 This Chapter has relied, in part, on data provided by third parties (e.g. OS Mapping, Local Authorities, NHS and NOMIS) which are the most up-to-date and available at the time of writing. No significant changes or limitations in these datasets have been identified that would affect the robustness of the assessment. For the October 2025 public health data release, the OHID Fingertips website states²⁸ that ward level data was removed from the local health and public health data for small geographical areas, as part of the August 2025 update.
- 18.4.51 Following user feedback, ward level data files have been made available as separate downloadable files. Data is only provided for the indicators that are currently displayed in the local health Fingertips tool. The files provide data that were published prior to the August 2025 update and may not be available for the same time point as the current live site. In future releases of the local health tool, it is the intention to include data for wards and NHS geographies, and the Department of Health and Social Care are exploring ways to estimate data for small geographical areas which can be built up into larger areas to make recent data available more quickly. The assessment has used the downloadable ward level data and the ES will make use of updated ward level data if released by the OHID at that time.
- 18.4.52 The assessment of effects on human health relies on the use of reasonable assumptions, professional judgement, and above guidance to determine the significance of effects.
- 18.4.53 The health and wellbeing assessment partially draws from and builds upon, the technical outputs from the EIA topic Chapters and other related assessments, as a consequence, the assumptions and limitations of those assessments also apply to any information used in this Chapter (e.g. for modelling work undertaken). It is, however, considered that the information available provides a suitable basis for assessment.
- 18.4.54 The baseline includes indicators where data is affected by the COVID-19 pandemic, e.g. in relation to Census 2021 statistics. The baseline is however considered sufficient and robust in evidencing that there are vulnerable population groups with high sensitivity. New data would be unlikely to change the assigned sensitivity conclusions, because a conservative approach has been purposefully adopted in

²⁸ Department of Health and Social Care. Fingertips Public Health Profiles. Local Health. <https://fingertips.phe.org.uk/profile/local-health> [Accessed 27/11/2025].

applying the potential for elevated physical and mental health vulnerability to relevant populations.

18.4.55 The assessment takes a public health approach in reaching population health conclusions. This includes considering the presence of vulnerable population groups, which are composed of vulnerable individuals. However, whilst the presence of such vulnerability is taken into account, it is not the role of the assessment to provide individual level clinical medical outcome analysis at an individual level.

18.4.56 The assessment informs public health stakeholders, decision makers and the public as to the public health implications of the Proposed Development. In so doing the following steps have been taken to allow confidence in the EIA health assessment conclusions:

- Methods are used that triangulate evidence sources and professional perspectives.
- The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence.
- Quantitative inputs for other assessments have been used, which include model validation, as described in other Chapters.
- The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings.
- The health assessment has been transparent in its analysis and follows good practice.

18.4.57 Regarding the application of the precautionary principle in public health, this is discussed by the WHO²⁹. The WHO note how the precautionary principle is a two-stage test, requiring both uncertainty and serious threats to health, i.e. large effect sizes indicated by available evidence. The WHO describe health impact assessments (such as this health assessment) as a “*compass to guide public health decisions under uncertainty*” and that “*a centrepiece of precautionary assessment is environment and health assessment, which weighs the science of hazards and exposure. In this step, evidence of risk and uncertainty is examined to determine the possibility (and plausibility) of a significant health threat and the need for precautionary action.*” Such an approach has been taken by this health

²⁹ World Health Organization, ‘The Precautionary Principle: Protecting Public Health, the Environment and the Future of Our Children’, 2004.

assessment, which considers levels of exposure, extent of the population exposed and the scale of change in relevant risk factors for health outcomes.

18.4.58 Despite the limitations discussed in this section, the assessment is considered to be robust, as outlined on each issue.

18.5 Baseline Conditions

Overview

18.5.1 The health of the population in the human health study areas for the Turbine Area, Bradford West Cable Corridor and Western Access Route is generally similar to, or better than, the England averages.

18.5.2 The health of the population in the Bradford West Substation connection area, and the Eastern Access Route human health study area is generally slightly worse than the national averages, indicating potential for higher general health sensitivity in these areas. Sensitivity is particularly elevated in areas approaching Bradford, notably the Thornton and Allerton Ward and the Park Ward; and near Halifax, the Illingworth and Mixenden wards.

Existing Baseline

18.5.3 The following baseline sets out OHID public health indicators^{Error! Bookmark not defined.} available for small geographic areas (wards). These indicators have been selected as providing a geographically relevant snapshot of population sensitivity. Additional indicators are available at local authority level and therefore have limited relevance to the localised impacts that are the focus of this assessment. The ward level data is considered sufficient to determine the sensitivity of the population, including the presence of vulnerable groups.

18.5.4 The general baseline in this section focuses on indicators for age, life expectancy and preventable mortality, to give an overall picture of health in the populations most likely to be affected by the Proposed Development. Data is presented by the site-specific study areas that are the focus of the assessment. Within the assessment (**Section 18.8**) additional indicators are presented relevant to the discussion of particular determinants of health. Additional baseline data tables taken into account are included in **Appendix 18-1: Baseline Data Tables**.

Table 18-12: General Health

Ward (2021 boundary)	Very good or good health (%)	Very bad or bad health (%)
Turbine Area Human Health study area		
Calder	81.5	5.6
Worth Valley	83.6	4.2

Ward (2021 boundary)	Very good or good health (%)	Very bad or bad health (%)
Boulsworth & Foulridge	83.0	4.0
Briercliffe	82.2	4.9
Cliviger with Worsthorne	82.6	4.8
Average (mean)	82.6	4.7
Bradford West Cable Corridor Human Health study area		
Calder	81.5	5.6
Bingley Rural	82.7	4.7
Worth Valley	83.6	4.2
Average (mean)	82.6	4.8
Bradford West Substation connection Human Health study area		
Thornton and Allerton	79.6	6.4
Bingley Rural	82.7	4.7
Average (mean)	81.2	5.6
Western Access Route Human Health study area		
Boulsworth & Foulridge	83.0	4.0
Worth Valley	83.6	4.2
Average (mean)	83.3	4.1
Eastern Access Route Human Health study area		
Worth Valley	83.6	4.2
Luddendenfoot	81.9	4.8
Illingworth and Mixenden	78.7	6.8
Warley	80.8	5.7
Park	79.2	7.2
Average (mean)	80.8	5.7
Human Health local study area		
Calderdale	80.8	5.7
Pendle	80.4	5.8
Bradford	80.6	6.0
Burnley	78.5	7.0
Human Health regional study area		
North West	80.4	6.2
Yorkshire and The Humber	80.5	5.8
Human Health national study area		
England (main comparator)	82.2	5.2

18.5.5 **Table 18-12** provides data for Census 2021, using 2022 electoral ward boundaries. The data shows that a similar proportion of the population of the Turbine Area, Bradford West Cable Corridor and Western Access Route human health study areas report being in good or very good health compared to the national average. These areas also have fewer people reporting being in bad or very bad health compared to the national average. The baseline indicates potential for lower general health sensitivity in these areas. The remaining category is those people who report as being in 'fair' health.

18.5.6 The data also shows that a slightly smaller proportion of the population of the Bradford West Substation connection and Eastern Access Route human health study areas report being in good or very good health compared to the national average. These areas also have slightly more people reporting being in bad or very bad health compared to the national average. The baseline indicates potential for higher general health sensitivity in these areas.

Table 18-13: Age related vulnerable groups

Ward (2021 boundary)	Aged 0 to 15 (%)	Aged over 65 (%)
Turbine Area Human Health study area		
Calder	16.3	21.2
Worth Valley	15.8	21.5
Boulsworth & Foulridge	16.2	23.9
Briercliffe	16.2	21.7
Cliviger with Worsthorne	12.7	31.9
Average (mean)	15.4	24.0
Bradford West Cable Corridor Human Health study area		
Calder	16.3	21.2
Bingley Rural	17.7	22.9
Worth Valley	15.8	21.5
Average (mean)	16.6	21.9
Bradford West Substation connection Human Health study area		
Thornton and Allerton	23.3	16.1
Bingley Rural	17.7	22.9
Average (mean)	20.5	19.5
Western Access Route Human Health study area		
Boulsworth & Foulridge	16.2	23.9
Worth Valley	15.8	21.5
Average (mean)	16.0	22.7
Eastern Access Route Human Health study area		
Worth Valley	15.8	21.5
Luddendenfoot	16.3	21.9
Illingworth and Mixenden	20.8	18.4
Warley	24.0	15.7
Park	27.7	9.0
Average (mean)	20.9	17.3
Human Health local study area		
Calderdale	19.4	19.0
Pendle	21.4	18.0
Bradford	22.8	15.2
Burnley	20.5	17.9
Human Health regional study area		
North West	18.8	18.7
Yorkshire and The Humber	18.5	19.0

Ward (2021 boundary)	Aged 0 to 15 (%)	Aged over 65 (%)
Human Health national study area		
England (main comparator)	18.5	18.3

- 18.5.7 **Table 18-13** provides data from Census 2021, using 2022 electoral ward boundaries. The data is for 2021 and for the population of children and young people (aged 0-15) and the population of older people (aged over 65). All study areas include vulnerable groups, including related to age. Vulnerability is not dependent on the relative proportion of such groups compared to national averages, as individuals are vulnerable per se. It is however informative to note trends in the distribution of such groups.
- 18.5.8 The data shows slightly fewer young people and more older people as a proportion of the population in the Turbine Area, Bradford West Cable Corridor and Western Access Route human health study areas compared to the national average.
- 18.5.9 The data also shows more young people as a proportion of the population of the Bradford West Substation connection and Eastern Access Route human health study areas compared to the national average. Additionally, the Bradford West Substation connection human health study area has more older people as a proportion of the population compared to the national average, whilst the Eastern Access Route human health study area population has slightly fewer.

Table 18-14: Life expectancy at birth

Ward (2021 boundary)	Female (years)	Male (years)
Turbine Area Human Health study area		
Calder	83.5	81.3
Worth Valley	84.7	80.5
Boulsworth & Foulridge	84.0	80.0
Briercliffe	80.7	78.3
Cliviger with Worsthorne	85.0	81.1
Average (mean)	83.6	80.3
Bradford West Cable Corridor Human Health study area		
Calder	83.5	81.3
Bingley Rural	84.4	80.2
Worth Valley	84.7	80.5
Average (mean)	84.2	80.7

Ward (2021 boundary)	Female (years)	Male (years)
Bradford West Substation connection Human Health study area		
Thornton and Allerton	82.8	78.2
Bingley Rural	84.4	80.2
Average (mean)	83.6	79.2
Western Access Route Human Health study area		
Boulsworth & Foulridge	84.0	80.0
Worth Valley	84.7	80.5
Average (mean)	84.3	80.2
Eastern Access Route Human Health study area		
Worth Valley	84.7	80.5
Luddendenfoot	83.3	79.7
Illingworth and Mixenden	82.2	77.4
Warley	82.0	81.3
Park	77.0	72.5
Average (mean)	81.8	78.3

18.5.10 **Table 18-14** provides data for OHID indicator ID 93283 at 2021 electoral ward level. The data is for the five years between 2016 and 2020 and for male and female gender of all age groups. Life expectancy is a general indicator of pressures on health outcomes that arise from the circumstances, choices and conditions. It measures the number of years a newly born person would be expected to live on average. Geographic variation in this figure indicates underlying pressures on mortality outcomes. National comparator data is not published for this date range, but for 2019 to 2023 female life expectancy was 83.0 years and male life expectancy 79.1 years. Whilst healthy life expectancy is noted as a preferential public health indicator, ward level data for this indicator is not available.

18.5.11 The life expectancy at birth data shows that with the exception of the Eastern Access Route human health study area population, the other human health study areas have similar or better than average life expectancy for both men and women. Wards with notably worse life expectancy than the national average include Briercliffe Ward and Park Ward.

Table 18-15: Mortality from causes considered preventable (aged under 75)

Ward (2021 boundary)	Value (rate per 100)
Turbine Area Human Health study area	
Calder	92.9
Worth Valley	72.3
Boulsworth & Foulridge	94.7
Briercliffe	134.3
Cliviger with Worsthorne	71.6
Average (mean)	93.2
Bradford West Cable Corridor Human Health study area	
Calder	92.9
Bingley Rural	85.5
Worth Valley	72.3
Average (mean)	83.6
Bradford West Substation connection Human Health study area	
Thornton and Allerton	120.6
Bingley Rural	85.5
Average (mean)	103.0
Western Access Route Human Health study area	
Boulsworth & Foulridge	94.7
Worth Valley	72.3
Average (mean)	83.5
Eastern Access Route Human Health study area	
Worth Valley	72.3
Luddendenfoot	91.4
Illingworth and Mixenden	127.0
Warley	117.9
Park	176.7
Average (mean)	117.1

- 18.5.12 **Table 18-15** provides data for OHID indicator ID 93480 at 2021 electoral ward level. The data is for the five years between 2016 and 2020 and for people aged over 75 years old. The indicator shows the public health opportunity to improve the health of the population, i.e. to act on preventable causes that ultimately affect mortality through many complex health impact pathways. This indicator is a general indication of pressures on the health of the population. The data is a standardised rate per 100, where 100 is the national average. Values above 100 show higher early mortality rates than the national average and values below 100 show a lower early mortality rate than the national average.
- 18.5.13 The data shows that preventable mortality rates are lower (better) than the national average, i.e. less than 100, in the Turbine Area, Bradford West Cable Corridor and Western Access Route human health study areas report. The baseline indicates potential for lower general health sensitivity in these areas, although pockets of higher preventable mortality are noted, such as in Briercliffe Ward.
- 18.5.14 The data also shows that preventable mortality rates are higher (worse) than the national average, i.e. greater than 100, in the Bradford West Substation connection and Eastern Access Route human health study areas. The baseline indicates potential for higher general health sensitivity in these areas, notably locations of very high preventable mortality, such as Park Ward.
- 18.5.15 **Figure 18-1** is reproduced from the UK Government index of multiple deprivation (IMD) website under the Open Government Licence v3.0. The Figure shows the distribution of deprivation in the surrounding area. The Figure shows that deprivation is highest in surrounding population centres, including Bradford, Burnley, Halifax and Keighley. The immediate vicinity of the Proposed Development does not show elevated deprivation, although pockets of deprivation are not ruled out.
- 18.5.16 **Figure 18-2** is reproduced from the UK Government IMD website under the Open Government Licence v3.0. The Figure shows the distribution of deprivation relating specifically to the health and disability sub-domain of the IMD. A similar trend is apparent as with the overall IMD indicator. The immediate vicinity of the Proposed Development is shown to have low health deprivation, although pockets of deprivation are not ruled out.

Further Data Collection

- 18.5.17 No additional public health surveys are proposed. Future Public Health Conditions

Collection of Predicted Data

- 18.5.18 The future baseline for public health is determined with reference to official government publications, including by the Chief Medical Officer and the UKHSA. It

would not be proportionate, given the complexities of health pathways across the wider determinants of health, to model future health baselines on an individual project basis at the local level.

Future Baseline

- 18.5.19 Public health data presents a snapshot at a particular time. However, population health is subject to continuing influences at the individual and community level. This includes seasonable variation in communicable illness and physical activity, as well as macro-economic trends in incomes and cost of living affecting spend on health promoting resources and activities.
- 18.5.20 The 2025 Chief Medical Officer report³⁰ sets out the key trends for the population health baseline, including in relation to inequalities. The report summaries that the population has gone through a major demographic change over a century and the proportion of older adults is projected to increase. Rural and coastal areas have a higher proportion of older people than urban areas. Most areas are ageing, but by 2043 the largest proportions of the population aged 85 and over will remain predominantly in rural and coastal areas. The number of older adults will increase more rapidly than the number of people of working age, with changes to the old age dependency ratio. The increase in older adults compared with working age adults will affect most areas. Disease burden increases with age. Multimorbidity (multiple conditions at once) increases with age but is more prevalent in more deprived areas, especially in younger age groups.
- 18.5.21 Climate change may also exacerbate physical and mental health risk factors, particularly around flooding and extremes of temperature. The UKHSA has undertaken a detailed review of the health effects of climate change³¹.
- 18.5.22 The trends discussed in these publications have been reviewed and taken into account by the impact assessment. The trends primarily affect the proportion of the population who are vulnerable, notably due to older age, rurality, deprivation and associated morbidity and mortality risks.
- 18.5.23 The methods for determining vulnerable group sensitivity specifically respond to public health trends. They do this by reflecting the broad presence, rather than specific proportions, of vulnerability factors. This means population sensitivity is reflective of vulnerability per se, e.g. of older people with poor health being in a

³⁰ UK Government, Department of Health and Social Care. Research and analysis. Health trends and variation in England 2025: a Chief Medical Officer report. 25 September 2025. Available online: <https://www.gov.uk/government/publications/health-trends-and-variation-in-england-2025-a-chief-medical-officer-report>

³¹ UK Government, UK Health Security Agency. Health Effects of Climate Change (HECC) in the UK. December 2024. Available online: <https://www.gov.uk/guidance/health-effects-of-climate-change-hecc-report>

relevant group within an area, not whether such characteristics are disproportionately represented in that population compared to national averages. Consequently, an assigned sensitivity score applies to current and future populations. The assessment is therefore robust in taking account of vulnerability that may fluctuate over time.

18.6 Environmental Measures

18.6.1 This section describes details of the environmental measures which have been included within the design of the Proposed Development (as presented in **Chapter 4: The Proposed Development**). These measures are an inherent part of the design of the Proposed Development and have been included to benefit population health and achieve positive effects where possible, as well as avoid, reduce or compensate for the adverse environmental effects of the Proposed Development, including reducing health inequalities.

Construction

The environmental measures included within the design of the Proposed Development, during the construction phase, include:

- Consideration of the layout of wind turbines and substation to reduce landscape and visual effects where possible, including consideration of separation between key receptors (e.g. residents) and wind turbine locations, and the overall composition of turbines when viewed from locations surrounding the Proposed Development;
- Careful consideration of any planting proposals within the Turbine Area and along Access Routes and Bradford West Cable Corridor to complement the local landscape character;
- Locating noise producing activities and design elements away from noise sensitive receptors wherever practicable;
- Temporary infrastructure will be designed to minimise the number of watercourse crossings and encroachments into 50m buffer zones around all mapped water features; and
- The proposed colour of the upper parts of the turbine would be selected to blend with the predominant colour of the sky and have a semi matte finish to minimise reflectivity;

18.6.2 The environmental measures include the objectives of management plans to be adhered to during the construction of the Proposed Development; to achieve

positive effects and/or avoid or reduce adverse effects, such as the use of the following plans:

- Outline Construction Environment Management Plan (oCEMP) (**Appendix 4-2**), including clear communications protocol with the public to reduce health risks associated with project related concern by providing information and advanced warning of particular activities in sensitive locations, logging any concerns and providing feedback on actions taken, for example through a specific community liaison officer role. Temporary measures to minimise the potential effects relevant to particular Aspects such as noise, dust and water quality will also be outlined in the oCEMP (**Appendix 4-2**), such as:
 - Good site practices would be implemented to reduce noise effects such as locating noise producing activities and design elements away from noise sensitive receptors wherever practicable and measures recommended in Section 8 of British Standard 5228, including keeping local residents informed of the proposed working schedule (i.e. times and duration of any abnormally noisy activity that may cause concern); and
 - Temporary drainage measures to ensure that the potential for pollution of surface water runoff is managed and any temporary measures to control flood flows and ensure that flood risk is not increased elsewhere.
 - mitigation measures to control and minimise the generation of dust during the construction phase (to reduce the generation of dust during construction works, and thus exposures to dust).
- Outline Construction Transport Management Plan (oCTMP) (**Appendix 14-2**), including prior notification of any planned road closures, restrictions or road diversions to emergency and healthcare service providers in order to mitigate against unforeseen increases in health-related journey times.
- Outline Public Rights of Way Management Plan (oPROWMP), including prior notification of any planned route closures, restrictions or diversions with the principle of maintaining similar levels of access for the public, to reduce potential for any lasting behavioural change in network usage, including in relation to vulnerable groups.
- Outline Landscape Environmental Management Plan (oLEMP), a plan setting out short term and long-term landscape and ecological objectives for the Proposed Development, including the proposed restoration measures following construction taking account of the surrounding local landscape character.
- Outline Employment Skills and Supply Chain Management Plan (oESSMP) to promote employment opportunities in renewable construction, including

targeted measures to support access to opportunities for local vulnerable groups, e.g. young adults not in education, employment or training (NEET).

- Outline Site Waste Management Plan (oSWMP) for construction will set out the standard good practice measures that will be implemented by the appointed contractor to manage waste generated by the construction of the Proposed Development. This document may form an appendix to the oCEMP (**Appendix 4-2**).

Operation and Maintenance

18.6.3 The environmental measures included within the design of the Proposed Development, during the operation and maintenance phase, include:

- The commitment to comply with the health protection limit values for the public set out for electro-magnetic field (EMF) exposure by the International Commission on Non-ionising Radiation Protection (ICNIRP)^{32, 33} and the Department for Energy and Climate Change (DECC) Voluntary Code of Practice³⁴.
- Turbine Area design relative to any PRoW and public access to common land that has been informed by engineering considerations with regard to public safety to support continuity of surrounding land use. For example, the design principles include avoiding siting turbines or permanent infrastructure next to each other, and directly next to PRoW e.g. the Pennine Way National Trail, and for horse riders (in line with British Horse Guidance), within the topple distance which is the tip height +10% (220m for 200m tip height and 165m for 150m tip height). Furthermore, an assessment for impacts to open land and common land is being undertaken, whereby compensation for any losses will be included in the ES, whilst reducing impacts on PRoW wherever possible as per those related Environmental Design Principles (EDPs) below:
 - So2a: To minimise effects on the Pennine Way, where possible and, where appropriate, to improve that network and other areas of open space including appropriate access to the Pennine Way.
 - So2b: Provide compensation for any common or open access land affected and avoid impacts wherever possible.

