Environmental Statement

Volume 2i: Scheme-wide Assessment

Chapter 15: Population and human health

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15. POPULATION AND HUMAN HEALTH

Summary of principal findings

This chapter presents the assessment of population and human health effects associated with the construction and operation of the Huddersfield to Westtown (Dewsbury) section of the Transpennine Route Upgrade (TRU) Programme. This chapter covers the assessment of the entirety of the Huddersfield to Westtown (Dewsbury) Route (hereafter referred to as 'the Scheme').

The assessment has been based on a detailed collation and evaluation of desktop study and other data sources covering the following wider determinants of health:

- Air pollution;
- Soil and water pollution;
- Risk of injuries and death;
- Housing;
- Education, healthcare services and community facilities;
- Open space, recreation and leisure-time facilities;
- Transport options;
- Active travel;
- Work and training;
- Social cohesion and lifetime neighbourhoods; and
- Noise pollution and vibration.

During construction, the assessment finds that significant effects are predicted for the following wider determinants of health.

For housing, the permanent loss of Numbers 1, 2 and 3 Heaton Lodge Cottages to facilitate the buildability of the Scheme and increase line speeds, and permanent loss of garden space at 12 Lilac Court, 4 Glenfield Avenue and Numbers 82 to 86 Glenfield Avenue would be permanent, direct and irreversible for the physical receptors (houses) and human receptors (owners/occupants). The effects would be the same for all population groups, including the wider group and any vulnerable groups present at these properties.

Temporary land take and/or disruption effects at Topaz Close, eight residential properties at Lilac Court, seven properties at Whitacre Street, rear gardens at Glenfield Avenue (Numbers 2 to 28 and 76 to 86), land to the rear of Numbers 682-684 Leeds Road, Chadwick Fold, 41 Thornhill Road, and four properties at Brooks Yard would result in significant temporary, direct, short-term and reversible for the physical receptors (houses) and human receptors (owners/occupants). The effects would be the same for all groups.

There would be no significant temporary or permanent effects for people not living at any of the above properties.

For education, healthcare services and other social infrastructure, significant temporary disruptions to access and severance effects for Childs Play Day Care Nursery at 21 Thornhill Road would result in temporary, direct, short-term and reversible for workers, parents and children that attend the nursery. There would be no significant effects for people not working at, or using, the nursery. Following completion of the works, there would be no permanent significant effects for the physical or human receptors

For open space, recreation and leisure-time facilities, the temporary loss of public open space

during construction would result in significant temporary, direct, short-term and reversible effects on the physical receptor (public open space) and the users of this public open space (human receptors). Permanent loss of public open space is mitigated through the provision of exchange land, so there will be no loss of area or quality of public open space as a result of the Scheme during the operational phase.

For transport options, the temporary closure of the railway and stations would result in significant disruption effects, changes to travel patterns, longer journey distances and times, changes in journey quality and reliability, inconvenience and increased costs. These effects would be temporary, direct, short-term and reversible. The effects would be the same for all population groups, including the wider group and any vulnerable groups. Following completion of the works, there would be no permanent significant effects for the physical or human receptors.

The temporary closure of a number of local roads in the core study area (e.g. the A62 Leeds Road, Whitacre Street, B6118 Colne Bridge Road, Station Road, Newgate/Newgate Street, Calder Road and Thornhill Road/Fall Lane) would result in significant disruption effects, re-routing of vehicles, changes to travel patterns, longer journey distances and times, changes in journey quality and reliability, inconvenience and increased costs. These effects would be temporary, direct, short-term and reversible for the physical and human receptors. These significant effects would be the same for all groups, irrespective of whether they fall within the wider group or one of the vulnerable groups.

As informed by Chapter 14 (Traffic and transport) in Volume 2i of the ES, delays, accidents, safety and amenity issues, fear and intimidation and severance are predicted for a number of physical receptors (links and roads) and human receptors (vehicle travellers, pedestrians and cyclists) in the study area identified in the Traffic and transport assessment, which is based on the Scheme and surrounding transport routes:

- Driver delay, pedestrian and cyclist delay, and accidents and safety – predicted for 48 links (37 roads);
- Pedestrian and cyclist amenity – predicted for 28 links (27 roads);
- Fear and intimidation – predicted for 48 links (37 roads); and
- Severance – predicted for 67 links (42 roads).