³² ICNIRP, 1998. ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (Up To 300 Ghz).

³³ ICNIRP, 2010. ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (1-100 kHz).

³⁴ Department for Energy and Climate Change, 2012. Power Lines: Demonstrating compliance with EMF public exposure guidelines A voluntary Code of Practice.

- Operational noise has been a key consideration throughout the design process to ensure that the final wind turbine layout strikes a balance between maximising the potential for renewable energy while providing appropriate protection of residential amenity.
- Surface water runoff from new impermeably surfaced areas will be managed to ensure that there is no increase in flood risk elsewhere and provide water quality benefits where possible.
- Shadow flicker turbine control system to halt relevant turbines when it detects environmental conditions necessary for Shadow Flicker to occur (i.e. the sun is shining and the wind is blowing).

18.6.4 The environmental measures include the objectives of management plans to be adhered to during the operation (and maintenance) of the Proposed Development; to achieve positive effects and/or avoid or reduce adverse effects, such as the use of the following plans:

- Outline Operational Environmental Management Plan (oOEMP), a plan setting out measures to manage environmental impacts during operation to ensure compliance with environmental regulations best practices and planning requirements such as health and safety procedures that will be implemented on-site and a clear communication protocol with the public to report any potential adverse effects associated with operational activities.
- Operational Noise Management Plan (ONMP), following confirmation of the choice of turbine to be installed onsite to ensure no exceedances to the Site Specific Noise Limits (SSNL) occur. This plan would manage a scheme of low noise operational modes to be used under specific wind conditions, secured as part of the oOEMP.
- OESSMP to promote local green jobs, including targeted measures to support access to opportunities for local vulnerable groups, e.g. young adults not in education, employment or training (NEET).

Decommissioning

18.6.5 The environmental measures include the objectives of management plans to be adhered to during the decommissioning phase of the Proposed Development; to achieve positive effects and/or avoid or reduce adverse effects, such as the use of the following plan:

- Outline Decommissioning Management Plan (oDMP), a plan setting out principal decommissioning activities and the measures that will be implemented to reduce adverse impacts on amenity, traffic or the environment in the

surrounding area, as well as measures to manage the use of PRow and good practice measures mitigation noise and emission effects similar to those included within the oCEMP (**Appendix 4-2**).

Assumptions

- 18.6.6 For the human health assessment, 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 not 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.
- 18.6.7 The human health assessment is informed by the conclusions of the other EIA topic Chapters listed in **paragraph 18.1.3**, and therefore is also on the basis of the assumptions set out in those assessments such as:
- **Chapter 13: Historic Environment** notes that data used to compile the assessment consists of information derived from a variety of sources, only some of which will be directly examined for the purposes of the assessment. The assumption is made that this data, as well as that derived from other secondary sources, is reasonably accurate.
 - **Chapter 15: Noise and Vibration** defines the study area for the operational noise assessment of the onsite substation through the identification of the closest residential noise sensitive receptors to the onsite substation, on the assumption that if noise levels are acceptable at the closest receptors, then they should also be acceptable at more distant locations. Similarly, the noise assessment derives the level of significance for high sensitivity residential receptors only. No other receptor types or lower sensitivities are considered, on the assumption that if noise levels are acceptable for the most sensitive receptors, they will also be acceptable for receptors with lower levels of sensitivity.
 - **Chapter 16: Air Quality** has assumed an approximate 30-month construction period commencing in Quarter 4 2029, and the air quality assessment will consider a peak year of construction within the ES. The Proposed Development is assumed to become operational in 2032 with a 35-year lifespan, and by the decommissioning phase emissions from the vehicle, plant and machinery fleet are assumed to have reduced as a result of improvements in vehicle technology and reduced reliance on fossil fuel combustion engines.

- Chapter 17: Socio-Economics** acknowledges that while economic conditions could change in the period between the time of writing and the construction of the Proposed Development, it is unlikely that the magnitude of impact related to such a change in economic conditions would be of such a scale as to change the conclusions of the assessment.

18.7 Potential Effects Scoped Out

18.7.1 This section lists the effects which are scoped out of the Human Health assessment as they are not considered likely to be significant. This includes the evidence that justifies this approach, as shown in **Table 18-16** below.

Table 18-16: Potential Effects Scoped Out

Effects Scoped Out	Justification	Phase
Health related behaviours - risk taking behaviours	Agreed as scoped out. Scoping Opinion ID 3.11.1 Agreement on the basis that standard health and safety protocols are enforced and secured through relevant plans throughout the construction, operation and decommissioning of the Proposed Development.	All
Health related behaviours - diet and nutrition	Agreed as scoped out Scoping Opinion ID 3.11.2. It is unlikely, as a result of loss of poor-quality agricultural land, to affect the affordability and availability of food locally.	All
Social environment - relocation	Agreed as scoped out Scoping Opinion ID 3.11.3. As per the Scoping Opinion, this issue has been kept under review and there are not changes that would indicate likely significant population health effects.	All
Social environment - community safety	Agreed as scoped out Scoping Opinion ID 3.11.4. Agreement on the basis that mitigation measures including safe working practices are secured through the CEMP and health and safety protocols and working practices that are to be enforced.	All

Effects Scoped Out	Justification	Phase
Social environment - transport	Although not explicitly stating in the Scoping Opinion in relation to Human Health, it was agreed at ID 3.7.1 that providing operational traffic levels remain below the threshold for assessment, this matter can be scoped out. This is consistent with Scoping Report Table 16-4, which scoped out operational transport health effects.	Operation
Economic environment - regeneration	Agreed as scoped out Scoping Opinion ID 3.11.5. The Proposed Development does not involve the demolition or rebuilding of any deprived neighbourhoods.	All
Bio-physical environment – land quality and use	Agreed as scoped out Scoping Opinion ID 3.11.6. Due to low-grade agricultural land, removing this from use during the operational period is unlikely to result in significant effects.	All
Bio-physical environment - air quality	Agreed as scoped out Scoping Opinion ID 3.11.7. Significant effects on human health from traffic and dust emissions are unlikely.	Operation
Institutional and built environment - built environment	Agreed as scoped out Scoping Opinion ID 3.11.8. The Proposed Development does not include changes to utilities for local communities or social infrastructure.	All
Bio-physical environment - radiation	Although not explicitly stating in the Scoping Report or Scoping Opinion, it is the case that construction and decommissioning works would not include using, or making material changes to, active major electrical infrastructure producing electromagnetic field (EMF). Relevant public and occupational safeguards, secured through management plans, would be followed for the temporary electrical equipment used. Electric and magnetic fields strengths reduce	Construction and Decommissioning

Effects Scoped Out	Justification	Phase
	<p>rapidly with distance, often requiring only a few meters separation between the source and receptor, to reach background levels. No ionising radiation sources are proposed. These issues are clarified as scoped out.</p>	
<p>Social environment - Housing</p>	<p>During operation the operational workforce is expected to be much smaller in number and more locally resident than for the construction phase. There is not expected to be a loss of residential housing or permanent loss of outdoor spaces associated with dwellings. Housing effects are therefore clarified as scoped out.</p>	<p>Operation and maintenance</p>
<p>Institutional and built environment - Health and social care services</p>	<p>During operation the majority of operational workers are assumed to be based in the regional area, returning to their usual place of residence when not working. The great majority of healthcare access would therefore be under existing NHS entitlement and triaged as normal use of the 111 service. During operation, the Proposed Development would comply with health and safety legislation in relation to access to first aid and health and safety at work. Any impact on local healthcare services due to the presence of the Proposed Development's workforce is therefore expected to be negligible and within the margins of normal out-of-area access to NHS services, e.g. by people traveling for leisure. This issue is clarified as scoped out as not having the potential for a likely significant population level effect.</p>	<p>Operation and maintenance</p>
<p>Bio-physical environment - Shadow Flicker</p>	<p>Although not explicitly stating in the Scoping Report or Scoping Opinion it is the case that during construction and decommissioning works there</p>	<p>Construction and Decommissioning</p>

Effects Scoped Out	Justification	Phase
	would not be operational turbines. Any shadow flicker effects associated with short-term testing or other activities that turned the blades would not be on a scale to have the potential for a likely significant population health effect. This issue is clarified as scoped out.	
Institutional and built environment - Wider societal infrastructure and resource	Similarly, although not explicitly stating in the Scoping Report or Scoping Opinion it is the case that during construction and decommissioning works there would not be operational turbines, so no renewable energy generation to provide a public health benefit at this stage. This issue is clarified as scoped out.	Construction and Decommissioning
Bio-physical environment - Climate change mitigation and adaptation	Embodied carbon and climate altering pollutant emissions in the construction and decommissioning phase are not of a scale to have the potential for population level health effects associated with climate change. This issue is clarified as scoped out, but the project is undertaking a full life cycle analysis within Chapter 11: Carbon and Climate Change .	Construction and Decommissioning

18.7.2 Where effects have the potential for likely significant effects and are therefore scoped in, they are included in the Preliminary Environmental Assessment below.

18.8 Preliminary Environmental Assessment

18.8.1 This is a preliminary assessment of Likely Significant Effects with the environmental measures referenced in **Section 18.6** in place, but without additional mitigation.

18.8.2 In line with proportionate assessment the determinants of health set out individually in the Scoping Report have been grouped where appropriate to avoid duplication. The public health scope and depth of analysis is unaffected by this presentation. For example, economic environment health determinants relating to ‘employment and income’, ‘education and training’, ‘local business activity’ and ‘connections to jobs’ have been grouped under the heading of ‘Employment, income and training’.

Construction Phase

Open space, leisure and play

- 18.8.3 This section considers the potential population health effects, including effects on health inequalities, of the activities and works undertaken during the construction phase of the Proposed Development, which may have temporary disturbances effects to public rights of way (PRoW) and common land. This section includes consideration of physical and mental health outcomes associated with walking and cycling opportunities and access to the natural environment.
- 18.8.4 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include activities that may temporarily limit public access, including relating to: excavations and earthworks; creating areas of hardstanding; assembly of project structures; creating and using access roads, including junction and highways works; construction compounds; batching plant; borrow pits; cable corridor excavation, horizontal directional drilling and reinstatement; watercourse diversions; and other construction activities. The majority of the Turbine Area is located within Open Access Land, as designated by Natural England. Replacement land for loss of open space will be provided as a result of the construction of the Proposed Development.

Approach

- 18.8.5 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**) consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).
- 18.8.6 The following study areas have informed the Human Health assessment in relation to the potential extent of impacts:
- **Chapter 14: Transport and Access** (see **Figure 6** of **Appendix 14-1: Transport Assessment**);
 - **Chapter 15: Noise and Vibration** (see **Figure 15-1**);
 - **Chapter 16: Air Quality** (see **Figure 16-1** and **16-2**); and
 - **Chapter 17: Socio-Economics and Tourism** (defined as the local regional and national economies of Calderdale, Yorkshire and the Humber and the UK).
- 18.8.7 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.
- Localised effects for the population of the:

- Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Bradford West Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**).

18.8.8 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-17**.

Table 18-17: Child prevalence of obesity

Ward (2021 boundary)	Reception (%)	Year 6 (%)
Turbine Area Human Health study area		
Calder	7.1	15.3
Worth Valley	7.4	19.5
Boulsworth & Foulridge	9.5	13.7
Briercliffe	8.8	25.0
Cliviger with Worsthorpe	9.5	12.5
Average (mean)	8.5	17.2
Bradford West Cable Corridor Human Health study area		
Calder	7.1	15.3
Bingley Rural	7.6	21.7
Worth Valley	7.4	19.5
Average (mean)	7.4	18.8
Bradford West Substation connection Human Health study area		
Thornton and Allerton	12.2	29.6

Ward (2021 boundary)	Reception (%)	Year 6 (%)
Bingley Rural	7.6	21.7
Average (mean)	9.9	25.6
Western Access Route Human Health study area		
Boulsworth & Foulridge	9.5	13.7
Worth Valley	7.4	19.5
Average (mean)	8.4	16.6
Eastern Access Route Human Health study area		
Worth Valley	7.4	19.5
Luddendenfoot	9.4	18.8
Illingworth and Mixenden	6.3	23.2
Warley	10.6	24.8
Park	12.6	28.4
Average (mean)	9.3	22.9

- 18.8.9 **Table 18-17** provides data for OHID indicator IDs 93105 and 93107 at 2021 electoral ward level. The data is a three-year average from 2021 and for children aged 4-5 years old (Reception) and children aged 10-11 years old (Year 6). The national (England) comparators are 9.6% and 22.7% respectively.
- 18.8.10 Only the Bradford West Substation connection human health study area exceeds the national average for Reception prevalence of obesity, driven by an exceedance in Thornton and Allerton Ward, despite better than average (lower) prevalence in Bingley Rural Ward. Park Ward in the eastern access route human health site-specific study area is also noted above the national average for Reception obesity prevalence.
- 18.8.11 For Year 6 obesity prevalence, the data shows below average rates in the Turbine Area, Bradford West Cable Corridor and Western Access Route human health study areas compared to the national average. Conversely Year 6 obesity rates are above the national average in the Bradford West Substation connection and Eastern Access Route human health site-specific study areas, notably in Thornton and Allerton Ward and Park Ward.
- 18.8.12 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Convincing positive relationships are found between the availability and accessibility of places for exercise and recreation and leisure-time physical activity.³⁵
- There is strong evidence that physical activity influences mental health and wellbeing, self-esteem, self-efficacy, physical self-worth, body image satisfaction, resilience, social support, social connection, physical health, pain, and fatigue.³⁶
- For example, a 10% increase in the proportion of green space has been linked to a 3.7% lower risk of depression (merged odds ratio (OR) (95% confidence interval (CI)) = 0.963 (0.948, 0.979)) and 6.2% lower risk of anxiety (merged OR (95% CI) = 0.938 (0.858, 1.025))³⁷.
- Green space exposure is associated with reduced all-cause mortality, mortality from cardiovascular diseases, incidence of diabetes and metabolic syndrome, low birth weight, and mental health improvements. Blue spaces also show positive associations with beneficial health outcomes, including reduced obesity rates and improved psychological well-being³⁸.
- The public value access to green and blue spaces to undertake recreational activities and avoid delay or losing the recreational experience and associated health benefits. The public are willing to pay (WTP) between £5.72 and £15.64 in 2019 value estimates for not postponing or losing an outdoor experience and for walking in local environments under current and improved environmental conditions, respectively. Determining public willingness to pay (WTP) involves estimating the theoretical maximum amount of money an individual is willing to

³⁵ Müller C, Paulsen L, Bucksch J, Wallmann-Sperlich B. Built and natural environment correlates of physical activity of adults living in rural areas: a systematic review. *Int J Behav Nutr Phys Act.* 2024 May 3;21(1):52. doi: 10.1186/s12966-024-01598-3. PMID: 38702772; PMCID: PMC11067138.

³⁶ White RL, Vella S, Biddle S, Sutcliffe J, Guagliano JM, Uddin R, Burgin A, Apostolopoulos M, Nguyen T, Young C, Taylor N, Lilley S, Teychenne M. Physical activity and mental health: a systematic review and best-evidence synthesis of mediation and moderation studies. *Int J Behav Nutr Phys Act.* 2024 Nov 28;21(1):134. doi: 10.1186/s12966-024-01676-6. PMID: 39609855; PMCID: PMC11603721.

³⁷ Liu Z, Chen X, Cui H, Ma Y, Gao N, Li X, Meng X, Lin H, Abudou H, Guo L, Liu Q. Green space exposure on depression and anxiety outcomes: A meta-analysis. *Environ Res.* 2023 Aug 15;231(Pt 3):116303. doi: 10.1016/j.envres.2023.116303. Epub 2023 Jun 1. PMID: 37268208.

³⁸ Wang X, Feng B, Wang J. Green spaces, blue spaces and human health: an updated umbrella review of epidemiological meta-analyses. *Front Public Health.* 2025 May 22;13:1505292. doi: 10.3389/fpubh.2025.1505292. PMID: 40475205; PMCID: PMC12137254.

spend for a product, service, or policy change, rather than any additional charge to individuals. Valuation estimates indicate the public value of improving green and blue spaces ultimately to gain the health benefits of undertaking leisure activities in green and blue spaces.³⁹

18.8.13 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is potential disruption of PRow and access to common land;
- The pathway is behavioural change in levels of usage of such amenities affecting physical and mental health outcomes; and
- Receptors are the study area population, including vulnerable groups.

18.8.14 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children and older people);
- existing poor health (including affecting mobility) or adverse health status (notably being obese);
- low income (limiting access to alternatives); and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.15 As set out in **Chapter 14: Transport and Access**, receptors include:

- Users of the PRow network passing through the Proposed Development; and
- Users of the Pennine Way passing through the Proposed Development.

Population sensitivity

18.8.16 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.17 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that the rural context affords many different

³⁹ Lynch M, Spencer LH, Tudor Edwards R. A Systematic Review Exploring the Economic Valuation of Accessing and Using Green and Blue Spaces to Improve Public Health. *Int J Environ Res Public Health*. 2020 Jun 10;17(11):4142. doi: 10.3390/ijerph17114142. PMID: 32531958; PMCID: PMC7312028.

opportunities to access natural environments and engage in physical activity. For many people the changes due to the Proposed Development would not affect areas of outdoor space or routes that they regularly use and rely on.

18.8.18 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that for some people there will be high reliance on the affected areas and routes with alternatives limited due to geographic, mobility or income factors. Higher sensitivity is also associated with existing poor health or a health state that is a risk factor for poor health, e.g. obesity. For this group the Proposed Development change has greater potential to result in sustained behavioural change.

Defining Impacts (Magnitude)

18.8.19 The residual effect conclusions of **Chapter 14: Transport and Access** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 14: Transport and Access** states that based on peak of construction activities, prior to taking into account mitigation, there is the potential for significant effects in relation to pedestrian delay and Non-motorised User (NMU) amenity. Consequently, **Chapter 14: Transport and Access** sets out a range of measures that are detailed in the oCTMP (**Appendix 14-2**) to address these potentially significant effects. Key measures relevant to human health include the Onsite Access Management Plan (including measures in relation to temporary diversion of PRowS and associated pedestrian, cyclist and horse rider considerations).
- **Chapter 14: Transport and Access**, concludes that there are no significant residual effects associated with construction traffic activity associated with the Proposed Development.

18.8.20 The effect on use of Open Access and Common Land also informs the Human Health assessment. **Chapter 4: The Proposed Development** explains that appropriate compensation land would be provided. Whilst the details are the subject of ongoing consultation and will be reported on further at the ES, the replacement land would appropriately respond to any Open Access and Common Land that becomes 'less advantageous'. The preliminary assessment therefore is on the basis that there would remain the same level of opportunity in relation to open space, leisure and play. This includes the physical and mental health benefits of using PRowS and Open Access and Common Land. The human health assessment takes into account that, even if appropriate PRowS diversions are provided and appropriate replacement land allocated; there remains the potential

for disruption and disturbance that could result in a degree of behavioural change in the population's use of such opportunities.

- 18.8.21 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.
- 18.8.22 This reflects that, for the context, the Proposed Development impact is a small adverse scale of change, for a medium-term duration (and within this short-term at any given location in relation to transitory construction effects), experienced frequently or occasionally depending on behavioural patterns in use of outdoor spaces and PRoW. The implication for population health is that health outcome severity relates to a minor change in morbidity (burden of disease) and quality-of-life risk-factors, notably for cardiovascular and mental wellbeing outcomes, as the predominant influence and this relating to a small minority in the study area population. For most of those affected the influence from this change in risk-factors would immediately reverse once the impact ceased, with no implications for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

- 18.8.23 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.
- 18.8.24 This reflects that taking account of the scientific literature indicating a causal relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2** notably:
- EN-1 section 5.11 (Land Use, Including Open Space, Green Infrastructure, and Green Belt);
 - NPPF Section 8 (Promoting healthy and safe communities), paragraph 103 (open space and recreation) and paragraph 105 (public rights of way);
 - Calderdale Local Plan 2018/19 – 2032/33 policy HW3 Wellbeing (encouraging walking and cycling and inclusive communities); and

- Bradford District Council Core Strategy to 2030 policy EN1: Protection and improvements in provision of Open Space and Recreation Facilities.
- Burnley's Local Plan 2012-2032 Policy SP6: Green Infrastructure

18.8.25 The Proposed Development change would also have a marginal effect the delivery of local health priorities related to obesity, healthy lifestyles and mental health, which are of specific relevance to this health determinant, as referenced in **Section 18.2**.

Additional Mitigation

18.8.26 No additional measures are proposed.

Residual Effects

18.8.27 The population health effect conclusions are unchanged.

Next Steps

18.8.28 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.29 Further design and management plan refinement will be undertaken in relation to Open Access and Common Land, to seek further improvement in relation to public health outcomes.

Transport modes, access and connections

18.8.30 This section considers the potential population health effects, including effects on health inequalities, of construction traffic and highways impacts. This includes: road safety, including active travel along highways; severance within and between communities; and the connections to key public services (notably routine or emergency health related journey travel times).

18.8.31 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include highway improvement works and creation of accesses, construction and formation of internal site access tracks, heavy goods vehicle (HGV) movements and Abnormal Indivisible Loads (AIL).