For active travel, significant disruption effects, increases in journey distance and times and severance are predicted for the physical and human receptors from the permanent diversion/realignment of PRoW footpaths HUD/51/10 and KIR/240/10, PRoW Bridleway DEW/3/10 and a small part of the Birkby Bradley Greenway (National Cycle Network (NCN) Route 69). These effects would be permanent, direct and irreversible. These effects would continue to be observed during the operation phase. The effects would be the same for all groups.

Temporary closure, disruption effects, and in some cases temporary diversions are anticipated at a number of PRoW, footpaths, canal towpaths and greenways in the core study area. Most of the effects (e.g. temporary disruptions, severance, pedestrian or cyclist delays, increased journey distance and times) would be direct, short-term and reversible, with indirect effects identified for PRoW DEW/1/10. The effects would be the same for all groups.

For work and training, permanent adverse effects would result from the demolition of the commercial property at 67 Thornhill Road during construction. This effect would be permanent, direct and irreversible for the physical receptor (commercial property) and the human receptors (owner(s) of the property). During operation, the socio-economic assessment has identified that improvements resulting from improved journey times, reliability, and capacity during operation are judged to be likely to bring direct significant benefits to the

local businesses and the labour market through improved access and in providing opportunities around Huddersfield Station through spend and business activity uplifts.

Temporary significant disruption effects would be experienced by the tea rooms at Huddersfield Station, the car wash facility and car park on Longroyd Lane to accommodate the construction compound, Montgomery's Engraving during works at Red Doles Road Underbridge (MVL3/96) and to accommodate the construction compound, local businesses off the A62 Leeds Road and in the surrounding area during the works, local businesses off the B6118 Colne Bridge Road and the surrounding area during the temporary closure of this road, and a range of local businesses near the proposed works at Calder Road and Thornhill Road. These effects would be temporary, direct, short-term and reversible for the physical and human receptors (owners/employees). No significant effects are predicted for customers or people that use these local businesses

Temporary residual effects are predicted from road traffic noise at noise sensitive receptors (NSR) due to temporary construction traffic and diversions along the affected routes (i.e. NSR along Alder Street and Woodhouse Hill, Sheepridge Road/Deighton Road up to Keldregate, Keldregate, Deighton Road between Keldregate and Whitacre Street, Whitacre Street, and Deighton Road between Whitacre Street and Leeds Road; Dalton Bank Road; Station Road, Hopton New Road, Back Station Road, Granny Lane, Hopton Lane/Hopton Hall Lane (down to Upper Hopton and Liley Lane), Calder Road and Newgate, and; Warren Street and Forge Lane). The significant effects would be the same for the wider group and all vulnerable groups.

During operation, significant residual adverse effects are predicted from airborne railway noise in the external amenity areas at No. 43, 45, 47, 49, 51 and 54 Whitacre Close, No. 11 & 13 Whitacre Street, No. 11 & 12 Lilac Court, No. 682-684 Leeds Road and No. 24 and 26 Brooks Yard during daytime periods should noise attenuation measures, in the form of barriers, not be effective or feasible.

15.1 Introduction

15.1.1 This chapter presents the assessment of population and human health effects associated with the construction and operation of the Huddersfield to Westtown (Dewsbury) section of the Transpennine Route Upgrade (TRU) Programme. This chapter covers the assessment of the entirety of the Huddersfield to Westtown (Dewsbury) Route (hereafter referred to as the 'Scheme'). The population and human health assessment is further broken down into six Route Section Assessments in Volume 2ii of this Environmental Statement (ES) which provide additional detail to this chapter.

15.1.2 This chapter is set out as follows:

- Legislative and policy context – the legislative and policy context relevant to the Scheme and population and human health is listed, with more detailed summary provided in the appendices;
- Assessment methodology – the methodology for assessing the potential impacts and effects (both beneficial and adverse) of the Scheme on physical and human receptors (i.e. population and human health) is described;
- Baseline of the Scheme – the population and human health baseline within the Scheme is summarised, with more detailed baseline provided in the appendices where indicated;
- Potential effects – the potential impacts and effects (both beneficial and adverse) on physical and human receptors, including physical, mental and social wellbeing during construction and operation are characterised;
- Mitigation measures – agreed avoidance, mitigation, compensation and enhancement measures to protect human health are described;
- Residual effects – the significance of residual effects (both beneficial and adverse) on physical and human receptors following the implementation of mitigation measures is assessed; and
- Cumulative developments relevant to the Scheme are described and assessed.