Approach

18.8.32 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed

Development’s wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.33 The **Chapter 14: Transport and Access** study area (see **Figure 6 of Appendix 14-1: Transport Assessment**) has informed the Human Health assessment in relation to the potential extent of impacts.

18.8.34 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Bradford West Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**)

18.8.35 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-18** and **Table 18-19**.

Table 18-18: Baseline indicators for road safety

Indicator	Local Study Area			National
	Calderdale County level data	Bradford County level data	Lancashire County level data for Burnley and Pendle	England
Killed and seriously injured casualties on England's roads (2024) all ages, crude rate per 1	139.0	214.2	103.8	89.8

Indicator	Local Study Area			National
	Calderdale County level data	Bradford County level data	Lancashire County level data for Burnley and Pendle	England
billion vehicle miles (updated Nov 2025).				

18.8.36 **Table 18-18** shows that in relation to local sensitivity in general, although borough and district level data is not available, county level data indicates that all areas perform worse than the national average in relation to road safety.

Table 18-19: Baseline indicators for access

Indicator	Local Study Area			
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough
Index of Multiple Deprivation 2025 - Barriers to Housing and Services Domain (rank of average rank, where 1 is the most deprived and 296 is the least deprived)	210	193	150	42

18.8.37 **Table 18-19** shows that in relation to local sensitivity in general at the local study area level, only the Pendle area (Western Access Route) indicates potential for access related deprivation, albeit the 2025 IMD indicator is predominantly comprised of housing rather than service-related indicators for this measure. It is taken into account that there will be pockets of higher deprivation within all areas.

18.8.38 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Road traffic accidents are a leading cause of physical injury worldwide, but they also frequently result in post-traumatic stress disorder (PTSD). Nearly half of

road traffic accident survivors experience PTSD within six weeks, with recovery occurring over 1 to 3 years.⁴⁰

- Transportation is a well-documented healthcare barrier, including among vulnerable populations⁴¹, emergency response time⁴², non-urgent care⁴³ and dental care people for people with special health care needs⁴⁴.

18.8.39 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is incidence of HGVs, AILs, highway works or restrictions;
- The pathway is changes in access, road conditions and travel times; and
- Receptors are the study area population, healthcare providers, emergency services, vehicle users and non-motorised road users.

18.8.40 As set out in **Chapter 14: Transport and Access**, receptors include:

- Users of the C682 Lancashire Moor Rd / Two Laws Rd;

⁴⁰ Trajchevska M, Jones CM. Post-Traumatic Stress Disorder (PTSD) Resulting from Road Traffic Accidents (RTA): A Systematic Literature Review. *Int J Environ Res Public Health*. 2025 Jun 23;22(7):985. doi: 10.3390/ijerph22070985. PMID: 40724052; PMCID: PMC12295818.

⁴¹ Starbird LE, DiMaina C, Sun CA, Han HR. A Systematic Review of Interventions to Minimize Transportation Barriers Among People with Chronic Diseases. *J Community Health*. 2019 Apr;44(2):400-411. doi: 10.1007/s10900-018-0572-3. PMID: 30206755; PMCID: PMC6450539.

⁴² Damdin S, Trakulsrichai S, Yuksen C, Sricharoen P, Suttapanit K, Tienpratarn W, Liengswangwong W, Seesuklom S. Effects of Emergency Medical Service Response Time on Survival Rate of Out-of-Hospital Cardiac Arrest Patients: a 5-Year Retrospective Study. *Arch Acad Emerg Med*. 2025 Feb 25;13(1):e36. doi: 10.22037/aaemj.v13i1.2596. PMID: 40352099; PMCID: PMC12065030.

⁴³ Shekelle PG, Begashaw MM, Miake-Lye IM, Booth M, Myers B, Renda A. Effect of interventions for non-emergent medical transportation: a systematic review and meta-analysis. *BMC Public Health*. 2022 Apr 21;22(1):799. doi: 10.1186/s12889-022-13149-1. PMID: 35449011; PMCID: PMC9026972.

⁴⁴ Zare Z, Bahrami MA, Bastani P, Kavosi Z. Oral and dental health utilization determinants in special health care needs: a systematic review of reviews. *BMC Oral Health*. 2024 Aug 20;24(1):965. doi: 10.1186/s12903-024-04734-4. PMID: 39164635; PMCID: PMC11334590.

- Residents of Colne, Cowling and Cross Hills, Keighley, Haworth, Oxenhope, Hebden Bridge, Earby; and
- School users of Christ Church Primary Scholl, Colne.

Population sensitivity

18.8.41 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.42 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children and older people as more frequent healthcare service users, as passengers or as non-motorised road users);
- existing poor health or a health related status accessing routine or urgent appointments;
- low income (limiting access to alternatives); and
- social and geographic disadvantage (including those experiencing existing access barriers and pockets of high deprivation in close proximity).

18.8.43 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that for many people there will be a low reliance on the affected parts of the road network, or low reliance on routine healthcare services, e.g. due to being in good health. Many people will also have a high capacity to adapt to known changes in journey times.

18.8.44 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that for some people the affected routes will be regularly used potentially on a daily basis, including for active travel, connect with other communities and to access healthcare services. Those with less capacity or resources to adapt to access or journey time changes may be more affected. Ambulance service response time is of high sensitivity, albeit delays are reduced by priority when travelling under blue lights. Those with poor health are likely to be more frequent users of routine and emergency healthcare services.

Defining Impacts (Magnitude)

18.8.45 The residual effect conclusions of **Chapter 14: Transport and Access** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

18.8.46 **Chapter 14: Transport and Access** states that based on peak of construction activities, prior to taking into account mitigation, there is it the potential for significant effects in relation to severance, pedestrian delay, Non-motorised User (NMU)

amenity, fear & intimidation, road safety and large loads. Consequently, **Chapter 14: Transport and Access** sets out a range of measures that are detailed in the oCTMP (**Appendix 14-2**) to address these potentially significant effects. Key measures relevant to human health include:

- Approved construction access routes;
- Routes barred for construction traffic;
- The creation of a Traffic Management Group to act as a liaison between the developer and local community;
- Contractor Selection including the requirements to adhere to the Considerate Constructors Scheme (CCS) and Construction Logistics and Community Safety (CLOCS) best practice guidance;
- Onsite Access Management Plan
- Enhanced road signage measures, including signage for AIL deliveries;
- HGV vehicle requirements including identify requirements and data logging;
- A Wear and Tear Agreement with all relevant local highway authorities;
- AIL Traffic Management Plan;
- CTMP management protocol and complaints process, including response times and commitments;
- A liaison process with other future consented projects that may share the access routes; and
- Potential road improvements such as enhanced passing places and corner widening on Cold Edge Road and Nab Water Lane.

18.8.47 Following the application of these secured mitigation measures, **Chapter 14: Transport and Access**, concludes that there are no significant residual effects associated with construction traffic activity associated with the Proposed Development.

18.8.48 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.49 This reflects that, for the context, the Proposed Development impact is a small adverse scale of change, for a medium-term duration (and within this short-term at any given location in relation to transitory construction effects), experienced frequently. The implication for population health is that health outcome severity

relates to a minor change in injury, morbidity and mortality related risk factors, associated with accident and time to healthcare treatment outcomes, as the predominant influence and this relating to a very few people in the study area population. At most there are slight implications for local healthcare service capacity and quality.

18.8.50 It is noted that works within the highway, e.g. to lay cables or improve accesses would follow government guidance on safe provision of road works⁴⁵, as required by the New Roads and Street Works Act 1991.

Preliminary Assessment (Significance)

18.8.51 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.52 This reflects that taking account of the scientific literature indicating a causal relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be very limited, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2** notably:

- EN-1 section 5.14 (transport);
- NPPF Section 8 (promoting healthy and safe communities);
- Calderdale Local Plan 2018/19 – 2032/33 policy HW3 (encouraging walking and cycling and inclusive communities); and
- Bradford District Council Core Strategy to 2030 policy TR3: Public Transport, Cycling and Walking and policy EN1: Protection and improvements in provision of Open Space and Recreation Facilities.

18.8.53 The Proposed Development change would also have a marginal effect on the delivery of local health priorities of general relevance to this health determinant, as referenced in **Section 18.2**.

⁴⁵ Department for Transport. Safety at Street Works and Road Works A Code of Practice (October 2013). ISBN 9780115531453.

Additional Mitigation

- 18.8.54 The following additional measures are proposed to reduce the adverse effect.
- 18.8.55 The final CTMP to include a commitment to early and ongoing notification to ambulance and healthcare service providers in the Human Health local study area of planned temporary road restrictions, e.g. lane or full closures, to allow for alternative emergency and routine routing and service planning.

Residual Effects

- 18.8.56 Taking into account the additional measures proposed, the residual population health effect would be **negligible** adverse, which is **not significant** in EIA terms.

Next Steps

- 18.8.57 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Community identity, culture, resilience and influence

- 18.8.58 This section considers the potential population health effects, including effects on health inequalities, of transient community identity effects directly affecting mental wellbeing, as well as indirectly affecting social participation, interaction and support.
- 18.8.59 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include enabling works, construction compounds, borrow pits, access road creation and infrastructure installation works. This includes temporary construction lighting and temporary changes in views associated with construction activities and works. To avoid double counting the permanent turbines structures and other visible elements of the completed infrastructure are assessed as part of the operational stage.

Approach

- 18.8.60 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.4**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).
- 18.8.61 The following **Chapter 12: Landscape and Visual**, **Chapter 13: Historic Environment** and **Chapter 17: Socio-Economics and Tourism** study areas has informed the Human Health assessment in relation to the potential extent of impacts:

- **Chapter 12: Landscape and Visual** (see **Figure 12-1**); and
- **Chapter 13: Historic Environment**; and
- **Chapter 17: Socio-Economics and Tourism** (defined as the local regional and national economies of Calderdale, Yorkshire and the Humber and the UK).

18.8.62 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**)

18.8.63 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- The landscape has a role in enhancing individual connections with nature and cultural heritage to foster psychological recovery and emotional stability.⁴⁶ Particularly in urban settings, even views of nature from buildings can have benefits.⁴⁷

⁴⁶ Li H, Xue T, Zhang A, Shen J, Luo X, Kong L, Huang G. Impact of urban and cultural landscape heritage on mental health: a systematic review and meta-synthesis. *BMC Public Health*. 2025 Sep 24;25(1):3095. doi: 10.1186/s12889-025-24211-z. PMID: 40993565; PMCID: PMC12462159.

⁴⁷ Soga M, Gaston KJ. Health benefits of viewing nature through windows: A meta-analysis. *Bioscience*. 2025 Jul 4;75(8):628-636. doi: 10.1093/biosci/biaf089. PMID: 40821892; PMCID: PMC12352305.

- Factors associated with physical activity in elderly people include access to nature, aesthetics, accessibility and amenity.⁴⁸
- Annoyance from visual aspects of wind turbines has been investigated and there is increasing evidence that annoyance is lower when people can participate in the process of planning and decision making.⁴⁹

18.8.64 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is visual change in the landscape due to the Proposed Development activities, structures and works;
- The pathway is change in community identity and sense of control mediating effects on wellbeing and behavioural change in accessing the landscape; and
- Receptors are the study area population, particularly those with frequent near views that are affected.

Population sensitivity

18.8.65 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.66 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably older people with longer-term experiences of the landscape);
- existing poor health (including resulting in heightened sensitivity to change);
- low income (included fewer resources to respond to change); and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.67 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that for many people the Proposed Development works and activities would not be visible, or views would be distant or transitory.

⁴⁸ Li, D.; Xu, H.; Kang, Y.; Steemers, K. Systematic Review: Landscape Characteristics Correlated with Physical Activity of the Elderly People. *Land* 2023, 12, 605. <https://doi.org/10.3390/land12030605>

⁴⁹ van Kamp I, van den Berg F. Health Effects Related to Wind Turbine Sound: An Update. *Int J Environ Res Public Health*. 2021 Aug 30;18(17):9133. doi: 10.3390/ijerph18179133. PMID: 34501721; PMCID: PMC8430592.

People who are supportive or ambivalent about the Proposed Development are less likely to consider there to be a change in their sense of community identity to an extent that affects their mental wellbeing or decisions to access outdoor spaces.

- 18.8.68 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that those people with near and frequent views of Proposed Development works or activities are more sensitive. It also includes those people who due to strong attachment to community or landscape, existing poor health, heightened sensitivity to visual change (e.g. associated with neurodiversity) or uncertainty or concern about the change, may be more likely to consider their community identity to have changed, even below levels of visual impact that would typically be considered acceptable.

Defining Impacts (Magnitude)

- 18.8.69 The residual effect conclusions of **Chapter 12: Landscape and Visual**, **Chapter 13: Historic Environment** and **Chapter 17: Socio-Economics and Tourism** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 12: Landscape and Visual**, states that despite the footprint of the Proposed Development being relatively small, there is potential for significant adverse visual effects associated with the Turbine Area and Access Routes given the sensitivities and designations that apply to the landscape. Construction is expected to take approximately 30 months, however the most widespread effect during the construction phase would relate to the tall cranes which are anticipated to be active for only a few months, making this a short-term effect. For the Bradford West Cable Corridor, landscape amenity effects are considered temporary and reversible as the Export Cable is intended to be undergrounded and the site restored to the current baseline following construction. **Chapter 12: Landscape and Visual** concludes that the residual effects on landscape character and amenity (excluding permanent infrastructure considered as operational effects) would be short term and temporary.
- **Chapter 13: Historic Environment** concludes that in relation to historic interests (which includes the Brontë literary associations) no significant residual effects are expected following implementation of additional mitigation measures on buried archaeological remains, with the exception of Vaccary Walls to be reviewed and set out in the ES.
- **Chapter 17: Socio-Economics and Tourism**, states that within the vicinity of the Proposed Development, Top Withens and the Brontë Waterfall and Bridge are walking stops along the Brontë Way. These form part of the broader literary tourism experience for visitors, however, Brontë Country is not a formal

designations. **Chapter 17: Socio-Economics and Tourism** concludes that in relation to tourism there would be no noticeable adverse effects.

18.8.70 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of construction related change is considered to be **negligible**.

18.8.71 This reflects that, for the context, the Proposed Development impact is a very small adverse scale of change (with the permanent infrastructure, including turbines, being assessed at the operational stage to avoid double counting), experienced frequently over a medium-term duration, although noting that within this duration localised and transitory effects would often be short-term and occasional for those experiencing them. The implication for population health is that health outcome severity relates to a very minor change in morbidity (burden of disease) and quality-of-life risk-factors, notably for mental wellbeing outcomes, as the predominant influence and this relating to, at most, a small minority in the study area population, e.g. those with direct near views of construction compounds or development activities. No implications are expected for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.72 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a negligible magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **negligible** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.73 This reflects that taking account of the scientific literature indicating a clear, though subjective, relationship between influences on community identity and changes in health outcomes; the degree of health baseline change is anticipated to be very limited, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have, at most, a marginal effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably:

- EN-1 Section 5.10 (landscape and visual);
- EN-3 Section 2.3; (factors influencing site selection and design)
- NPPF paragraphs 124 (making effective use of land) and 135 (place making);
- Calderdale Local Plan 2018/19 – 2032/33 Policy HW3: Wellbeing; and
- Bradford District Council Core Strategy to 2030 Policy DS5: Safe and Inclusive Places.

18.8.74 The Proposed Development's degree of change would also have, at most, a marginal effect the delivery of local health priorities of general relevance to this health determinant, as referenced in **Section 18.2** including prevention focused public health priorities that promote inclusive and resilient communities.

Additional Mitigation

18.8.75 No additional measures are proposed.

Residual Effects

18.8.76 The population health effect conclusions are unchanged.

Next Steps

18.8.77 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.78 Further design and management plan refinement will be undertaken in relation to localised visual disturbance, including lighting, considerations to seek further improvement in relation to public health outcomes. Community feedback will be reviewed in relation to further information or dialogue processes that can be provided during, or in advance of, construction to reduce risks of adverse impacts on community identity and increase opportunities to promote positive elements of existing community identity, e.g. through information boards along footpaths.

Employment, income and training

18.8.79 This section considers the potential population health effects, including effects on health inequalities, of changes in employment and income during the construction phase of the Proposed Development. The assessment considers opportunities for good quality jobs and training opportunities, which may particularly benefit some vulnerable groups. Potential for some adverse effects on local employment are acknowledged and also taken into account.

Approach

18.8.80 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.81 **Chapter 17: Socio-Economics and Tourism** study area has informed the Human Health assessment in relation to the potential extent of impacts, defined as the local

regional and national economies of Calderdale, Yorkshire and the Humber and the UK.

18.8.82 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**); and
 - Human Health regional study area (see **paragraph 18.4.7**).

18.8.83 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-20**.

Table 18-20: Baseline indicators for Unemployment

Indicator	Local Study Area				National
	Calderdale Metropolitan	City of Bradford Metropolitan	Burnley Borough Council	Pendle Borough	England
Unemployment: people claiming out of work benefit (aged 16 to 64) (2024-25 data) (%)	4.5	7.7	6.3	6.8	4.1
Long-term unemployment: people claiming out of work benefit for over 12 months (aged 16 to 64) (2024-25 data) (%)	0.35	0.78	0.27	0.81	0.51

Table 18-21: Baseline indicators for NEETs

Indicator	Local Study Area			National
	Calderdale County level data	Bradford County level data	Lancashire County level data for Burnley and Pendle	England
16 to 17 year olds not in education, employment or training (NEET) or whose activity is not known (%) (indicator data updated 07 May 2025)	4.3	4.4	5.8	5.4

18.8.84 **Table 18-20** shows that in relation to local sensitivity in general, that unemployment is similar to national averages in Calderdale Metropolitan Borough, with lower (better) than average long-term unemployment. Unemployment is above the national average in City of Bradford Metropolitan District, Burnley Borough Council and Pendle Borough, although Burnley Borough Council has lower (better) than average long-term unemployment. City of Bradford Metropolitan and Pendle Borough are therefore likely to be more sensitive on average and may disproportionately benefit from employment opportunities.

18.8.85 **Table 18-21** shows that in relation to local sensitivity in general, although borough and district level data is not available, county level data indicates that the proportion of NEETs is lower (better) than the national average in Calderdale County and Bradford County but higher (worse) Lancashire County, indicative of data for Burnley and Pendle. As NEETs may discretionally benefit from employment and training opportunities of the Proposed Development, the Lancashire area may be particularly sensitive to such gains.

18.8.86 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Employment is beneficial for health, particularly for depression and general mental health⁵⁰. Unemployment increases the risk of poor mental health

⁵⁰ van der Noordt M, IJzelenberg H, Droomers M, Proper KI. Health effects of employment: a systematic review of prospective studies. *Occup Environ Med.* 2014 Oct;71(10):730-6. doi: 10.1136/oemed-2013-101891. Epub 2014 Feb 20. PMID: 24556535.

outcomes⁵¹ and increased mental health service use⁵². Re-employment may reduce this risk.⁵³

- Higher education and income as consistent predictors of better health-related quality of life among individuals with chronic diseases.⁵⁴
- Lower socioeconomic and educational factors are linked to the risk of cognitive impairment and dementia in later life⁵⁵ and poorer surgical recovery outcomes⁵⁶.

18.8.87 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is direct and indirect employment and training opportunities associated with the Proposed Development;
- The pathway is changes in social status and income spend on health promoting goods and services as mediators of physical and mental health; and

⁵¹ Virgolino A, Costa J, Santos O, Pereira ME, Antunes R, Ambrósio S, Heitor MJ, Vaz Carneiro A. Lost in transition: a systematic review of the association between unemployment and mental health. *J Ment Health*. 2022 Jun;31(3):432-444. doi: 10.1080/09638237.2021.2022615. Epub 2022 Jan 5. PMID: 34983292.

⁵² Li K, Lorgelly P, Jasim S, Morris T, Gomes M. Does a working day keep the doctor away? A critical review of the impact of unemployment and job insecurity on health and social care utilisation. *Eur J Health Econ*. 2023 Mar;24(2):179-186. doi: 10.1007/s10198-022-01468-4. Epub 2022 May 6. PMID: 35522390; PMCID: PMC9985560.

⁵³ Sterud T, Lunde LK, Berg R, Proper KI, Aanesen F. Mental health effects of unemployment and re-employment: a systematic review and meta-analysis of longitudinal studies. *Occup Environ Med*. 2025 Sep 16;82(7):343-353. doi: 10.1136/oemed-2025-110194. PMID: 40930969; PMCID: PMC12505101.

⁵⁴ Kangas T, Milis SL, Vanthomme K, Vandenheede H. The social determinants of health-related quality of life among people with chronic disease: a systematic literature review. *Qual Life Res*. 2025 Sep;34(9):2501-2511. doi: 10.1007/s11136-025-03976-1. Epub 2025 Apr 29. PMID: 40301158; PMCID: PMC12431912.

⁵⁵ Le T, Maharani A, Hayter M, Gilleen J, Lee A. Cognitive impairment and dementia-Are they linked to childhood health and socioeconomic status? A systematic review. *PLoS One*. 2025 Mar 27;20(3):e0311074. doi: 10.1371/journal.pone.0311074. PMID: 40146762; PMCID: PMC11949372.

⁵⁶ Yap ZL, Summers SJ, Grant AR, Moseley GL, Karran EL. The role of the social determinants of health in outcomes of surgery for low back pain: a systematic review and narrative synthesis. *Spine J*. 2022 May;22(5):793-809. doi: 10.1016/j.spinee.2021.11.013. Epub 2021 Nov 27. PMID: 34848343.

- Receptors are the study area population, including working age people and their dependants.

Population sensitivity

18.8.88 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.89 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably young adults early in their careers and children and older people as dependants);
- existing poor health or adverse health status amongst workers or dependants; (including linked with existing unemployment or poor quality employment);
- low income (greater potential for transformational effects for those with existing low pay); and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.90 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that most people will have existing stable employment and training opportunities that are unaffected by the Proposed Development or are a dependant of those with existing stable employment.

18.8.91 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that people with existing poor-quality employment (in relation to working conditions, pay and job stability) or who are unemployed, would be more sensitive to the changes. Young adults early in their careers may particularly benefit from early employment and upskilling opportunities that support them into a stable skilled career. Those who experience high degrees of deprivation or social disadvantage and who are dependants, or future dependants (e.g. future children and older people), of those employed would also be more sensitive.

Defining Impacts (Magnitude)

18.8.92 The residual effect conclusions of **Chapter 17: Socio-Economics and Tourism** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 17: Socio-Economics and Tourism** states the increase in employment and Gross Value Added (GVA) at the local level in Calderdale during the development and construction phase is temporary moderate or large beneficial, whilst at the regional level the effect is temporary neutral or slight

beneficial. The focus of the local employment, and linked GVA, opportunity relates to 'balance of plant', which is the civil works relating to roads, foundations, electrical systems and structures other than the turbines themselves. Local construction jobs in Calderdale are equated to 198 years (i.e. equivalent to 198 full time roles for one year, but in practice spread over the two-and-a-half-year construction period and delivered as a mix of full- and part-time jobs).

18.8.93 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.94 This reflects that, for the local context, the Proposed Development impact is a medium beneficial scale of change, for a medium-term duration, experienced continuously to frequently depending on tasks. The implication for population health is that health outcome severity relates to a minor change in morbidity risk-factors, notably for physical and mental health outcomes linked to socio-economic status and income spend on health promoting goods and activities (including for dependants), as the predominant influence and this relating to a small minority in the study area population. For most of those affected the influence from this change in risk-factors would gradually reverse once employment ceased, although a legacy of upskilling may sustain benefits long-term for some, with slight protective implications for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.95 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** beneficial population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.96 This reflects that taking account of the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes. The degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal beneficial effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably:

- EN-1 Section 4.4 (health) and Section 5.13 (socio-economic); and
- NPPF Section 8 (health) and paragraph 85 (building a strong, competitive economy).

- Calderdale Local Plan 2018/19 – 2032/33 Policy HW1 (promoting and enabling healthy lifestyles).
- Bradford District Council Core Strategy to 2030 Policy EC1 creating a successful and competitive Bradford District economy.
- Pendle Borough Council Core Strategy 2011-2030 Policy WRK 1 Strengthening the Local Economy.

18.8.97 The Proposed Development change would also have a marginal beneficial effect the delivery of local health priorities of general relevance to promoting socio-economic outcomes, as referenced in **Section 18.2**.

Additional Mitigation

18.8.98 The following additional measures to include in the oESSMP are proposed to improve the beneficial effect. As far as reasonably practicable, subject to security checks and minimum requirements, promote access to construction opportunities for vulnerable groups in the Human Health local study area, including Calderdale. For example, advertising and interviewing locally with the view to encouraging applications from young adults not in education employment or training (NEET) and adults who are in long-term unemployment. As appropriate work with local providers to consider if there are inclusive upskilling courses or apprenticeship opportunities to bridge skills gaps for required roles.

Residual Effects

18.8.99 Taking into account the additional measures proposed, the residual population health effect would be **moderate** beneficial, which is significant in EIA terms. Such an outcome is likely to be influential in its benefits for delivering the policies discussed in **paragraph 18.8.96**.

18.8.100 Although the construction industry has higher accident risks on average than other professions⁵⁷, the nature of activities undertaken would not substantially differ from industry norms and health and safety statutory standards would be followed. Consequently, no significant public health implication on healthcare services locally would be expected from promoting localised construction employment.

Next Steps

18.8.101 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any

revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.102 Further refinement will be undertaken in relation to the measures within the oESSMP, to seek further improvement in relation to public health outcomes.

Housing

18.8.103 This section considers the potential population health effects, including effects on health inequalities, of changes in demand for housing due to the accommodation needs of the Proposed Development's construction workforce. This issue therefore focuses on access to existing housing; there is no new housing proposed.

18.8.104 The information reviewed at this preliminary stage indicates that it is unlikely that there would be the potential for significant adverse effects on population health, including for vulnerable groups due to local housing pressures. This includes having regards to the **Chapter 17: Socio-Economics and Tourism** findings in relation to construction effects. The following preliminary information is set out. This determinant of health will be kept under review and further information reported in the Environmental Statement. This includes potential to scope out this health determinant as not having the potential for likely significant public health effects.

Approach

18.8.105 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.106 The **Chapter 17: Socio-Economics and Tourism** study area (defined as the local regional and national economies of Calderdale, Yorkshire and the Humber and the UK) has informed the Human Health assessment in relation to the potential extent of impacts.

18.8.107 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);

- Western Access Route Human Health site-specific study area (see **Table 18-6**); and
- Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**).

18.8.108 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-22**.

Table 18-22: Baseline indicators for housing affordability

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
Affordability of home ownership ⁵⁸	4.6	5.2	3.7	4.6	7.7

18.8.109 In relation to local sensitivity in general, these indicators show that across the local study area housing is on average more affordable than the national average. This is also the case compared to the regional value of 5.8 for both the North West region and Yorkshire and the Humber region.

18.8.110 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Housing quality directly affects physical and mental health⁵⁹. This includes considerations in relation to sufficient space, with overcrowding linked to respiratory infections and poor mental health outcomes such as stress and

⁵⁸ Ratio of median house price to median gross annual residence-based earnings (A higher ratio indicates that on average, it is less affordable for a resident to purchase a house in their local authority district).

⁵⁹ Janet Ige et al., 'The Relationship between Buildings and Health: A Systematic Review', *Journal of Public Health* 41, no. 2 (1 June 2019): e121–32, <https://doi.org/10.1093/pubmed/fdy138>.

depression⁶⁰. It also includes effects associated with mould and damp⁶¹, noise⁶², thermal comfort⁶³ and lighting⁶⁴.

- A key feature of healthy housing is being adaptable, so as to meet the needs of residents at different stages of their life, including managing disability, reducing falls and injuries and promoting better quality of life⁶⁵. Housing insecurity has a profound impact on children and young people⁶⁶. Housing pressures can also affect health and social care key workers⁶⁷.

⁶⁰ H Shannon et al., 'Web Annex A. Report of the Systematic Review on the Effect of Household Crowding on Health. In: WHO Housing and Health Guidelines.' (World Health Organization, 2018).

⁶¹ Adekunle Gregory Fakunle et al., 'Association of Indoor Microbial Aerosols with Respiratory Symptoms among Under-Five Children: A Systematic Review and Meta-Analysis', *Environmental Health* 20, no. 1 (1 July 2021): 77, <https://doi.org/10.1186/s12940-021-00759-2>.

⁶² Ang Li et al., 'Environmental Noise Exposure and Mental Health: Evidence From a Population-Based Longitudinal Study', *American Journal of Preventive Medicine* 63, no. 2 (1 August 2022): e39–48, <https://doi.org/10.1016/j.amepre.2022.02.020>; Eulalia Peris and Benjamin Fenech, 'Associations and Effect Modification between Transportation Noise, Self-Reported Response to Noise and the Wider Determinants of Health: A Narrative Synthesis of the Literature', *Sci. Total Environ.* 748 (15 December 2020): 141040, <https://doi.org/10.1016/j.scitotenv.2020.141040>

⁶³ Ige J, Pilkington P, Orme J, Williams B, Prestwood E, Black D, Carmichael L, Scally G. The relationship between buildings and health: a systematic review. *J Public Health (Oxf)*. 2019 Jun 1;41(2):e121-e132. doi: 10.1093/pubmed/fdy138. PMID: 30137569; PMCID: PMC6645246.

⁶⁴ Mary Jean Brown and David E. Jacobs, 'Residential Light and Risk for Depression and Falls: Results from the LARES Study of Eight European Cities', *Public Health Reports* 126, no. 1_suppl (May 2011): 131–40, <https://doi.org/10.1177/00333549111260S117>.

⁶⁵ MacLachlan et al., 'Report of the Systematic Review on Potential Benefits of Accessible Home Environments for People with Functional Impairments - Web Annex F. In: WHO Housing and Health Guidelines.' (World Health Organization, 2018), <https://iris.who.int/bitstream/handle/10665/275844/WHO-CED-PHE-18-07-eng.pdf>

⁶⁶ Hock ES, Blank L, Fairbrother H, Clowes M, Cuevas DC, Booth A, Clair A, Goyder E. Exploring the impact of housing insecurity on the health and wellbeing of children and young people in the United Kingdom: a qualitative systematic review. *BMC Public Health*. 2024 Sep 9;24(1):2453. doi: 10.1186/s12889-024-19735-9. PMID: 39251944; PMCID: PMC11385840.

⁶⁷ Cantrell A, Chambers D, Booth A. Interventions to minimise hospital winter pressures related to discharge planning and integrated care: a rapid mapping review of UK evidence. Appendix 6 Changing community provision tables. *Health Soc Care Deliv Res*. 2024 Sep;12(31):1-116. doi: 10.3310/KRWH4301. PMID: 39267416.

18.8.111 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is availability of good quality affordable housing;
- The pathway is demand generated by the presence of a workforce may place pressure on local housing markets; and
- Receptors are the study area population, including residents and key workers.

Population sensitivity

18.8.112 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.113 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children and older people);
- existing poor health (including affecting mobility and need for adaptable homes);
- low income (limiting access to good quality housing locally); and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.114 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that most people will be in existing housing that is unaffected by any impacts on demand associated with the Proposed Development.

18.8.115 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that there will be some groups, such as those on low incomes or with existing poor health, as well as their dependants, where housing pressures may exacerbate existing housing access challenges, including those seeking to stay locally to benefit from informal care and support networks. Health and social care key workers are also considered more sensitive in relation to their permanent and temporary accommodation needs.

Defining Impacts (Magnitude)

- 18.8.116 Further assessment of workforce profile and accommodation impacts will be undertaken at the ES stage within the Socio-economics and Tourism assessment. The Health assessment will review that data when available.

Preliminary Assessment (Significance)

- 18.8.117 No preliminary assessment for health has been undertaken at this stage and this will be considered in the ES. However, at this stage significant effects cannot be ruled out.

Next Steps

- 18.8.118 The assessment of population health effects of changes in demand for housing due to the accommodation needs of the Proposed Development's construction workforce will be kept under review and further reported on in the ES. This may include that in line with proportionate assessment this health determinant is scoped out as not having the potential for likely significant public health effects.

Health and social care services

- 18.8.119 This section considers the potential population health effects, including effects on health inequalities, of changes in demand for healthcare due to the presence of the Proposed Development's construction workforce. This issue therefore focuses on access to existing healthcare, including primary care and emergency department usage. Health service capacity may be affected by a non-permanent UK population in the area. These are people who are not usually resident in the area (so not registered with local NHS services).
- 18.8.120 The information reviewed at this preliminary stage indicates that it is unlikely that there would be the potential for significant adverse effects on population health, including for vulnerable groups due to local healthcare pressures. This includes having regards to the **Chapter 17: Socio-Economics and Tourism** findings in relation to construction effects. The following preliminary information is set out. This determinant of health will be kept under review and further information reported in the Environmental Statement. This includes potential to scope out this health determinant as not having the potential for likely significant public health effects.

Approach

- 18.8.121 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.122 The following **Chapter 17: Socio-Economics and Tourism** study area has informed the Human Health assessment in relation to the potential extent of impacts, defined as the local regional and national economies of Calderdale, Yorkshire and the Humber and the UK.

18.8.123 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**).

18.8.124 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-23**.

Table 18-23: Emergency hospital admissions: all causes

Ward (2021 boundary)	Value (%)
Turbine Area Human Health site-specific study area	
Calder	84.0
Worth Valley	109.0
Boulsworth & Foulridge	84.8
Briercliffe	105.9
Cliviger with Worsthorne	73.7
Average (mean)	91.5
Cable Corridor Human Health site-specific study area	
Calder	84.0

Ward (2021 boundary)	Value (%)
Bingley Rural	105.8
Worth Valley	109.0
Average (mean)	99.6
Bradford West Substation connection Human Health site-specific study area	
Thornton and Allerton	135.9
Bingley Rural	105.8
Average (mean)	120.9
Western Access Route Human Health site-specific study area	
Boulsworth & Foulridge	84.8
Worth Valley	109.0
Average (mean)	96.9
Eastern Access Route Human Health site-specific study area	
Worth Valley	109.0
Luddendenfoot	86.5
Illingworth and Mixenden	125.6
Warley	116.3
Park	168.0
Average (mean)	121.1

18.8.125 **Table 18-23** provides data for OHID indicator ID 93227 at 2021 electoral ward level. The data is for the five years between 2016 and 2020 and for all age groups. The data is a standardised rate per 100, where 100 is the national average. Values above 100 show a higher admissions rate than the national average and values below 100 are a lower admissions rate than the national average. The data provides an indication of pressures on emergency departments (EDs) (commonly referred to as Accident and Emergency, or “A&E”). The data shows that the Turbine Area, Western Access Route and Cable Corridor human health site-specific study area have hospital admissions below the national average. While the Bradford West Substation and Eastern Access Route human health site-specific study areas have the highest percentage of hospital admissions locally and sit higher than the national average of 100; in the latter case these admissions are driven by 168 admissions per 100 in Park Ward.

18.8.126 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- GP access varies substantially throughout England, though socially deprived areas do not have poorer spatial access to GPs⁶⁸. The mean distance to the nearest GP surgery is 1.2 km. The mean distance to the chosen GP surgery, accounting for quality considerations, is 1.9 km. 91.9% of residents in rural areas choose a practice within 7 km and 91.5% of those in urban areas choose a practice within 3 km⁶⁹.
- In September 2022 there were one FTE GP per 2,215 patients in England a 15% reduction in the GP to patient ratio since 2015⁷⁰. As of August 2025, the average number of patients cared for by each fully qualified FTE GP is 2,247⁷¹.
- Trends in the organisational structure, workforce and recorded appointments in English general practice show that in the last decade, within the context of a growing and ageing population, there has been a shift towards fewer but larger organisations and more multidisciplinary teams with fewer qualified FTE GPs per 1000 patients⁷⁰.
- Attendances at ED by patients who could have been treated in primary care increase waiting times and costs in EDs and may reduce quality of care⁷²,

⁶⁸ Bauer J, Müller R, Brüggmann D, Groneberg DA. Spatial Accessibility of Primary Care in England: A Cross-Sectional Study Using a Floating Catchment Area Method. *Health Serv Res.* 2018 Jun;53(3):1957-1978. doi: 10.1111/1475-6773.12731. Epub 2017 Jul 7. PMID: 28685827; PMCID: PMC5980177.

⁶⁹ Santos R, Gravelle H, Propper C. Does Quality Affect Patients' Choice of Doctor? Evidence from England. *Econ J (London).* 2017 Mar;127(600):445-494. doi: 10.1111/eoj.12282. Epub 2016 Feb 23. PMID: 28356602; PMCID: PMC5349292.

⁷⁰ Pettigrew LM, Petersen I, Mays N, et al. The changing shape of English general practice: a retrospective longitudinal study using national datasets describing trends in organisational structure, workforce and recorded appointments. *BMJ Open* 2024;14:e081535. doi: 10.1136/bmjopen-2023-081535

⁷¹ Royal College of General Practitioners. Key general practice statistics for England. Last updated: Thursday 9 October 2025. Patients and Workload in General Practice Data, Figure 2. <https://www.rcgp.org.uk/representing-you/key-statistics-insights>

⁷² Carter EJ, Pouch SM, Larson EL. The relationship between emergency department crowding and patient outcomes: a systematic review. *J Nurs Scholarsh.* 2014 Mar;46(2):106-15. doi: 10.1111/jnu.12055. Epub 2013 Dec 19. PMID: 24354886; PMCID: PMC4033834.

including due to pressure on NHS staff⁷³. In England 9.3 % of ED attendances are non-urgent and 21.8 % of ED attendances are clinically inappropriate, both definitions of avoidable use. Greater primary care accessibility is associated with lower rates of avoidable hospitalisation⁷⁴. GPs with higher same-day appointments for patients are associated with lower avoidable use of EDs⁷⁵. Limited evidence suggests that emergency nurse practitioners in community settings and community health centres may reduce ED attendance⁷⁶. Mobile mental health clinics for patients with barriers to attending traditional mental health services may also be effective in reducing ED attendance⁷⁷. Quality of primary care itself has a limited effect on ED attendance, with 2.4% of ED attendances associated with low levels of primary care quality⁷⁸. Variations in the number of patients per FTE GP do not necessarily mean that some practices have more capacity than others.⁷⁹

- With regards workforce healthcare service use, workplace culture has a significant effect on health and safety⁸⁰. With regards public healthcare service

⁷³ Hall LH, Johnson J, Watt I, Tsipa A, O'Connor DB. Healthcare Staff Wellbeing, Burnout, and Patient Safety: A Systematic Review. *PLoS One*. 2016 Jul 8;11(7):e0159015. doi: 10.1371/journal.pone.0159015. PMID: 27391946; PMCID: PMC4938539.

⁷⁴ Rosano A, Loha CA, Falvo R, van der Zee J, Ricciardi W, Guasticchi G, de Belvis AG. The relationship between avoidable hospitalization and accessibility to primary care: a systematic review. *Eur J Public Health*. 2013 Jun;23(3):356-60. doi: 10.1093/eurpub/cks053. Epub 2012 May 29. PMID: 22645236.

⁷⁵ Jamieson T, Gravelle H, Santos R. Availability of primary care and avoidable attendance at English emergency departments: A regression analysis. *Health Policy*. 2025 Jul;157:105330. doi: 10.1016/j.healthpol.2025.105330. Epub 2025 Apr 24. PMID: 40319669.

⁷⁶ Ismail SA, Gibbons DC, Gnani S. Reducing inappropriate accident and emergency department attendances: a systematic review of primary care service interventions. *Br J Gen Pract*. 2013 Dec;63(617):e813-20. doi: 10.3399/bjgp13X675395. PMID: 24351497; PMCID: PMC3839390.

⁷⁷ Weissinger AC, Burns R, Campbell NJ. Evaluating Emergency Department Utilization for Mobile Mental Health Patients: A Correlational Retrospective Analysis. *J Am Psychiatr Nurses Assoc*. 2021 Sep-Oct;27(5):383-389. doi: 10.1177/1078390320916236. Epub 2020 Apr 13. PMID: 32281904.

⁷⁸ Parkinson B, Meacock R, Checkland K, et al How sensitive are avoidable emergency department attendances to primary care quality? Retrospective observational study *BMJ Quality & Safety* 2021;30:884-892.

⁷⁹ Monitor. Improving GP services: commissioners and patient choice. June 2015. https://assets.publishing.service.gov.uk/media/5a7f96f2ed915d74e33f75d6/GP_services.pdf

⁸⁰ Flynn JP, Gascon G, Doyle S, Matson Koffman DM, Saringer C, Grossmeier J, Tivnan V, Terry P. Supporting a Culture of Health in the Workplace: A Review of Evidence-Based Elements. *Am J Health Promot*. 2018 Nov;32(8):1755-1788. doi: 10.1177/0890117118761887. Epub 2018 May 28. PMID: 29806469.

use linked to proximity to relevant infrastructure, research finds no consistent associations between health risks and living near wind turbines.⁸¹

18.8.127 A search of GP surgeries in proximity to the postcode HX7 7AW (selected as representative of the Turbine Area as a central location from which to base analysis) identified the locations set out in **Table 18-24**. This applies the 7km (4.3 miles) identified in the literature as the distance in a rural context that 91.9% of residents in rural areas choose a practice within.

Table 18-24: GP practice data

Practice name	Address	Distance	Patients	FTE GPs	Ratio of Patients to FTE GPs
Hebden Bridge Group Practice - Valley Medical Centre (practice code B84004)	Valley Road, Hebden Bridge, West Yorkshire, HX7 7BZ	1.4 miles away	18,578	11.92	1,559 patients per GP
Hebden Bridge Group Practice - Grange Dene Medical Centre (practice code B84004)	Burnley Road, Mytholmroyd, Halifax, Hebden Bridge, West Yorkshire, HX7 5LF	2.8 miles away	Data within Hebden Bridge Group Practice.		
Todmorden Group Practice (practice code B84006)	Lower George Street, Todmorden, West Yorkshire, OL14 5RN	3.9 miles away	16,042	5.66	2,833 patients per GP
Hebden Bridge Group Practice - Luddendenfoot Health Centre (practice code B84004)	Kershaw Drive, Luddendenfoot, Halifax, West Yorkshire, HX2 6PD	4.3 miles away	Data within Hebden Bridge Group Practice.		

18.8.128 As shown in **Table 18-24** whilst the Todmorden Group Practice has a high patient to FTE GP ratio, the Hebden Bridge Group Practice operates three sites

⁸¹ Baliatsas, Christos & Yzermans, Joris & Hooiveld, M. & Kenens, Raymond & Spreeuwenberg, Peter & van Kamp, Irene & Dückers, Michel. (2025). Health problems near wind turbines: A nationwide epidemiological study based on primary healthcare data. *Renewable and Sustainable Energy Reviews*. 216. 10.1016/j.rser.2025.115642.

within the area and has an average of 1,559 patients per GP which is within the recommended patient to GP ratio of 1,800 patients per FTE GP (a commonly applied benchmark that is indicative but often exceeded in practice⁸²). It is noted that the 1,800 patients per GP is potentially becoming outdated as a benchmark, as average rates are typically in excess of this value. A benchmark ratio of one FTE GP per 2,000 patients is considered a more appropriate benchmark for assessment purposes and indicates a point at which quality of care is likely to be affected⁸³.