15.1.3 A detailed description of the Scheme is provided in Chapter 2 (Scheme description) in Volume 2i of the ES and all appendices and figures referred to in this chapter are provided in Volumes 3 and 4 of this ES respectively.

15.2 Legislative and policy context

15.2.1 The following legislation, national, regional and local planning policy has been used to inform the baseline and assessment, providing direction on relevant issues such as population, human health, transport, land use and development. A detailed summary of the legislation and policy and how it is relevant to the Scheme is included in Appendix 15-1.

National

- Town and Country Planning Act 1990 (T&CPA)[1];
- National Policy Statement for National Networks (December 2014)[2] (NPS) ;
- National Planning Policy Framework (2019)[3] (NPPF);

[1] UK Government - Public General Acts (1990) *Town and Country Planning Act 1990* (Town and Country Planning Act 1990 (legislation.gov.uk))
[2] Department for Transport *National Networks National Policy Statement (December 2014)* (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf)
[3] Ministry of Housing, Communities and Local Government (2019) *National Planning Policy Framework* (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf)

- National Planning Practice Guidance (NPPG)[4] March 2012, updated July 2019;
- National Infrastructure Delivery Plan 2016 – 2021[5];
- Countryside Rights of Way Act 2000[6];
- Fair Society, Healthy Lives (the Marmot Review) 2010[7];
- Health and Social Care Act 2012[8];
- The Public Services (Social Value) Act 2012[9]; and
- Public Health England (PHE) Strategy 2020 to 2025[10] (2019).

15.2.2 The national legislation and policy highlight the importance of the rail network, with a high proportion of rail journeys used for business and commuting/education purposes. The legislation and policies promote integrated transport and spatial planning solutions, with a presumption in favour of sustainable development, provided that it protects, manages and mitigates any potential significant effects on the built and natural environment.

15.2.3 The general aim of the health legislation, strategies and policies is to improve the physical and mental health and social wellbeing of the population and reduce inequalities.

15.2.4 The Scheme can contribute to sustainable development by reducing congestion, providing extra capacity on the rail network, more services and better journeys. This can have positive economic and social benefits for people and promote positive health outcomes, as promoted by the legislation, strategies and polices.

Regional

- The Strategic Transport Plan (Transport for the North) (January 2019)[11];
- My Journey West Yorkshire: Connecting People and Places- West Yorkshire Local Transport Plan 2011-2026 (LTP3)[12];
- West Yorkshire Combined Authority (WYCA) Transport Strategy 2040[13];
- Leeds City Region Strategic Economic Plan 2016-2036 (SEP)[14];
- RailPlan 7 (2012)[15]; and
- Kirklees 2025 Transport Vision (2005)[16].

15.2.5 Several strategies and plans have been produced for the West Yorkshire and Leeds City

[4] Ministry of Housing, Communities and Local Government *National Planning Practice Guidance* (Planning practice guidance - GOV.UK (www.gov.uk))
[5] Infrastructure & Projects Authority *National Infrastructure Delivery Plan 2016 – 2021* (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/520086/2904569_nidp_deliveryplan.pdf)
[6] UK Government (2000) *Countryside Rights of Way Act* (Countryside and Rights of Way Act 2000 (legislation.gov.uk)
[7] The Marmot Review (2010) Fair Society, Healthy Lives (Fair Society Healthy Lives full report (parliament.uk))
[8] UK Government (2012) *Health and Social Care Act* (https://www.legislation.gov.uk/)
[9] UK Government (2012) *The Public Services (Social Value) Act 2012* (https://www.legislation.gov.uk/ukpga/2012/3/enacted)
[10] Public Health England (2019) *PHE Strategy 2020 to 2025* (https://assets.publishing.service.gov.uk/government/)
[11] Transport for the North (2019) *The Strategic Transport Plan* (https://transportforthenorth.com/our-north/strategic-transport-plan/)
[12] METRO My Journey West Yorkshire: Connecting People and Places- West Yorkshire Local Transport Plan 2011-2026 (LTP3https://www.wymetro.com/media/1124/20121003ltpfullstrategy.pdf)
[13] West Yorkshire Combined Authority (WYCA) *Transport Strategy 2040* (https://www.westyorks-ca.gov.uk/media/2379/transport-strategy-2040.pdf)
[14] Leeds City Region Enterprise Partnership & WYCA (2016) *Leeds City Region Strategic Economic Plan 2016-2036* (https://www.westyorks-ca.gov.uk/media/1110/strategic-economic-plan.pdf)
[15] METRO (2012) *RailPlan 7* (https://www.wymetro.com/media/1128/20121017railplan7.pdf)
[16] Kirklees Council (2005) *Kirklees 2025 Transport Vision* (https://www.kirklees.gov.uk/beta/planning-policy/pdf/supportingDocuments/transportInfrastructure/2025-Kirklees-Transport-Vision.pdf)