18.8.129 The nearest ED (A&E)²² is Calderdale Royal Hospital, 8.1 miles from indicative postcode HX7 7AW. Other EDs include Airedale General Hospital (10.1 miles away) and Bradford Royal Infirmary (10.3 miles away).

18.8.130 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is demand for healthcare services by Proposed Development workers who are away from their usual place of NHS registration, or healthcare use by the public due to project impacts;
- The pathway is change in capacity, staffing and resources of the local NHS; and
- Receptors are the study area population as patients and staff of healthcare services.

Population sensitivity

18.8.131 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.132 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children, including pregnant mothers, and older people as higher users of services);

⁸² London's Healthy Urban Development Unit (HUDU) uses the 1,800 people per GP as a default benchmark, based on guidance from the Royal College of GPs. HUDU Planning Contribution Model Guidance Notes. October 2009.

<https://www.healthyurbandevelopment.nhs.uk/wp-content/uploads/2013/03/GuidanceNotes-2009.pdf>

⁸³ van den Hombergh P, Campbell S. Is 'practice size' the key to quality of care? Br J Gen Pract. 2013 Sep;63(614):459-60. doi: 10.3399/bjgp13X671498. PMID: 23998813; PMCID: PMC3750771.

- existing poor health or a health status with higher user of services (including multimorbidity associated with older age and higher deprivation); and
- social and geographic disadvantage (notably existing barriers in healthcare access).

18.8.133 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that a large proportion of workers would make use of healthcare services with which they are already registered close to their usual place of residence. This is particularly the case for routine appointments, including checkups, screening services, vaccinations and routine dentistry. It also reflects that a large proportion of the study area population are not frequent users of healthcare services and so any temporary additional demand would be unlikely to affect their healthcare service experience. Local healthcare services will also already be providing services for some people who are out of their usual area from a variety of reasons, including leisure or work. Such usage is part of routine NHS strategic service planning and factored into service resilience.

18.8.134 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that some people will make frequent use of healthcare services and so be more affected by any changes in the capacity of those services, e.g. those with long-term conditions requiring frequent reviews or interventions. Patients requiring emergency care are considered of high sensitivity. Health, social care and allied profession staff who experience increased pressures due to additional demand are also considered more sensitive.

Defining Impacts (Magnitude)

18.8.135 Further assessment of the construction workforce profile will be undertaken at the ES stage within the Socio-economics and Tourism assessment. The composition of the Proposed Development's construction workforce, particularly people who are not usually resident in the area (so not registered with local NHS services), will inform the expected change in demand for healthcare and associated population health effects. The health assessment will review that data when available.

Preliminary Assessment (Significance)

18.8.136 No preliminary assessment for health has been undertaken at this stage. This will be considered further within the ES. However, at this stage significant effects cannot be ruled out.

Next Steps

The assessment of population health effects of changes in demand for healthcare due to the composition of the construction workforce will be kept under review and further reported on in the ES.

Air quality

18.8.137 This section considers the potential population health effects, including effects on health inequalities, of emissions generated by the Proposed Development, including UK statutory health protection standards and non-threshold health effects (effects even below these standards).

18.8.138 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include activities relating to excavations and earthworks; creating areas of hardstanding; assembly of project structures; creating and using access roads, including junction and highways works; construction compounds; batching plant; borrow pits; cable corridor excavation, horizontal directional drilling and reinstatement; watercourse diversions; and other construction activities.

Approach

18.8.139 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.140 The **Chapter 16: Air Quality** study area for construction dust and plant emissions and study area for road traffic emissions (see **Figure 16-1** and **Figure 16-2**) have informed the Human Health assessment in relation to the potential extent of impacts.

18.8.141 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);

- Western Access Route Human Health site-specific study area (see **Table 18-6**); and
- Eastern Access Route Human Health site-specific study area (see **Table 18-7**).

18.8.142 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-25**. These indicators are not available at the site-specific geographic resolution so the district and borough level data is used.

Table 18-25: Baseline indicators for air quality

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
Air pollution: estimated fraction of mortality attributable to particulate air pollution (%). ⁸⁴	5.0	5.2	4.8	4.6	5.2

18.8.143 In relation to local sensitivity in general, these indicators show that baseline air pollution related mortality is likely to be similar to or less than national averages. This is also consistent with regional averages of 5.1% for Yorkshire and the Humber and 4.9% for the North West.

18.8.144 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- The literature on air quality and health is well advanced. Poor air quality is linked to multiple adverse health outcomes, including liver disease⁸⁵, cognitive

⁸⁴ Fraction of annual all cause adult mortality attributable to particulate air pollution (measured as fine particulate matter, PM_{2.5}). 2023 data (updated February 2025).

⁸⁵ Gao S, Tian L, Zeng Y, Wang H, Yu Y. A meta-analysis and systematic review on the association between air pollution and chronic liver diseases. *Nanotoxicology*. 2025 Sep;19(6):589-612. doi: 10.1080/17435390.2025.2565212. Epub 2025 Sep 29. PMID: 41021442.

outcomes^{86, 87}, reduced lung function^{88, 89}, chronic obstructive pulmonary disease (COPD)⁹⁰, ischemic heart disease⁹¹, asthma exacerbation^{92, 93}, and cardiovascular disease⁹⁴.

⁸⁶ Geto AK, Feleke SF, Yimer A, Kidie AA, Tesfa NA, Mislu E, Yesuf HA, Hailu M, Ayal BG. The association between air pollution and cognitive impairment: a systematic review and meta-analysis of global studies. *BMC Public Health*. 2025 Oct 21;25(1):3548. doi: 10.1186/s12889-025-24560-9. PMID: 41121001; PMCID: PMC12538874.

⁸⁷ Best Rogowski CB, Bredell C, Shi Y, Tien-Smith A, Szybka M, Fung KW, Hong L, Phillips V, Jovanovic Andersen Z, Sharp SJ, Woodcock J, Brayne C, Navaratnam A, Khreis H. Long-term air pollution exposure and incident dementia: a systematic review and meta-analysis. *Lancet Planet Health*. 2025 Jul;9(7):101266. doi: 10.1016/S2542-5196(25)00118.4. Epub 2025 Jul 24. PMID: 40716448.

⁸⁸ Josa-Culleré A, Cakmak-Onal A, Gimeno-Santos E, Alcaraz-Serrano V, Buekers J, Delgado-Ortiz L, Marin A, Rodríguez-Chiaradia DA, Garcia-Aymerich J, Rivas I, Koch S. Effects of the inhaled dose of air pollution on health: a systematic review. *Eur Respir Rev*. 2025 Sep 26;34(177):250042. doi: 10.1183/16000617.0042-2025. PMID: 41005809; PMCID: PMC12464717.

⁸⁹ Gross A, Tham R, Dharmage SC, Rööslü M, Frey U, Gorlanova O. Exposure to long-term ambient air pollution and lung function in adults: a systematic review and meta-analysis. *Eur Respir Rev*. 2025 Jun 11;34(176):240264. doi: 10.1183/16000617.0264-2024. PMID: 40500128; PMCID: PMC12152583.

⁹⁰ Wang T, Liang M, Ye X, Huang X, Chen H, He X, Xie M, Xie X, Jiang X, Chen Z, Xie B, Zeng Y, Xie X. Ambient air pollution exposure, mediating biomarkers and risk of COPD: a cohort study and meta-analysis. *Eur Respir Rev*. 2025 Sep 3;34(177):250055. doi: 10.1183/16000617.0055-2025. PMID: 40903047; PMCID: PMC12406020.

⁹¹ Maimaitiniyazi M, Haibier A, Maimaitiniyazi M, Maisuti M, Aihaiti A, Yisimiti T, Nijjati M. Outdoor air pollution and hospitalizations for ischemic heart disease: a systematic review and meta-analysis. *Front Public Health*. 2025 Aug 5;13:1643134. doi: 10.3389/fpubh.2025.1643134. Erratum in: *Front Public Health*. 2025 Oct 17;13:1712503. doi: 10.3389/fpubh.2025.1712503. PMID: 40837958; PMCID: PMC12361193.

⁹² Gudziunaite S, Mackintosh KA, Davies GA, Jordan KA, Lewis PD, Griffiths CJ, Alexander Swain T, McNarry MA. Global Trends in the Relationship Between Chronic Air Pollution Exposure, Physical Activity and Lung Function in Youth Aged 5-18 Years With and Without Asthma: A Systematic Review. *Sports Med Open*. 2025 May 21;11(1):57. doi: 10.1186/s40798-025-00856-3. PMID: 40399510; PMCID: PMC12095106.

⁹³ Lee S, Tian D, He R, Cragg JJ, Carlsten C, Giang A, Gill PK, Johnson KM, Brigham E. Ambient air pollution exposure and adult asthma incidence: a systematic review and meta-analysis. *Lancet Planet Health*. 2024 Dec;8(12):e1065-e1078. doi: 10.1016/S2542-5196(24)00279-1. PMID: 39674196.

⁹⁴ Islam F, Nukala SK, Shrestha P, Badgery-Parker T, Foo F. Air pollution and cardiovascular disease: a systematic review of the effects of air pollution,

- Air quality related health effects may be exacerbated by elevated temperatures⁹⁵, with implications for climate change.
- However, even in areas of elevated air pollution increasing physical activity has an overall beneficial effect on mortality risk outcomes⁹⁶.
- WHO air quality guidelines⁹⁷ set out recommendations on air pollutant target levels. Section 6.3.1 of the WHO publication acknowledges that acceptable levels of air pollution in a country will, in addition to the science on health outcomes, also relate to economic, technological feasibility, and sociopolitical factors. The HRAPIE-2 study⁹⁸ with updated concentration–response functions for health risk assessment of air pollution is noted and taken into account.

18.8.145 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is emissions to air due to the Proposed Development, including gases, vapours, dusts, particulates and aerosols, notably nitrogen dioxide (NO₂) and fine particulate matter (PM_{2.5} and PM₁₀), as well as mobilisation of any contaminated dusts encountered;
- The pathway is diffusion and dispersion through the air; and

including bushfire smoke, on cardiovascular disease. *Am Heart J Plus*. 2025 Apr 19;54:100546. doi: 10.1016/j.ahjo.2025.100546. PMID: 40322276; PMCID: PMC12049817.

⁹⁵ Rackow B, König HH, Wall M, Konnopka C. The interaction between air pollution, weather conditions, and health risks: a systematic review. *Sci Total Environ*. 2025 Sep 20;996:180080. doi: 10.1016/j.scitotenv.2025.180080. Epub 2025 Jul 31. PMID: 40749248.

⁹⁶ Martin L, Nasir H, Bagheri R, Ugbohue UC, Laporte C, Baker JS, Gu Y, Zak M, Duclos M, Dutheil F. Physical Activity, Air Pollution, and Mortality: A Systematic Review and Meta-analysis. *Sports Med Open*. 2025 Apr 7;11(1):35. doi: 10.1186/s40798-025-00830-z. PMID: 40192932; PMCID: PMC11977067.

⁹⁷ World Health Organization (2021). Global air quality guidelines. Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide.

⁹⁸ Health risks of air pollution in Europe: HRAPIE-2 project: updated guidance on concentration–response functions for health risk assessment of air pollution in the WHO European Region. Copenhagen: WHO Regional Office for Europe; 2025. Licence: CC BY-NC-SA 3.0 IGO.

- Receptors are the study area population, including frequent users of outdoor spaces in proximity to sources and long-term occupants of community buildings in proximity to sources.

Population sensitivity

18.8.146 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.147 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children and older people);
- existing poor health or health status relating to respiratory conditions; and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.148 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that a large proportion of people will be in generally good health and live, work or engage in leisure or other pursuits at a distance from air pollution sources at which high degree of dispersion would operate, such that the exposures are negligible, even accounting for non-threshold effects.

18.8.149 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that for some people existing respiratory conditions (e.g. asthma or COPD), general poor health or characteristics such as being frail elderly or young age (with developing lungs, higher breathing rates to bodyweight and being closer to ground level pollution) are more sensitive to air pollution. Those living, working or regularly using outdoor spaces or routes in close proximity to the sources of pollution may also be more sensitive.

Defining Impacts (Magnitude)

18.8.150 The residual effect conclusions of **Chapter 16: Air Quality** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 16: Air Quality** states in relation to both construction dust impacts and construction traffic impacts that no significant residual effects are anticipated for human health receptors. An outline Construction Environmental Management Plan (oCEMP) (**Appendix 4-2**) will be adopted to minimise the environmental impacts of the construction works, and a set of best-practice measures (as detailed within the IAQM guidance) will be incorporated into the specification for

the works. Traffic will be managed in a way which minimises the potential air quality impacts at sensitive receptor locations through measures included within the oCTMP (**Appendix 14-2**), oCEMP(**Appendix 4-2**). There will be further assessment of air quality effects in the ES.

18.8.151 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.152 This reflects that, for the context, the Proposed Development impact is a very low change in exposures, for a medium-term duration (and within this short-term at any given location in relation to transitory construction effects), experienced frequently. The implication for population health is that health outcome severity relates to a minor change in morbidity (burden of disease) risk-factors, notably for cardiovascular and respiratory outcomes, as the predominant influence and this relating to a small minority in the study area population. No implications for local healthcare service capacity and quality are expected.

Preliminary Assessment (Significance)

18.8.153 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be at most a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.154 This reflects that taking account of the scientific literature indicating a causal relationship between air quality and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the potential for adverse effects; the degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. The Proposed Development change would have at most a marginal effect the delivery of health policies and health inequalities. This includes as set out in **Section 18.2**:

- EN-1 section 5.2 (air quality, including 5.2.3 on non-threshold effects and vulnerable groups);
- Calderdale Local Plan 2018/19 – 2032/33 policy EN2 Air quality;
- Bradford District Council Core Strategy to 2030 Policy EN8: Environmental Protection (including air quality);
- Pendle Borough Council Core Strategy 2011-2030 Policy ENV 5 Pollution and Unstable Land (including air quality); and

- Burnley's Local Plan 2012-2032 Policy NE5: Environmental Protection (including air quality).

18.8.155 The Proposed Development change would also have a marginal effect on the delivery of local health priorities of specific or general relevance to air quality.

18.8.156 It is relevant, and taken into account, that as well as taking into consideration non-threshold effects, in this case the exposure change are expected to be well within thresholds defined by health protection standards, as set out in **Chapter 16: Air Quality**.

Additional Mitigation

18.8.157 No additional measures are proposed.

Residual Effects

18.8.158 The population health effect conclusions are unchanged.

Next Steps

18.8.159 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Noise and vibration

18.8.160 This section considers the potential population health effects, including effects on health inequalities, of changes in the sound environment due to the Proposed Development during construction.

18.8.161 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include: activities relating to excavations and earthworks; creating areas of hardstanding; assembly of project structures; creating and using access roads, including junction and highways works; construction compounds; batching plant; borrow pits; cable corridor excavation, horizontal directional drilling and reinstatement; watercourse diversions; and other construction activities.

Approach

18.8.162 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.163 The following **Chapter 15: Noise and Vibration** study area has informed the Human Health assessment in relation to the potential extent of impacts:

- **Figure 15-1**

18.8.164 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).

18.8.165 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-26**.

Table 18-26: Baseline indicators for noise

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
The rate of complaints about noise (rate per 1,000 people) ⁹⁹	4.8	3.8	0.5	4.3	5.9
The percentage of the population	4.5	3.8	4.0	5.1	4.3

⁹⁹ Number of complaints per year per local authority about noise per thousand population (according to statistics collected by the Chartered Institute of Environmental Health (CIEH)).

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
exposed to road, rail and air transport noise of 65dB(A) or more, during the daytime (%)					
The percentage of the population exposed to road, rail and air transport noise of 55 dB(A) or more during the night-time (%)	8.8	6.8	7.9	8.4	8.4

18.8.166 In relation to local sensitivity in general, these indicators show that estimated rates of complaints about noise are lower than the national average across the local study area. Alternative comparator rates are 5.5 per 1,000 population in Yorkshire and the Humber region and 3.5 per 1,000 population in North West region show overall a similar trend, though in Pendle the rates are slightly higher than that region's average.

18.8.167 For estimate exposures to noise, for both daytime and night-time the exposures in the local study area are generally similar to national averages. Calderdale is slightly above average during the daytime and night-time. Pendle is above average during the daytime. Yorkshire and the Humber region rates are 3.1% for daytime and 6.4% for night-time; and North West region rates are 3.8% for daytime and 8.4% for night-time.¹⁰⁰ These local study area district and borough

¹⁰⁰ Although a 2021 statistic (with potential for Covid-19 pandemic effects to affect its use) the indicator definitions explain that it is based on modelling and population estimates from earlier periods, applied at façade level by modelling undertaken in 2021. It is considered by this health assessment to therefore be a

wide estimates should be considered in the context that the statistics will be driven by the intersection of transport noise sources (notably A roads) and population density, neither of which are dominant features of the areas of construction activity.

18.8.168 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Adverse associations are found between noise and cardiovascular outcomes, diabetes, hearing impairment, neurological disorders and reproductive outcomes with environmental noise exposure, especially occupational noise¹⁰¹.
- There is suggestive evidence of a potential link between noise annoyance and poorer mental health¹⁰². Noise exposure has been linked with non-auditory health effects, including psychophysiological, cognitive development, mental health and sleep effects¹⁰³. Noise annoyance and sleep disturbance are likely mediators of the relationship between exposure to environmental noise at home and poor mental health¹⁰⁴. Evidence suggests that green spaces can help reduce noise-related distress, improve quality of life, and lower the risk of diseases associated with chronic stress¹⁰⁵. Having access to quiet areas and

useful estimate for baseline purposes that remains relevant to the current population.

¹⁰¹ Chen X, Liu M, Zuo L, Wu X, Chen M, Li X, An T, Chen L, Xu W, Peng S, Chen H, Liang X, Hao G. Environmental noise exposure and health outcomes: an umbrella review of systematic reviews and meta-analysis. *Eur J Public Health*. 2023 Aug 1;33(4):725-731. doi: 10.1093/eurpub/ckad044. PMID: 37030015; PMCID: PMC11314258.

¹⁰² Gong X, Fenech B, Blackmore C, Chen Y, Rodgers G, Gulliver J, Hansell AL. Association between Noise Annoyance and Mental Health Outcomes: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2022 Feb 25;19(5):2696. doi: 10.3390/ijerph19052696. PMID: 35270388; PMCID: PMC8910193.

¹⁰³ Terzakis ME, Dohmen M, van Kamp I, Hornikx M. Noise Indicators Relating to Non-Auditory Health Effects in Children-A Systematic Literature Review. *Int J Environ Res Public Health*. 2022 Nov 24;19(23):15633. doi: 10.3390/ijerph192315633. PMID: 36497707; PMCID: PMC9739374.

¹⁰⁴ Grocott K, Mansour A, Shiels E, Bentley R, Mason K. Mental health effects of exposure to environmental noise at home: A systematic review of potential mediating pathways. *Noise Health*. 2025 May-Jun 01;27(126):255-267. doi: 10.4103/nah.nah_171_24. Epub 2025 Jun 26. PMID: 40574296; PMCID: PMC12282965.

¹⁰⁵ Ferrante M, Rapisarda P, Castrogiovanni M, Filippini T, Oliveri Conti G, Vinceti M. Urban greenness for the protection of adverse effects of noise on human health: A PRISMA systematic review. *Sci Total Environ*. 2025 May

covering noise sources, either visually or acoustically, with natural features seems to decrease people's negative responses to noise¹⁰⁶.

- An all sources of transport noise estimate found a pooled effect size for heart disease incidence (relative risk (RR) = 1.03 [1.01 to 1.04]) and mortality (RR = 1.03 [1.02 to 1.05]) per 10 dB L_{den} increase in long-term noise exposure. The starting point for these exposure response relationships was between 32 to 45 dB L_{den}, depending on the source and outcome. All exposures are at the most-exposed façade.¹⁰⁷

18.8.169 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is noise generated by Proposed Development activities or infrastructure, including at structures, work areas and along cable and transport corridors;
- The pathway is pressure waves through the air and ground vibration; and
- Receptors are the study area population, including frequent users of outdoor spaces in proximity to sources and long-term occupants of community buildings in proximity to sources.

Population sensitivity

18.8.170 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.171 Vulnerability relates to characteristics or intersectionality in relation to:

25;978:179415. doi: 10.1016/j.scitotenv.2025.179415. Epub 2025 Apr 16. PMID: 40245511.

¹⁰⁶ Peris E, Fenech B. Associations and effect modification between transportation noise, self-reported response to noise and the wider determinants of health: A narrative synthesis of the literature. *Sci Total Environ*. 2020 Dec 15;748:141040. doi: 10.1016/j.scitotenv.2020.141040. Epub 2020 Jul 22. PMID: 33113703.

¹⁰⁷ Minkin M, Woodland L, Williams OA, Hamilton S, Hansell AL, Vienneau D, Gong X, Fenech B. Revisiting the association between transportation noise and heart disease reported in the World Health Organization Environmental Noise Guidelines for the European Region: a systematic review and meta-analysis. *Environ Int*. 2025 Aug;202:109667. doi: 10.1016/j.envint.2025.109667. Epub 2025 Jul 13. PMID: 40700954.

- age (notably children and young people in relation to disturbance in learning settings);
- existing poor health (including during recovery) or a relevant health status that is associated with hyper-sensitivity to noise (including linked to neurodiversity);
- low income (fewer resources to access alternatives); and
- social and geographic disadvantage (notably pockets of high deprivation in close proximity).

18.8.172 Using the criteria set out in **Table 18-8** the sensitivity of the general population of the study area is **low**. This reflects that a large proportion of people will be in generally good health and live, study, work or engage in leisure or other pursuits at a distance from noise sources at which levels would be unlikely to be a source of concern. Typically, this population would not distinguish the noise within the wider soundscape, so would not have a heightened sensitivity relating to subjective responses (i.e. non-threshold effects).

18.8.173 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects the presence within the study area population of people with existing poor health, including poor mental health; or with a health status associated with hyper-sensitivity to noise (as can be the case with neurodivergence, including autism). Those living, working or regularly using outdoor spaces or routes in close proximity to the sources of noise may also be more sensitive. Higher sensitivity may also be associated with subjective associations with past noise experiences, including particular tonal characteristics or noise levels that give rise to concern, annoyance or other health outcomes even below levels that would typically be considered acceptable. Higher sensitivity may also arise for those people less able to adapt to change, including due to fewer resources or reduced mobility. People with who feel a high degree of uncertainty or concern about the Proposed Development may also be more sensitive.

Defining Impacts (Magnitude)

18.8.174 The residual effect conclusions of **Chapter 15: Noise and Vibration** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 15: Noise and Vibration** states that the BS 5228 Category A threshold values are exceeded at one location during core daytime hours and seven locations during core weekend/evening time hours. These effects are not expected to be significant due to the duration of the works causing exceedance, magnitude of the exceedances, and implementation of additional mitigation to minimise construction noise secured through the oCEMP (**Appendix 4-2**).

- Activities that need to take place outside core construction hours (i.e. turbine erection, concrete pours and Abnormal Indivisible Load deliveries) are not predicted to exceed Category A threshold values. No construction activities are anticipated during the night-time and any equipment operating during night-time hours are not predicted to exceed the night-time Category A threshold.
- **Chapter 15: Noise and Vibration** concludes that the residual effects of construction noise are predicted to be **not significant**. No additional residual effects nor additional mitigation are identified after considering construction traffic.

18.8.175 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.176 This reflects that, for the context, the Proposed Development impact is a low exposure, for a medium-term duration, experienced frequently or occasionally. The implication for population health is that health outcome severity relates to a minor change in quality-of-life risk-factors, notably for mental wellbeing outcomes, as the predominant influence and this relating to a small minority in the study area population. The minor change in risk factors is unlikely to be discernible and this public health conclusion is consistent with the findings of the noise assessment that considers impacts at the individual dwelling level. For most of those affected the influence from this change in risk-factors would rapidly reverse once the impact ceased, with no implications for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.177 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.178 This takes into account the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect on the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably:

- EN-1 section 5.12 (noise);

- NPPF paragraph 198 (ensuring that new development is appropriate for its location taking into account the likely effects of pollution on health including noise);
- Calderdale Local Plan 2018/19 – 2032/33 policy EN1 noise and vibration;
- Bradford District Council Core Strategy to 2030 Policy EN8: Environmental Protection (including noise and vibration);
- Pendle Borough Council Core Strategy 2011-2030 Policy ENV 5 Pollution and Unstable Land (including noise); and
- Burnley's Local Plan 2012-2032 Policy NE5: Environmental Protection (including noise and vibration).

18.8.179 It is relevant, and taken into account, that as well as taking into consideration non-threshold effects, in this case the exposure change would be mostly within thresholds defined by health protection standards, as set out in **Chapter 15: Noise and Vibration**.

Additional Mitigation

18.8.180 No additional measures are proposed.

Residual Effects

18.8.181 The population health effect conclusions are unchanged.

Next Steps

18.8.182 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.183 Further design and management plan refinement will be undertaken in relation to the oCEMP (**Appendix 4-2**), to seek further improvement in relation to public health outcomes.

Water quality or availability

18.8.184 This section considers the potential population health effects, including effects on health inequalities, of potential effects on water quality, quantity and flood risk due to the Proposed Development during construction.

18.8.185 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include works for drainage systems, crossings and water management.

18.8.186 Water supplies are regulated. The Water Supply (Water Quality) Regulations 2016¹⁰⁸ set out measures to protect the quality of water intended for human consumption. Regard has also been given to WHO targets¹⁰⁹.

Approach

18.8.187 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.188 The following **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** study area has informed the Human Health assessment in relation to the potential extent of impacts:

- **Figure 10-1**

18.8.189 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).

¹⁰⁸ The Water Supply (Water Quality) Regulations 2016. Available at: <https://www.legislation.gov.uk/uksi/2016/614/contents>

¹⁰⁹ World Health Organization. 2022. Guidelines for drinking-water quality: Fourth edition incorporating the first and second addenda, Geneva: World Health Organization.

18.8.190 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Exposure to floods is associated with increased risks of all-cause mortality and morbidities for gastrointestinal illness, infectious disease and respiratory diseases¹¹⁰. The mental health of those experiencing flooding may also be affected, including post-traumatic stress disorder¹¹¹. Measures that reduce the risk of adverse outcomes include: empowering and training people in flood responses; training people to avoid high-risk behaviours; implementing accurate evacuation and decision-making protocols; enhancing people's risk perception about floods; protecting vulnerable groups; identifying and protecting vulnerable areas; improving disaster management processes; strengthening flood reduction structures; developing and promoting early warning systems; and taking precautionary and preparation measures¹¹². Healthcare facilities can be especially sensitive to flood events where their operation and access is affected¹¹³.
- Good hydration is vital for good health and well-being¹¹⁴. Water quality is sensitive to landscape changes, including forestry, agriculture and urbanisation¹¹⁵. Water quality can be affected by algal blooms in rivers, lakes

¹¹⁰ Yang Z, Huang W, McKenzie JE, Yu P, Ju K, Wu Y, Wen B, Guo Y, Li S. Mortality and morbidity risks associated with floods: A systematic review and meta-analysis. *Environ Res.* 2024 Dec 15;263(Pt 3):120263. doi: 10.1016/j.envres.2024.120263. Epub 2024 Oct 29. PMID: 39481788.

¹¹¹ Golitaleb M, Mazaheri E, Bonyadi M, Sahebi A. Prevalence of Post-traumatic Stress Disorder After Flood: A Systematic Review and Meta-Analysis. *Front Psychiatry.* 2022 Jun 23;13:890671. doi: 10.3389/fpsyt.2022.890671. PMID: 35815011; PMCID: PMC9259936.

¹¹² Yari A, Ostadtaghizadeh A, Ardalan A, Zarezadeh Y, Rahimiforoushani A, Bidarpoor F. Risk factors of death from flood: Findings of a systematic review. *J Environ Health Sci Eng.* 2020 Jul 24;18(2):1643-1653. doi: 10.1007/s40201-020-00511-x. PMID: 33312668; PMCID: PMC7721754.

¹¹³ Arefi F, Tavan A, Moradi SM, Daneshi S, Farahmandnia H. Identifying challenges and future directions of flood hazards mitigation strategies in health facilities: a systematic literature review. *BMC Emerg Med.* 2025 Sep 1;25(1):174. doi: 10.1186/s12873-025-01339-0. PMID: 40890625; PMCID: PMC12403506.

¹¹⁴ Gandy J. Water intake: validity of population assessment and recommendations. *Eur J Nutr.* 2015 Jun;54 Suppl 2(Suppl 2):11-6. doi: 10.1007/s00394-015-0944-8. Epub 2015 Jun 6. Erratum in: *Eur J Nutr.* 2015 Sep;54(6):1031. doi: 10.1007/s00394-015-0965-3. PMID: 26048039; PMCID: PMC4473081.

¹¹⁵ Shi X, Mao D, Song K, Xiang H, Li S, Wang Z. Effects of landscape changes on water quality: A global meta-analysis. *Water Res.* 2024 Aug 15;260:121946. doi: 10.1016/j.watres.2024.121946. Epub 2024 Jun 14. PMID: 38906080.

and potable water¹¹⁶. Recreational exposure to natural toxins by skin contact, accidental swallowing of water or inhalation can cause a wide range of acute or chronic illnesses¹¹⁷. Potable water sources, including ground water, are susceptible to contamination¹¹⁸, and these risks are likely to be increased by climate change¹¹⁹.

- In general, the scientific literature indicates that communities where polluting human activities are sited, often show disadvantage in terms of social and economic variables. The majority of associations identified support an increased burden on vulnerable categories, especially ethnic minorities and unemployed. However, several relationships are found in the opposite direction or in both ways, particularly with wealth and education, reflecting a mixed reality where potential discrimination in siting decisions coexists with socio-economic benefits for nearby communities due to industrial development¹²⁰.

18.8.191 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is changes to flood risk and emissions to water due to the Proposed Development, including mobilisation of historic contaminants or release of new contaminants, e.g. accidental spills;

¹¹⁶ Thawabteh AM, Naseef HA, Karaman D, Bufo SA, Scrano L, Karaman R. Understanding the Risks of Diffusion of Cyanobacteria Toxins in Rivers, Lakes, and Potable Water. *Toxins* (Basel). 2023 Sep 20;15(9):582. doi: 10.3390/toxins15090582. PMID: 37756009; PMCID: PMC10535532.

¹¹⁷ Koreivienė J, Anne O, Kasperovičienė J, Burškytė V. Cyanotoxin management and human health risk mitigation in recreational waters. *Environ Monit Assess*. 2014 Jul;186(7):4443-59. doi: 10.1007/s10661-014-3710-0. Epub 2014 Mar 25. PMID: 24664523.

¹¹⁸ Mumberg T, Ahrens L, Wanner P. Managed aquifer recharge as a potential pathway of contaminants of emerging concern into groundwater systems - A systematic review. *Chemosphere*. 2024 Sep;364:143030. doi: 10.1016/j.chemosphere.2024.143030. Epub 2024 Aug 8. PMID: 39121959.

¹¹⁹ Andrade L, O'Dwyer J, O'Neill E, Hynds P. Surface water flooding, groundwater contamination, and enteric disease in developed countries: A scoping review of connections and consequences. *Environ Pollut*. 2018 May;236:540-549. doi: 10.1016/j.envpol.2018.01.104. PMID: 29428708.

¹²⁰ Di Fonzo D, Fabri A, Pasetto R. Distributive justice in environmental health hazards from industrial contamination: A systematic review of national and near-national assessments of social inequalities. *Soc Sci Med*. 2022 Mar;297:114834. doi: 10.1016/j.socscimed.2022.114834. Epub 2022 Feb 18. PMID: 35217367.

- The pathway is exposure via surface or ground water, including recreational or potable waters, as well as physical or mental health effects of flooding; and
- Receptors are the study area population, including, and as well as, users of public water supplies, and essential services affected by flooding.

Population sensitivity

- 18.8.192 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.
- 18.8.193 Vulnerability relates to characteristics or intersectionality in relation to:
- age (notably children and older people as more sensitive to contaminants and flood risk);
 - existing poor health (including increased sensitivity to contaminants and reduced mobility linked to flood risk);
 - low income (including fewer resources to respond to flood risk or events); and
 - social and geographic disadvantage (notably pockets of high deprivation in areas of flood risk or close proximity to potential sources of contamination).
- 18.8.194 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that a large proportion of people will be in generally good health and live, work or engage in leisure or other pursuits away from areas where there is any change in flood risk or potential contamination due to the Proposed Development. This includes that a large proportion of people would not make use of recreational waters where a relevant exposure could arise. For most people any potential contamination of potable surface or groundwater pathways would be inherently negligible due to water pathway distance and dilution effects.
- 18.8.195 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that susceptibility may increase due to age or health status, including children being more prone to toxin exposure due to body size or time spent close to recreational waters. It also includes exacerbation of existing physical or mental health conditions for those who are affected by contaminants or flood risk, including pre-flood stress, flood event hazards and post-flood exposure to mould, infectious agents or contaminants. Potential for bioaccumulation, e.g. fishing or use of contaminated waters for crop irrigation, would also increase sensitivity where this forms part of regular diets.

Defining Impacts (Magnitude)

18.8.196 The residual effect conclusions of **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** states that given most of the construction works will be outside the 50m buffer of sensitive watercourses, the likelihood of a significant pollution event on the water environment is low. The track section within the Special Protection Zone (SPZ) at River Laneshaw is more likely to experience moderate impacts of contamination during construction and intended be used as a transport route during operation, so the potential risk of contamination is considered permanent for this water source. A range of good practice methods and procedures to avoid pollution of watercourses will be implemented through an oCEMP (**Appendix 4-2**) and reduce the residual impacts to minor and **not significant**.
- There are currently no known private water supplies within close proximity to the Proposed Development, but these will be assessed in detail in the ES.
- In terms of flooding, members of the public are considered highly sensitive to flood risk, although the potential for flooding associated with construction activity is considered unlikely following the implementation of mitigation measures and environmental management plans.

18.8.197 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.198 This reflects that, for the context, the Proposed Development impact is a very low exposure, any impact durations would be short-term and experienced as one-off contamination or flooding events, which would be managed by measures in the CEMP. The implication for population health is that health outcome severity relates to a very minor change in morbidity (burden of disease) risk-factors, notably toxicological outcomes, as the predominant influence and this relates to at most a small minority in the study area population. For most of those affected the influence from this change in risk-factors would rapidly reverse once the impact ceased. The Proposed Development's flood mitigation measures are expected to avoid the risk of settlement flooding where secondary effects on mental health and respiratory outcomes may arise and be slower to reverse. At most there would be a slight healthcare service capacity and quality effects in the unlikely event of temporary contamination or flooding.

Preliminary Assessment (Significance)

18.8.199 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.200 This reflects that taking account of the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be very limited, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably:

- EN-1 section 5.16 (water);
- NPPF paragraph 187 (conserving and enhancing the natural environment including water quality and risks);
- Calderdale Local Plan 2018/19 – 2032/33 policy EN1 and EN3 (water quality and quantity);
- Bradford District Council Core Strategy to 2030 Policy EN8: Environmental Protection (including water environment);
- Pendle Borough Council Core Strategy 2011-2030 Policy ENV 5 Pollution and Unstable Land (including water quality); and
- Burnley's Local Plan 2012-2032 Policy NE5: Environmental Protection (including water quality).

18.8.201 The Proposed Development change would also have marginal effect the delivery of local health priorities of general relevance to this health determinant.

Additional Mitigation

18.8.202 No additional measures are proposed.

Residual Effects

18.8.203 The population health effect conclusions are unchanged.

Next Steps

- 18.8.204 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.
- 18.8.205 Further design and management plan refinement will be undertaken in relation to oCEMP (**Appendix 4-2**), to seek further improvement in relation to public health outcomes.

Operation and Maintenance Phase

- 18.8.206 Introductory information for each determinant of health is set out in the construction phase assessment section and not repeated here. This is in line with proportionate assessment and avoids duplication. This includes common information in relation to approach, relevant health outcomes, scientific literature, source-pathway-effect model, study areas and population groups. The operational phase assessment only sets out such information where it varies from the construction stage information.

Open space, leisure and play

- 18.8.207 This section considers the potential population health effects, including effects on health inequalities, of how the operation of the Proposed Development, affects PRow and common land. This section includes consideration of physical and mental health outcomes associated with walking and cycling opportunities and access to the natural environment.
- 18.8.208 The relevant project activities and works are set out in **Chapter 4: The Proposed Development**. Beyond the turbine foundations and onsite substation areas, it is the Applicant's aim that the Turbine Area will still be publicly accessible during operation of the Proposed Development. The oPROWMP will outline how PRow and open access land will be managed for the Proposed Development during the operational phase.

Approach

- 18.8.209 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.
- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**); and

- Bradford West Substation connection Human Health site-specific study area (see **Table 18-4**).

Population sensitivity

- 18.8.210 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.
- 18.8.211 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.17**.
- 18.8.212 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.18**.

Defining Impacts (Magnitude)

- 18.8.213 The residual effect conclusions of **Chapter 12: Landscape and Visual** inform the Human Health assessment and are summarised below, before then considering their implications for public health.
- **Chapter 12: Landscape and Visual** states within the assessment of visual amenity, that there is potential for significant effects on people using PRow that traverse the landscape, especially within 5km of the Turbine Area in Worth Valley to the north and Calder Valley to the south. While the intervening distance between the Turbine Area and locations in the surrounding nationally designated landscape would reduce the magnitude of change for these users. The sensitivity of routes through these landscapes is also influenced by the national value of these landscapes.
 - The wind turbines are also expected to be theoretically visible from certain cycle routes and canals that are not routes through valleys and low lying landscapes, particularly the Leeds Liverpool Canal and cycle routes within the Lancashire valleys and Airedale.
- 18.8.214 As discussed in **Chapter 4: The Proposed Development**, there would be continued access to Open Access and Common Land, including any required replacement land. The preliminary assessment therefore is on the basis that there would remain the same level of opportunity in relation to open space, leisure and play. This includes the physical and mental health benefits of using PRow and Open Access and Common Land.
- 18.8.215 The human health assessment also takes into account that the presence of the operational structures, including turbines and substation, could result in a degree of behavioural change in the population's use of such spaces and routes.

Any such public health implication would relate to the long-term change in the setting and experience of areas used principally for walking¹²¹. The nature of Open Access and Common Land is that members of the public are able to vary the routes taken within this designation. It is considered likely that peoples' route preference will adapt to the presence of the Proposed Development infrastructure, rather than forgo use of the area. Recognising there are strong subjective elements to preferences, some people may be interested by the turbines and walk in their vicinity; others may choose to take alternative routes at a greater distance. In either case, the opportunity to roam across the land remains.

18.8.216 It is acknowledged that some people who feel strongly about the presence of turbines or other infrastructure may forgo use of the PRowS and Open Access and Common Land affected by the Proposed Development entirely. However, given the common occurrence of turbines within the modern rural landscape, this response is not considered likely to arise to such an extent that there would be the potential for significant public health impacts. For those choosing to forgo the routes and areas affected by the Proposed Development, there is considered sufficient alternative opportunity within the wider landscape. In this regard behavioural change at sub-population level is also likely to be to alternative areas rather than forgoing the benefits of accessing outdoor spaces.

18.8.217 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.218 This reflects that, for the context, the Proposed Development impact is a small adverse scale of change, for a long-term duration, experienced frequently or occasionally. The implication for population health is that health outcome severity relates to a minor changes in quality-of-life for a large minority of the site-specific study area population; and a minor change in morbidity related to cardiovascular and mental health outcomes for a small minority of the site-specific study area population. For many people any short- to medium-term behavioural influences may gradually reduce over time as new norms establish. At most there may be slight implications for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.219 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.24**. The

¹²¹ The Countryside and Rights of Way (CROW) Act 2000 (UK Government, 2000), which designates common land in England as access land, where the public may roam freely on foot.

degree of change is not expected to be so great that at a population level people would forgo use of the PRowWs and Open Access and Common Land or substantially alter their behaviours in accessing outdoor spaces.

Additional Mitigation

18.8.220 No additional measures are proposed.

Residual Effects

18.8.221 The population health effect conclusions are unchanged.

Next Steps

18.8.222 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.223 Further design and management plan refinement will be undertaken in relation to oPROWMP, to seek further improvement in relation to public health outcomes.

Community identity, culture, resilience and influence

18.8.224 This section considers the potential population health effects, including effects on health inequalities, of operational community identity effects directly affecting mental wellbeing, as well as indirectly social participation, interaction and support.

18.8.225 The relevant project features are set out in **Chapter 4: The Proposed Development** and include the turbines and substation.

Approach

18.8.226 The following **Chapter 12: Landscape and Visual** and **Chapter 13: Historic Environment** study areas have informed the Human Health assessment in relation to the potential extent of impacts:

- **Figure 12.1;** and
- **Chapter 13: Historic Environment.**

18.8.227 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:

- Turbine Area Human Health site-specific study area (see **Table 18-3**); and
- Bradford West Substation connection Human Health site-specific study area (see **Table 18-4**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**).

Population sensitivity

18.8.228 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18-4.26**.

18.8.229 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.67**.

18.8.230 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.68**.

Defining Impacts (Magnitude)

18.8.231 The residual effect conclusions of **Chapter 12: Landscape and Visual** and **Chapter 13: Historic Environment** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 12: Landscape and Visual** states the Proposed Development state the potential effects on landscape character, visual amenity, and residential visual amenity. In terms of landscape character, significant adverse effects are predicted across the 45km study area with most prominent change within 10km of the wind turbines. The wind turbines are theoretically visible in all directions from the Turbine Area and particularly pronounced across elevated moorland and moorland fringe landscapes and less developed valleys including South Pennine Moors within Calderdale. The Export Cable will be buried along its length and trenchless techniques along the Bradford West Cable Corridor to reduce potential long-term landscape and visual effects. These changes would be reversible given the 35-year operational life of the Proposed Development, requiring removal and restoration of the wind farm footprint.
- Significant adverse effects on landscape character are not expected in relation to wider landscapes surrounding the Pennines, such as those in the vicinity of Wakefield, Barnsley, Manchester and Preston. While the proposed wind turbines are likely to be visible from certain locations, they will be seen as part

of as broad backdrop of Pennine landscapes therefore influence over local character is likely to be limited.