Region with the aim of delivering an efficient Northern transport network – connecting people and businesses and allowing the efficient movement of goods and services.

15.2.6 These strategies and plans highlight the need for improved and faster transport links and integrated networks with other public transport services. By improving connections and increasing efficiency, reliability and resilience in the rail network and releasing constraints on the road, the Scheme can have a positive impact on the local economy and quality of life of people in the local area and across the region.

Local

- Kirklees Local Plan (2019)[17];
- Kirklees Local Plan allocations and designations (Adopted Feb 2019)[18];
- The Infrastructure Delivery Plan (IDP) Addendum[19];
- Kirklees Walking and Cycling Strategic Framework 2018-2030[20];
- Kirklees Joint Health and Wellbeing Strategy 2014-2020 (JHWS)[21];
- Kirklees Joint Strategic Assessment (KJSA)[22];
- Kirklees 'Whole Life Approach' for Mental Health & Wellbeing 2017-2021 "No Health, without Mental Health"[23];
- Kirklees Council's Corporate Plan 2018-2020[24];
- Kirklees Economic Strategy 2019-2025[25];
- Huddersfield Town Centre Masterplan 2019-2031 (June 2019)[26];
- Dewsbury Riverside Masterplan[27];
- Bradley Masterplan[28]; and
- Mirfield Neighbourhood Plan[29]

15.2.7 The local planning policy, strategies and plans set out the vision and parameters for development within Kirklees and how this development will be accommodated to reflect the distinctiveness of different parts of the district. This includes objectively assessed development needs, clear policies to guide decisions on planning applications, site allocations showing land to be developed, designations showing land to be protected from development,

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[17] Kirklees Council (2019) *Kirklees Local Plan - Strategy and Policies* (https://www.kirklees.gov.uk/beta/planning-policy/pdf/local-plan-strategy-and-policies.pdf)
[18] Kirklees council (2019) *Kirklees Local Plan Allocations and Designations* (https://www.kirklees.gov.uk/beta/planning-policy/pdf/local-plan-allocations-and-designations.pdf)
[19] Kirklees Council (2015) *Kirklees Local Plan Infrastructure Delivery Plan* (https://www.kirklees.gov.uk/beta/planning-policy/pdf/submission-documents/CIL_005_Kirklees_Infrastructure_Delivery_Plan_October_2015.pdf)
[20] Kirklees Council (2018) *Kirklees Walking and Cycling Strategic Framework 2018 – 2030* (https://www.kirklees.gov.uk/beta/food-exercise-and-sport/pdf/walking_and_cycling_framework.pdf)
[21] Kirklees Council *Kirklees Joint Health and Wellbeing Strategy 2014-2020* (Joint Health and Wellbeing Strategy (kirklees.gov.uk))
[22] Kirklees Council *Kirklees Joint Strategic Assessment* (http://observatory.kirklees.gov.uk/jsna)
[23] Nadeem Murtuja / Nikki Gibson-Windle and Tony Bacon (2017) *Kirklees 'Whole Life Approach' for Mental Health & Wellbeing 2017-2021 "No Health, without Mental Health* (https://www.kirklees.gov.uk/beta/adult-social-care-providers/pdf/mental-health-strategy.pdf)
[24] Kirklees Council (2018) *Kirklees Council's Corporate Plan 2018-2020* (https://www.kirklees.gov.uk/beta/delivering-services/)
[25] Kirklees Council (2019) *Kirklees Economic Strategy 2019-2025* (https://www.kirklees.gov.uk/beta/delivering-services/pdf/economic-strategy.pdf)
[26] Kirklees Council (2019) *Huddersfield Town Centre Masterplan 2019-2031* (https://www.kirklees.gov.uk/beta/huddersfield-blueprint/index.aspx)
[27] Miller Homes *Dewsbury Riverside Masterplan* (www.dewsburyriverside.co.uk/proposal.aspx)
[28] MW Architecture and Urban Design/Kirklees Council *Bradley Masterplan* (https://www.kirklees.gov.uk/beta/planning-policy/pdf/site-specific/Bradley-Masterplan-Huddersfield-stage-2-report-preferred-urban-design-approach.pdf)
[29] Mirfield Town Council *Mirfield Neighbourhood Plan* (Neighbourhood Plan (mirfieldtowncouncil.com)