- In terms of visual amenity, there is potential for significant effects on viewpoints surrounding the Turbine Area, particularly for elevated positions in which wind turbines would contrast the baseline landscape such as Heptonstall, Slack, Pecket Well, Stanbury, Oldfield and Oakworth.
- For residents, it is likely that significant adverse effects on visual amenity would occur for multiple properties within 2km of the Turbine Area as consequence of the nature of the properties and characteristics of the local landscape, particularly where they occupy open, exposed positions. The separation distances between the turbines and the properties would be variable, however turbines lie within 1km of certain properties.
- **Chapter 13: Historic Environment** concludes that although multiple operational turbines will be visible from the designated heritage assets, the nearest of which lies at a distance of approximately 800m, this would lead to a small reduction in the limited contribution made by more distant elements of their setting to the significance of these heritage assets. No additional mitigation or significant residual effects are expected, as there are no identified preliminary likely significant effects.

18.8.232 The health assessment notes that the Brontë literary associations are a relevant consideration in relation to community identity, and the health assessment considers whether the degree of change to landscape characteristics could be associated with significant public health implications. In doing so, the following points summarise the literature context relevant to the public health assessment:

- Brontë sisters novels have a sustained broad and strong following, with *Jane Eyre* and *Wuthering Heights* (published 1847), amongst others, established as prominent contributions to English literature.
- *Wuthering Heights* is a fictional dwelling that gives its name to the novel and is a backdrop to key events. The manor house is likely at least in part inspired by the ruined farmhouse of Top Withens.
- The Brontë Society (1964) plaque at Top Withens reads “*Top Withens. This farmhouse has been associated with ‘Wuthering Heights’, the Earnshaw home in Emily Brontë’s novel. The buildings, even when complete, bore no resemblance to the house she described, but the situation may have been in her mind when she wrote the moorland setting of The Heights.*”
- The Brontë sisters lived in Brontë Parsonage (now museum) in Haworth.

- 18.8.233 The emotive nature of the landscape and how this has informed community identity, including, but not limited to the Brontë literary associations, is noted by the health assessment. The potential for changes to the landscape to result in renewed social interest in the Brontë sisters' literary works, and potentially Top Withens by association, is also noted. The highly established status of the novels is however not dependent on the landscape setting that likely inspired them, rather they stand on the quality of their literary execution. Interest in Top Withens and the surrounding landscape would continue, with potential for some people to be more inclined to visit the location and other people less so, depending on subjective factors of personal attitudes. The degree in change in health-related outcomes at a population level is not considered to be so great as to constitute a significant public health effect; whether linked to behavioural change in accessing the outdoors, or to social or mental wellbeing outcomes linked to community identity.
- 18.8.234 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.
- 18.8.235 This reflects that, for the context, the Proposed Development impact is a large scale of change over a long-term duration, assessed as adverse as a worst case but noting that responses would be subjective. Experience of the change would be frequently or occasionally for users of transitory views, e.g. when driving on highways (noting that the PRow and open space effects have been assessed separately under the 'Open space, leisure and play' health determinant). For those people with direct views from dwellings of the Proposed Development's operational infrastructure, the experience would be frequent or continuous depending on the aspect and degree of screening. The implication for population health is that health outcome severity relates to a minor change in quality-of-life risk-factors, notably for mental wellbeing outcomes as the predominant influence. Whilst at most, a large minority in the study area population would have relevant views influenced, for many people the influence from this change in risk-factors is likely to diminish over time with new contextual norms establishing and any associated stress responses reducing. At most slight implications for local healthcare service capacity and quality are anticipated.
- 18.8.236 The community identity impacts are likely to relate in part to community sense of control, which can affect anxieties and mental health. Public participation can help mitigate such impacts. In this regard the consultation process is an opportunity to share information with communities, reducing uncertainty and increasing the extent to which there is a shared understanding of the Proposed Development.

Preliminary Assessment (Significance)

18.8.237 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.238 The presence of a number of other windfarms within the area, as set out in **Chapter 4: The Proposed Development**, is relevant and limits the extent to which structures such as turbines represent novel change within landscapes on a scale that could be significant for public health.

Additional Mitigation

18.8.239 No additional measures are proposed.

Residual Effects

18.8.240 The population health effect conclusions are unchanged.

Next Steps

18.8.241 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Employment, income and training

18.8.242 This section considers the potential population health effects, including effects on health inequalities, of changes in employment and income during the operational phase of the Proposed Development. The assessment considers opportunities for good quality jobs and training opportunities, which may particularly benefit some vulnerable groups. Potential for some adverse effects on local employment are acknowledged and also taken into account.

Approach

18.8.243 The relevant study areas are as set out in **paragraph 18.8.81** and **18.8.82**.

Population sensitivity

18.8.244 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.245 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.90**.

18.8.246 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.91**.

Defining Impacts (Magnitude)

18.8.247 The residual effect conclusions of **Chapter 17: Socio-Economics** and Tourism inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 17: Socio-Economics** states that during operation and maintenance there are estimated to be 10 jobs per year in Calderdale local authority, 25 jobs per year in the Yorkshire and Humber region and 75 jobs per year in the UK. The local and regional employment is identified as representing a neutral to slight beneficial effect.
- **Chapter 17: Socio-Economics** confirms that an Outline Employment, Skills and Supply Chain Management Plan (oESSCMP) will be prepared and submitted with the DCO. This will focus on how the socio-economic benefits identified might be maximised and secured. It will consider issues such as supply chain opportunities, community benefit funding, employment and skills and how local communities can be empowered.

18.8.248 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **negligible**.

18.8.249 This reflects that, for the context, the Proposed Development impact is a small beneficial scale of change, over a long-term duration, experienced continuously. The implication for population health is that health outcome severity relates to a minor change in morbidity risk-factors, notably for physical and mental health outcomes linked to socio-economic status and income spend on health promoting goods and activities (including for dependants), as the predominant influence and this relating to very few people in the study area population.

Preliminary Assessment (Significance)

18.8.250 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a negligible magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **negligible** beneficial population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.251 This reflects that although the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes and there are the environmental measures through the OESSMP (as described or cross-referred to in **Section 18.6**) being implemented to increase the beneficial effect; the degree of health baseline change is anticipated to be very limited, including accounting for vulnerable groups.

Additional Mitigation

18.8.252 No additional measures are proposed.

Residual Effects

18.8.253 The population health effect conclusions are unchanged.

Next Steps

18.8.254 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.255 Further design and management plan refinement will be undertaken in relation to the OESSMP, to seek further improvement in relation to public health outcomes.

Noise and vibration

18.8.256 This section considers the potential population health effects, including effects on health inequalities, of changes in the sound environment due to the Proposed Development's operational and maintenance phase.

18.8.257 The relevant project features are set out in **Chapter 4: The Proposed Development** and include the turbines and substation as noise sources. Occasional noise from maintenance activities and traffic is not considered to be on a scale to affect population health due to its temporary or transitory nature.

Approach

18.8.258 The following **Chapter 15: Noise and Vibration** study area has informed the Human Health assessment in relation to the potential extent of impacts:

- **Figure 15-1.**

18.8.259 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:

- Turbine Area Human Health site-specific study area (see **Table 18-3**); and
- Bradford West Substation connection Human Health site-specific study area (see **Table 18-4**).

18.8.260 The assessment approach also includes reviewing the scientific literature, which is set out in **Paragraphs 18.8.168 to 18.8.169** and the following additional summary points relevant to operation are noted about impacts and health outcomes in general:

- High level, but inaudible, infrasound from wind turbines does not appear to perturb any physiological or psychological measure¹²². Other sources of low-frequency and infrasound noise can be found in the vicinity of residential areas, and the residents themselves are unaware of them and do not report the inconvenience related to their emission¹²³.
- Findings suggest that there may be a possible relation between exposure to wind turbines and sleep disorders, although no conclusions can be drawn in terms of causality due to the poor quality of current evidence.¹²⁴

Population sensitivity

18.8.261 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.262 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.188**.

¹²² Marshall NS, Cho G, Toelle BG, Tonin R, Bartlett DJ, D'Rozario AL, Evans CA, Cowie CT, Janev O, Whitfeld CR, Glozier N, Walker BE, Killick R, Welgampola MS, Phillips CL, Marks GB, Grunstein RR. The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive, Healthy Adults. *Environ Health Perspect.* 2023 Mar;131(3):37012. doi: 10.1289/EHP10757. Epub 2023 Mar 22. PMID: 36946580; PMCID: PMC10032045.

¹²³ Staniek A, Milterska M. Analysis of noise generated by wind turbines with reference to other low frequency noise sources and their possible impact on human health. *Int J Occup Med Environ Health.* 2025 Apr 23;38(2):122-134. doi: 10.13075/ijomeh.1896.02433. Epub 2025 Mar 7. PMID: 40066489; PMCID: PMC12064345.

¹²⁴ Godono A, Ciocan C, Clari M, Mansour I, Curoso G, Franceschi A, Carena E, De Pasquale V, Dimonte V, Pira E, Dallapiccola B, Normanno N, Boffetta P. Association between exposure to wind turbines and sleep disorders: A systematic review and meta-analysis. *Int J Hyg Environ Health.* 2023 Sep;254:114273. doi: 10.1016/j.ijheh.2023.114273. Epub 2023 Oct 14. PMID: 37844409.

18.8.263 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.189**.

Defining Impacts (Magnitude)

18.8.264 The residual effect conclusions of **Chapter 15: Noise and Vibration** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 15: Noise and Vibration** states that operational wind turbine noise would meet the Site-Specific Noise Limits under all conditions and at all locations for both daytime and night-time periods across the majority of noise assessment locations (NAL). For 10 NALs, the noise limits would be exceeded for certain wind speeds and directions during daytime periods leading to adverse effects on residential amenity. For the onsite substation at all receptors the increase in noise level for both day or night is 0 dB and hence the effects are **not significant**.
- **Chapter 15: Noise and Vibration** secures additional mitigation measures as part of the oOEMP, including a scheme of low noise operational modes to be used under specific wind conditions for these turbines. Following the implementation of these measures, all residual effects would be **not significant**.

18.8.265 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.266 This reflects that, for the context, the Proposed Development impact is a very low exposure for a long-term duration and experienced frequently to occasionally depending on weather conditions. For example, high wind weather conditions may result in more frequent experience of adverse effects for residents in close proximity to the turbines, albeit these are specifically addressed by the oOEMP ONMP. Recognising there are subjective attitudes to noise even within standards typically considered acceptable, the implication for population health is that health outcome severity relates to a minor change in quality-of-life risk-factors, notably for mental wellbeing outcomes, as the predominant influence and this relating to at most a small minority of people in the study area population. No implications are anticipated for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.267 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor**

adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.268 This reflects that taking account of the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect on the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably those identified in 18.8.117.

18.8.269 It is relevant, and taken into account, that as well as taking into consideration non-threshold effects. In this case the exposure change would fall within thresholds defined by UK guidance to provide appropriate health protection, as set out in **Chapter 15: Noise and Vibration**.

Additional Mitigation

18.8.270 No additional measures are proposed.

Residual Effects

18.8.271 The population health effect conclusions are unchanged.

Next Steps

18.8.272 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.273 Further design and management plan refinement will be undertaken in relation to oEMP and ONMP to seek further improvement in relation to public health outcomes.

Water quality or availability

18.8.274 This section considers the potential population health effects, including effects on health inequalities, of potential effects on water quality, quantity and flood risk due to the Proposed Development during its operational phase.

18.8.275 The relevant project activities and works are set out in **Chapter 4: The Proposed Development** and include works for drainage systems, crossings and water management.

Approach

18.8.276 The following **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** study area has informed the Human Health assessment in relation to the potential extent of impacts:

- **Figure 10-1.**

18.8.277 The following Human Health study areas are used, which relate to the relevant population whose sensitivity is considered.

- Localised effects for the population of the:
 - Turbine Area Human Health site-specific study area (see **Table 18-3**);
 - Cable Corridor Human Health site-specific study area (see **Table 18-4**);
 - Bradford West Substation connection Human Health site-specific study area (see **Table 18-5**);
 - Western Access Route Human Health site-specific study area (see **Table 18-6**); and
 - Eastern Access Route Human Health site-specific study area (see **Table 18-7**).
- Wider area effects for the population of the:
 - Human Health local study area (see **paragraph 18.4.6**).

Population sensitivity

18.8.278 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.279 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.212**.

18.8.280 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.213**.

Defining Impacts (Magnitude)

18.8.281 The residual effect conclusions of **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 10: Hydrology and Hydrogeology, Geology and Peat** states the risk of pollution is significantly reduced during the operational stage. Potential pollution sources such as fuel storage and accidental leaks for maintenance vehicles remain a risk but are limited in scale and frequency. These operational risks will be managed through routine inspection, compliance with pollution prevention guidelines and additional mitigation to protect the water supply at River Laneshaw through a specific drainage management plan will reduce the residual effects to minor and **not significant**.
- In terms of flooding, the potential flood risk associated with operation includes an increase or change in flood risk due to changes in ground levels or uncontrolled discharges of surface water from new impermeable areas. In the absence of hydraulic modelling results or the completion of the drainage strategy, significant effects cannot be ruled out at this stage.

18.8.282 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low**.

18.8.283 This reflects that, for the context, the Proposed Development impact is for very low exposure, for a short-term duration, experienced as a one-off contamination or flooding event. The implication for population health is that health outcome severity relates to a minor change in morbidity (burden of disease) and quality-of-life risk-factors, notably for mental wellbeing outcomes, as the predominant influence and this relating to a small minority in the study area population. At most there would be a slight healthcare service capacity and quality in the unlikely event of contamination or flooding.

Preliminary Assessment (Significance)

18.8.284 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria,, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.285 This reflects that taking account of the scientific literature indicating a clear relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Section 18.6**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be slight, including accounting for vulnerable groups. Furthermore, the Proposed Development change would have a marginal effect the delivery of health policies and acting on health inequalities, as set out in **Section 18.2**, notably those outlined in 18.8.199.

18.8.286 This conclusion also takes account of the reasonable assumption that the Proposed Development will include appropriate flood mitigations such that any significant public health impacts could be avoided. This will be assessed further in the ES.

Additional Mitigation

18.8.287 No additional measures are proposed at this stage.

Residual Effects

18.8.288 The population health effect conclusions are unchanged.

Next Steps

18.8.289 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.290 Further design and management plan refinement will be undertaken in relation to the drainage strategy, to seek further improvement in relation to public health outcomes.

Shadow Flicker

18.8.291 This section considers the potential population health effects, including effects on health inequalities, of how shadow flicker could potentially affect annoyance, community context or other health outcomes.

Approach

18.8.292 The assessment follows the approach set out in **Section 18.4**, which includes taking into account information on: the health policy context and local health priorities (**Section 18.2**); consultation feedback (**Section 18.3** and the Proposed Development's wider consultation); and general baseline health metrics and indicators for the population (**Section 18.5**).

18.8.293 The **Chapter 22: Shadow Flicker** Calculated Study Area has informed the Human Health assessment in relation to the potential extent of impacts (see **Figure 21-1: Calculated Study Area**).

18.8.294 The Human Health study areas are used, which relate to the relevant population whose sensitivity is considered. In this case, the relevant population relates to the Turbine Area Human Health site-specific study area (see **Table 18-3**).

18.8.295 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Exposure to flicker from a turbine is determined by the hub height, blade diameter, height of the sun and blade direction relative to the observer, and these variables are affected by the time of day, time of year, wind direction and geographical location¹²⁵. No studies of good quality link shadow flicker with adverse health outcomes¹²⁵. In rare cases seizures may be triggered by people prone to photosensitive epilepsy, although this outcome is often considered negligible due to the combination of very low prevalence of susceptibility and very low numbers of people exposed to turbines shadows (an Australian study found the risk to be <1 in 10 million in the general population)¹²⁵.
- Shadow flicker exposure has the potential for annoyance, including further stress including sleep disturbance and irritability^{126, 127}. Annoyance can be defined as “a feeling of displeasure associated with any agent or condition believed to affect adversely an individual or group”¹²⁸. Feelings of annoyance may or may not result in negative health consequences¹²⁷. Variables associated with high annoyance to wind turbine shadow flicker included annoyance to other wind turbine-related features, concern for physical safety and noise sensitivity¹²⁹.
- The available scientific evidence suggests that electromagnetic fields, shadow flicker, low-frequency noise, and infrasound from wind turbines are not likely to

¹²⁵ Merlin, T, Newton, S, Ellery, B, Milverton, J & Farah, C 2015, Systematic review of the human health effects of wind farms, National Health and Medical Research Council, Canberra. ISBN (online): 978-0-9923968-0-0

¹²⁶ Freiberg, A., Schefter, C., Hegewald, J., Seidler, A., 2019. The influence of wind turbine visibility on the health of local residents: a systematic review. *Int. Arch. Occup. Environ. Health* 92, 609–628. <https://doi.org/10.1007/s00420-019-01403-w>

¹²⁷ Haac, R., Darlow, R., Kaliski, K., Rand, J., Hoen, B., 2022. In the shadow of wind energy: Predicting community exposure and annoyance to wind turbine shadow flicker in the United States. *Energy Res. Soc. Sci.* 87, 102471.

¹²⁸ Lindvall, T., Radford, E.P., 1973. Measurement of annoyance due to exposure to environmental factors: The fourth Karolinska institute symposium on environmental health. *Environ. Res.* 6, 1–36. [https://doi.org/10.1016/0013-9351\(73\)90014-5](https://doi.org/10.1016/0013-9351(73)90014-5)

¹²⁹ Voicescu SA, Michaud DS, Feder K, Marro L, Than J, Guay M, Denning A, Bower T, van den Berg F, Broner N, Lavigne E. Estimating annoyance to calculated wind turbine shadow flicker is improved when variables associated with wind turbine noise exposure are considered. *J Acoust Soc Am.* 2016 Mar;139(3):1480-92. doi: 10.1121/1.4942403. PMID: 27036286.

affect human health¹³⁰. Annoyance to amenity affecting factors such as shadow flicker strongly depends on visual impact, attitudes toward wind energy, and proximity¹³¹. When accounting for subjective factors, such as turbine aesthetics, studies find no clear dose-response relationship between shadow flicker exposure and self-reported annoyance¹³².

18.8.296 The assessment approach includes a consideration of likelihood. In this case a theoretical population health effect is considered, although the evidence for a plausible source-pathway-receptor relationship is not well established in the scientific literature:

- The source is wind turbines;
- The pathway is pulsating patterns of light and shadow caused by the rotation of the turbine blades; and
- Receptors are the population, including vulnerable groups, living or working close to the wind turbines.

18.8.297 Vulnerability relates to characteristics or intersectionality in relation to:

- existing poor health (including affecting attitudes to annoyance) or adverse health status (notably photosensitive epilepsy);
- low income (limiting resources to adapt to alternatives); and
- social and geographic disadvantage (notably living in close proximity).

Population sensitivity

18.8.298 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out above.

18.8.299 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that the majority of the population

¹³⁰ Knopper LD, Ollson CA, McCallum LC, Whitfield Aslund ML, Berger RG, Souweine K, McDaniel M. Wind turbines and human health. *Front Public Health*. 2014 Jun 19;2:63. doi: 10.3389/fpubh.2014.00063. PMID: 24995266; PMCID: PMC4063257.

¹³¹ Tsani, T., Weinand, JM., Linßen, J., Stolten, D. Quantifying social factors for onshore wind planning – A systematic review, *Renewable and Sustainable Energy Reviews*, Volume 203, 2024, 114762, ISSN 1364-0321.

¹³² Haac, R., Darlow, R., Kaliski, K., Rand, J., Hoen, B. In the shadow of wind energy: Predicting community exposure and annoyance to wind turbine shadow flicker in the United States, *Energy Research & Social Science*, Volume 87, 2022, 102471, ISSN 2214-6296.

are in good health and will live, work, study or spend time in locations that would not fall within the shadows cast by the Proposed Development infrastructure. Therefore, the majority of people are also unlikely to experience concern, annoyance or other health outcomes associated with shadow flicker.

18.8.300 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is high. This reflects that a small sub-population may comprise people for whom intensity of the shadow flicker is higher due to close proximity to the Proposed Development's wind turbines and this may generate annoyance for occupants of the exposed dwellings. The sub-population also includes people with existing mental health conditions or relevant health statuses including depression, and anxiety, which may increase sensitivity; as well as those more sensitive to visual impacts, including associated with neurodiversity. People who are concerned or have high degrees of uncertainty about shadow flicker and its effect on their wellbeing may also be more sensitive in relation to the effect on annoyance.

Defining Impacts (Magnitude)

18.8.301 The residual effect conclusions of **Chapter 22: Shadow Flicker** inform the Human Health assessment and are summarised below, before then considering their implications for public health.

- **Chapter 22: Shadow Flicker** states that once mitigation is applied, then there will be at most minor (**not significant**) shadow flicker effects. The mitigation relates to a shadow flicker turbine control system.

18.8.302 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **negligible**.

18.8.303 This reflects that, for the context, the Proposed Development impact is a very low exposure, for a long-term duration, experienced occasionally. The implication for population health is that health outcome severity relates to a minor change in annoyance or quality-of-life risk-factors, notably for mental wellbeing outcomes, as the predominant influence and this relating to a very few people in the study area population. No implications for local healthcare service capacity and quality.

Preliminary Assessment (Significance)

18.8.304 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a negligible magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be

a **negligible** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms.

18.8.305 This reflects that taking account of the scientific literature indicating a largely suggestive relationship between this type of impact and changes in health outcomes and the environmental measures (as described or cross-referred to in **Chapter 22: Shadow Flicker**) being implemented to reduce the adverse effect; the degree of health baseline change is anticipated to be very limited, including accounting for vulnerable groups. Noting the Government position in NPS EN-3 Section 2.12, it is considered that the Proposed Development change would have no effect the delivery of health policies, health policies and health inequalities.

Additional Mitigation

18.8.306 No additional measures are proposed.

Residual Effects

18.8.307 The population health effect conclusions are unchanged.

Next Steps

18.8.308 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.8.309 Further management plan refinement will be undertaken in relation to mechanisms for community feedback and information sharing, including complaints procedures, in the oOEMP, to seek further improvement in relation to public health outcomes.

Wider societal infrastructure and resource

18.8.310 This section considers the potential population health effects, including effects on health inequalities, of the renewable energy security benefits to public health that arise due to the Proposed Development. The Proposed Development will contribute towards a clean and resilient electricity infrastructure, generating the energy on which society depends on for good population health. A reliable supply of electricity is required in relation to numerous societal factors such as food production and safety, thermal comfort, healthcare, education, income generation and socialising. There are also wider societal benefits in reducing the adverse health effects of climate change where electricity is generated through renewable sources, as is the case here.

Approach

- 18.8.311 The Human Health study area is used, which relates to the relevant population whose sensitivity is considered, is the Human Health national study area. This relates to impacts extended via National Grid electricity transmission and distribution (with benefits to smaller geographies inherent within this national distributed benefit).
- 18.8.312 Additional health indicators considered relevant to this determinant of health are set out in **Table 18-27** and **Table 18-28**.

Table 18-27: Baseline indicators for winter mortality

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
Winter mortality index (%) ¹³³	6.1	12.1	13.9	8.9	8.1
Winter mortality index (age 85 plus) (%)	5.9	16.0	21.3	38.2	11.3

- 18.8.313 In relation to sensitivity in general, these indicators show that baseline excess winter mortality is lower in Calderdale than national averages, but higher in the other parts of the local study area. Notably in Burnley and Pendle the over 85 year old excess winter mortality is much higher than the national average. Whilst excess winter mortality is not solely due to temperatures, thermal comfort is an influential factor. The equivalent issue of thermal comfort, e.g. from air conditioning in care homes is also a consideration in summer months related to heat wave mortality, for which new statistics are emerging.
- 18.8.314 For comparison, the Yorkshire and the Humber region winter mortality index is 6.9 and for over 85 year olds 10.7. For the North West region winter mortality index is 8.2 and for over 85 year olds 11.3. These are more similar to national averages.

¹³³ The winter mortality index is a measure expressed as a ratio of the difference in all cause mortality during winter months (December to March) compared to the average in the non winter months (the preceding August to November and following April to July).

Table 18-28: Fuel poverty

Indicator	Local Study Area				National
	Calderdale Metropolitan Borough	City of Bradford Metropolitan District	Burnley Borough Council	Pendle Borough	England
Fuel poverty (%) ¹³⁴	15.1	15.9	16.2	16.0	11.4

18.8.315 Fuel poverty relates to living in a property with a fuel poverty energy efficiency rating of band D or below and when they spend the required amount to heat their home, they are left with a residual income below the official poverty line. For all areas of the local study area rates of fuel poverty are higher (worse) than the national average. This remains the case with the regional averages of 14.7% for Yorkshire and the Humber and 12.1% for the North West.

18.8.316 Whilst the assessment focuses on the distributed national level benefit, this baseline data illustrates that localised pressures exist for those hosting the Proposed Development, and benefits would also be expected to extend to this level.

18.8.317 The assessment approach also includes reviewing the scientific literature and the following summary points are noted about impacts and health outcomes in general:

- Energy is an increasingly important social and public health concern. It is essential for good health and a prerequisite for basic needs in the household¹³⁵.
- Energy insecurity is an inability to adequately meet basic household energy needs, with adverse environmental, health and social consequences¹³⁶. The challenge is multidimension and includes housing conditions, energy

¹³⁴ The percentage of households in an area that experience fuel poverty based on the low income, low energy efficiency methodology. Updated August 2025.

¹³⁵ Manongi NJ, Rajapandian R, Moti Wala S, AlEdani EM, Samuel EA, Ahmad K, Arcia Franchini AP. A Systematic Review of the Impact of Energy Insecurity on Mental Health During the COVID-19 Pandemic. *Cureus*. 2024 Oct 13;16(10):e71370. doi: 10.7759/cureus.71370. PMID: 39534827; PMCID: PMC11556447.

¹³⁶ Hernández D. Understanding 'energy insecurity' and why it matters to health. *Soc Sci Med*. 2016 Oct;167:1-10. doi: 10.1016/j.socscimed.2016.08.029. Epub 2016 Aug 21. PMID: 27592003; PMCID: PMC5114037.

expenditure and coping strategies¹³⁷. A particularly severe instance of energy insecurity is when a utility disconnects a household from service, affecting its ability to refrigerate perishable food, purchase medicine, or maintain adequate temperatures¹³⁸.

- The growing incidence of extreme weather events attributable to climate change and the parallel surge in energy prices trickle down to formidable health impacts that may prove especially detrimental to vulnerable populations¹³⁹. The availability of reliable, clean, and sustainable energy necessary to ensure the continuous operation of health-care facilities, is essential for delivering safe and effective health care¹⁴⁰.

18.8.318 The assessment approach includes a consideration of likelihood. In this case a population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is renewable electricity generation by the Proposed Development;
- The pathway is electricity transmission and distribution via the National Grid to homes, businesses and services, enabling essential public health elements, including health protection, health promotion and health and social care services; and
- Receptors are the national population accessing electricity from the National Grid, including vulnerable groups.

¹³⁷ Hernández D. Understanding 'energy insecurity' and why it matters to health. *Soc Sci Med*. 2016 Oct;167:1-10. doi: 10.1016/j.socscimed.2016.08.029. Epub 2016 Aug 21. PMID: 27592003; PMCID: PMC5114037.

¹³⁸ Memmott T, Carley S, Graff M, Konisky DM. Utility disconnection protections and the incidence of energy insecurity in the United States. *iScience*. 2023 Feb 21;26(3):106244. doi: 10.1016/j.isci.2023.106244. PMID: 36949753; PMCID: PMC10025124.

¹³⁹ Hernández D. Energy insecurity: a framework for understanding energy, the built environment, and health among vulnerable populations in the context of climate change. *Am J Public Health*. 2013 Apr;103(4):e32-4. doi: 10.2105/AJPH.2012.301179. Epub 2013 Feb 14. PMID: 23409876; PMCID: PMC3673265.

¹⁴⁰ NIHR Global Health Research Unit on Global Surgery. Energy security as a crucial component of health infrastructure: global evidence and actions. *Lancet Planet Health*. 2025 Nov 11:101329. doi: 10.1016/j.lanplh.2025.101329. Epub ahead of print. PMID: 41237797.

18.8.319 Vulnerability relates to characteristics or intersectionality in relation to:

- age (notably children and older people in relation to thermal comfort and food safety);
- existing poor health (including in relation to uninterrupted operation of health and social care services);
- low income (including, affordability of energy markets being dependant on their stability and sustainability); and
- social and geographic disadvantage (including greater reliance on electronic or online social networks and communications for informal support networks and reducing social isolation).

Population sensitivity

18.8.320 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.321 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low**. This reflects that a large proportion of the population will be in good health and have sufficient resources to respond to interruptions in electricity supplies and/or fluctuations in energy prices.

18.8.322 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high**. This reflects that people on low incomes or in poor health may be particularly susceptible to energy insecurity. For these groups and their dependants (young and old), power interruptions or restrictions may greatly increase the risk of adverse health outcomes. Such outcomes occur in many places globally where there has not been adequate investment in large-scale renewable energy and are a foreseeable outcome should there be inadequate provision of new sustainable energy infrastructure in the UK.

Defining Impacts (Magnitude)

18.8.323 **Chapter 4: The Proposed Development** states that the Proposed Development's 34 turbines will allow the export of approximately 240 MW of electricity.

18.8.324 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **medium**.

18.8.325 This reflects that, in the national electricity supply context, the Proposed Development, as a nationally significant infrastructure project, is a medium

beneficial scale of change, for a long-term duration, experienced continuously to frequently. The implication for population health is that health outcome severity relates to a minor change in population mortality (e.g., reducing excess winter deaths), morbidity (reduced burden of disease for physical and mental health outcomes) and increased quality-of-life. Whilst the benefit is to a small minority of the national population as a disturbed effect via the National Grid, this still represents a very large number of people benefiting in ways influential to their livelihoods and lifestyles.

Preliminary Assessment (Significance)

18.8.326 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a medium magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **moderate** beneficial population health effect due to the Proposed Development, which is **significant** in EIA terms.

18.8.327 This reflects that scientific literature indicates a clear relationship between this type of impact and changes in health outcomes; and for the scale of renewable energy generation the degree of health baseline change is anticipated to be small including accounting for vulnerable groups, which is an important degree of change in public health terms within a large population. Consistent with NPS EN-1 paragraph 4.4.1, the Proposed Development change would have an influential general effect on the delivery of health policies and priorities, including in relation to health inequalities, as set out in **Section 18.2**.

Additional Mitigation

18.8.328 No additional measures are proposed.

Residual Effects

18.8.329 The population health effect conclusions are unchanged.

Next Steps

18.8.330 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Decommissioning Phase

18.8.331 Introductory information for each determinant of health is set out in the construction phase assessment section and not repeated here. This is in line with

proportionate assessment and avoids duplication. This includes common information in relation to approach, relevant health outcomes, scientific literature, source-pathway-effect model, study areas and population groups. The operational phase assessment only sets out such information where it varies from the construction stage information.

Open space, leisure and play

18.8.332 This section considers the potential population health effects, including effects on health inequalities, of how the decommissioning of the Proposed Development, effects public rights of way and common land. This section includes consideration of physical and mental health outcomes associated with walking and cycling opportunities and access to the natural environment. The relevant project activities and works are set out in **Chapter 4: The Proposed Development**.

Approach

18.8.333 The relevant study areas are as set out in **paragraphs 18.8.6 and 18.8.7**.

Population sensitivity

18.8.334 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.16**.

18.8.335 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.17**.

18.8.336 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.18**.

Defining Impacts (Magnitude)

18.8.337 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.22**.

Preliminary Assessment (Significance)

18.8.338 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.24**.

Additional Mitigation

18.8.339 No additional measures are proposed.

Residual Effects

18.8.340 The population health effect conclusions are unchanged.

Next Steps

18.8.341 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Transport modes, access and connections

18.8.342 This section considers the potential population health effects, including effects on health inequalities, of decommissioning traffic and highways impacts. This includes: road safety, including active travel along highways; severance within and between communities; and the connections to key public services (notably routine or emergency health related journey travel times). The relevant project activities and works are set out in **Chapter 4: The Proposed Development**.

Approach

18.8.343 The relevant study areas are as set out in **paragraphs 18.8.33** and **18.8.24**.

Population sensitivity

18.8.344 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.345 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.43**.

18.8.346 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.44**.

Defining Impacts (Magnitude)

18.8.347 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.49**.

Preliminary Assessment (Significance)

18.8.348 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.52**.

Additional Mitigation

18.8.349 No additional measures are proposed.

Residual Effects

18.8.350 The population health effect conclusions are unchanged.

Next Steps

18.8.351 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Community identity, culture, resilience and influence

18.8.352 This section considers the potential population health effects, including effects on health inequalities, of decommissioning community identity effects directly affecting mental wellbeing, as well as indirectly social participation, interaction and support. The relevant project features are set out in **Chapter 4: The Proposed Development**.

Approach

18.8.353 The relevant study areas are as set out in **paragraphs 18.8.61** and **18.8.62**.

Population sensitivity

18.8.354 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.355 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.26**.

18.8.356 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.68**.

Defining Impacts (Magnitude)

18.8.357 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **negligible** for the reasons set out in **paragraph 18.8.71**.

Preliminary Assessment (Significance)

18.8.358 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a negligible magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **negligible** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.73**.

Additional Mitigation

18.8.359 No additional measures are proposed.

Residual Effects

18.8.360 The population health effect conclusions are unchanged.

Next Steps

18.8.361 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Employment, income and training

18.8.362 This section considers the potential population health effects, including effects on health inequalities, of changes in employment and income during the decommissioning phase of the Proposed Development. The assessment considers opportunities for good quality jobs and training opportunities, which may particularly benefit some vulnerable groups. Potential for some adverse effects on local employment are acknowledged and also taken into account.

Approach

18.8.363 The relevant study areas are as set out in **paragraphs 18.8.81** and **18.8.82**.

Population sensitivity

18.8.364 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.365 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.90**.

18.8.366 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.91**.

Defining Impacts (Magnitude)

18.8.367 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.94**.

Preliminary Assessment (Significance)

18.8.368 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** beneficial population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.96**.

Additional Mitigation

18.8.369 No additional measures are proposed.

Residual Effects

18.8.370 The population health effect conclusions are unchanged.

Next Steps

18.8.371 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Housing

18.8.372 This section considers the potential population health effects, including effects on health inequalities, of changes in demand for housing due to the accommodation needs of the Proposed Development's decommissioning workforce. This issue therefore focuses on access to existing housing; there is no new housing proposed.

18.8.373 The information reviewed at this preliminary stage indicates that it is unlikely that there would be the potential for significant adverse effects on population health, including for vulnerable groups due to local housing pressures. This includes having

regards to the **Chapter 17: Socio-Economics and Tourism** findings in relation to construction effects. The following preliminary information is set out. This determinant of health will be kept under review and further information reported in the Environmental Statement. This includes potential to scope out this health determinant as not having the potential for likely significant public health effects.

Approach

18.8.374 The relevant study areas are as set out in **paragraphs 18.8.105** and **18.8.106**.

Population sensitivity

18.8.375 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.376 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.113**.

18.8.377 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.144**.

Defining Impacts (Magnitude)

18.8.378 As set out in **paragraph 18.8.117**, defining impacts in the Health Impact Assessment is dependent on further assessment of the workforce profile and accommodation impacts that will be undertaken at the ES stage within the Socio-Economics and Tourism assessment.

Preliminary Assessment (Significance)

18.8.379 No preliminary assessment for health has been undertaken at this stage. This will be considered further in the ES. However, at this stage significant effects cannot be ruled out.

Next Steps

18.8.380 The assessment of population health effects of changes in demand for housing due to the accommodation needs of the Proposed Development's construction workforce will be undertaken, factoring in any assessments that inform the evidence-base for this health determinant.

Health and social care services

18.8.381 This section considers the potential population health effects, including effects on health inequalities, of changes in demand for healthcare due to the presence of the Proposed Development's decommissioning workforce. This issue

therefore focuses on access to existing healthcare, including primary care and emergency department usage. Health service capacity may be affected by a non-permanent UK population in the area. These are people who are not usually resident in the area (so not registered with local NHS services).

18.8.382 The information reviewed at this preliminary stage indicates that it is unlikely that there would be the potential for significant adverse effects on population health, including for vulnerable groups due to local healthcare pressures. This includes having regards to the **Chapter 17: Socio-Economics and Tourism** findings in relation to construction effects. The following preliminary information is set out. This determinant of health will be kept under review and further information reported in the Environmental Statement. This includes potential to scope out this health determinant as not having the potential for likely significant public health effects.

Approach

18.8.383 The relevant study areas are as set out in **paragraphs 18.8.128** and **18.8.128**.

Population sensitivity

18.8.384 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in paragraph 18.8.26.

18.8.385 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.139**.

18.8.386 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.140**.

Defining Impacts (Magnitude)

18.8.387 As set out in **paragraph 18.8.143**, defining impacts in the Health Impact Assessment is dependent on further assessment of the construction workforce profile, particularly those who are not usually resident in the area (so not registered with local NHS services), that will be undertaken at the ES stage within the Socio-economics and Tourism assessment.

Preliminary Assessment (Significance)

18.8.388 No preliminary assessment for health has been undertaken at this stage. This will be considered further in the ES. However, at this stage significant effects cannot be ruled out.

Next Steps

18.8.389 The population health effects of changes in demand for healthcare due to the composition of the construction workforce will be assessed, factoring in any assessments that inform the evidence-base for this health determinant.

Air quality

18.8.390 This section considers the potential population health effects, including effects on health inequalities, of emissions generated by the Proposed Development, during decommissioning, including in relation to UK statutory health protection standards and non-threshold health effects (effects even below these standards). The relevant project activities and works are set out in **Chapter 4: The Proposed Development**.

Approach

18.8.391 The relevant study areas are as set out in **paragraph 18.8.155, 18.8.140 and 18.8.156**.

Population sensitivity

18.8.392 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.393 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.164**.

18.8.394 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.164**.

Defining Impacts (Magnitude)

18.8.395 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.167**.

Preliminary Assessment (Significance)

18.8.396 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.169**.

Additional Mitigation

18.8.397 No additional measures are proposed.

Residual Effects

18.8.398 The population health effect conclusions are unchanged.

Next Steps

18.8.399 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Noise and vibration

18.8.400 This section considers the potential population health effects, including effects on health inequalities, of changes in the sound environment due to the Proposed Development during construction. The relevant project activities and works are set out in **Chapter 4: The Proposed Development**.

Approach

18.8.401 The relevant study areas are as set out in **paragraphs 18.8.179** and **18.8.180**.

Population sensitivity

18.8.402 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.403 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.188**.

18.8.404 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.189**.

Defining Impacts (Magnitude)

18.8.405 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.192**.

Preliminary Assessment (Significance)

18.8.406 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.194**.

Additional Mitigation

18.8.407 No additional measures are proposed.

Residual Effects

18.8.408 The population health effect conclusions are unchanged.

Next Steps

18.8.409 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

Water quality or availability

18.8.410 This section considers the potential population health effects, including effects on health inequalities, of potential effects on water quality, quantity and flood risk due to the Proposed Development during decommissioning.

Approach

18.8.411 The relevant study areas are as set out in **paragraphs 18.8.206** and **18.8.207**.

Population sensitivity

18.8.412 General factors taken into account that distinguish the sensitivity of the general population and vulnerable group sub-population are set out in **paragraph 18.4.26**.

18.8.413 Using the criteria set out in **Table 18-8**, the sensitivity of the general population of the study area is **low** for the reasons set out in **paragraph 18.8.212**.

18.8.414 Using the criteria set out in **Table 18-8**, the sensitivity of the vulnerable group sub-population of the study area is **high** for the reasons set out in **paragraph 18.8.123**.

Defining Impacts (Magnitude)

18.8.415 In relation to population health, using the criteria set out in **Table 18-9** and associated guiding definitions, the magnitude of change is considered to be **low** for the reasons set out in **paragraph 18.8.216**.

Preliminary Assessment (Significance)

18.8.416 On the basis of high sensitivity in the vulnerable group sub-population for the study areas, as indicative of both vulnerability and inequalities, and the preliminary assessment of a low magnitude of impact, the professional judgment, informed by the **Table 18-10** matrix and **Table 18-11** criteria, is that there would be a **minor** adverse population health effect due to the Proposed Development, which is **not significant** in EIA terms. The rationale is as set out in **paragraph 18.8.218**.

Additional Mitigation

18.8.417 No additional measures are proposed.

Residual Effects

18.8.418 The population health effect conclusions are unchanged.

Next Steps

18.8.419 These preliminary conclusions will be discussed with stakeholders (as set out in **Section 18.3**) and feedback sought. The assessment and its data inputs will be reviewed and updated as appropriate for the ES, including in relation to any revised information set out within the other EIA topic Chapter and assessments that inform the evidence-base for this health determinant.

18.9 Conclusions

18.9.1 **Table 18-29** presents a summary of the preliminary assessment of likely significant effects, with further information. It also includes the next steps to be undertaken as part of the Environmental Impact Assessment.

Table 18-29: Summary of Preliminary assessment of Likely Significant Effects

Element	Preliminary assessment of Likely Significant Effect	Additional Mitigation	Residual Effect	Next Steps
Construction and Decommissioning Phases				

Element	Preliminary assessment of Likely Significant Effect	Additional Mitigation	Residual Effect	Next Steps
Open space, leisure and play	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Transport modes, access and connections	Minor adverse (not significant)	CTMP measures for early highway impact notification to health services	Negligible adverse (not significant)	Stakeholder discussion Updated analysis in ES Chapters
Community identity, culture, resilience and influence	Negligible adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Employment, income and training	Minor beneficial (not significant)	oESSMP measures targeting vulnerable groups.	Moderate beneficial (significant)	Stakeholder discussion Updated analysis in ES Chapters

Element	Preliminary assessment of Likely Significant Effect	Additional Mitigation	Residual Effect	Next Steps
Housing	To be assessed further in the ES – significant effects cannot be ruled out			N/A
Health and social care services	To be assessed further in the ES – significant effects cannot be ruled out			N/A
Air quality	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Noise and vibration	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Water quality or availability	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters

Element	Preliminary assessment of Likely Significant Effect	Additional Mitigation	Residual Effect	Next Steps
Operation and Maintenance Phase				
Open space, leisure and play	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Community identity, culture, resilience and influence	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Employment, income and training	Negligible beneficial (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Noise and vibration	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters

Element	Preliminary assessment of Likely Significant Effect	Additional Mitigation	Residual Effect	Next Steps
Water quality or availability	Minor adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Shadow Flicker	Negligible adverse (not significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters
Wider societal infrastructure and resource	Moderate beneficial (significant)	None	Unchanged	Stakeholder discussion Updated analysis in ES Chapters