infrastructure provision to support the delivery of the proposed development, area specific masterplans and neighbourhood plans to focus development towards specific and local need, and an indication of how policies will be delivered and implemented.

15.2.8 The Scheme is seen as an important part in supporting the strategic policies for Kirklees. It can contribute to a sustainable transport system that has the potential to improve the health and wellbeing of the local population and the environment whilst positively contributing to the local economy. In doing so, the Scheme design will need to protect, where possible, the natural and built environment and existing and future development land.

15.3 Assessment methodology

15.3.1 This section explains the methodology used to assess the effects of the Scheme (both beneficial and adverse) on population and human health, including the distribution of effects within the population.

15.3.2 The population and human health assessment methodology uses the following assessment steps:

- Study area – the study areas relevant to population and human health are identified and summarised;
- Sensitive receptors – the physical and human receptors with potential to be impacted or affected by the Scheme (both beneficial and adverse) are identified, including the presence of sensitive/vulnerable groups that would be more susceptible to impacts or effects arising from the Scheme;
- Wider determinants of health – the wider health determinants (i.e. a diverse range of social, economic and environmental factors which influence people's mental and physical health) considered relevant to the Scheme are identified and described;
- Sensitivity of receptors – the sensitivity of the physical and human receptors to changes to the wider health determinants is described; and
- Assessment criteria – the criteria for assessing the magnitude of impact and significance of effects (both beneficial and adverse) of changes to the wider health determinants is described.

Study area

15.3.3 By using professional judgement, industry best practice and knowledge from other transportation schemes, the likely effects for population and human health will predominantly be assessed within the core study area, however other study areas will also be used to develop the baseline profile for the Scheme and assess the potential impacts and effects arising from the Scheme. The following study areas will be used:

- Core study area consisting of the Scheme Area (area within the Scheme boundary) and a 500 metre (m) buffer extending outwards from the Scheme boundary (see Figure 15-1). This study area has been chosen as from a population and human health perspective it captures the key sensitive physical and human health receptors which have the potential to be impacted or affected by the Scheme. Within this core study area, the level of potential disruption effects to population and human health (e.g. the physical and human receptors) will generally be considered on the basis that the closer the proposed works occur to sensitive receptors (for example, for Housing – residential properties would be the physical receptors and the residents/occupants living within these properties would be the human receptors, some of whom may be susceptible to changes to the baseline conditions), the more mitigation may be required (e.g. close to the proposed works or directly affected, as opposed to 500m away). However, impacts from changes to some receptors (for example, the temporary closure of a railway station) has the potential to result in effects that would

extend further or beyond the core study area and this will also be considered in the assessment.

- A wider study area (see Figure 15-2) used to define the characteristics and sensitivity of local communities and the context within which the local economy operates. This wider study encompasses:
  - The Kirklees local authority area;
  - Other nearby local authority areas where appropriate; and
  - The regional area where appropriate.
- A wider study area used to define the characteristics of population and human health and health inequalities. This includes the area within which the local and regional National Health Service (NHS) organisations operate. This is shown in Figure 15-3;
- From a public health perspective, likely changes in, for example, air quality or noise levels or soil pollution are changes in determinants of health, not changes in health outcomes. Therefore, the consideration of potential significant effects on population and human health also requires a consideration of the way in which any change identified in the various environmental topic chapters of the ES (e.g. Air quality, Noise and vibration etc.), can be expected to manifest itself in health and well-being outcomes e.g. a change in air pollutants can cause a change in respiratory health or noise or vibration can cause a change in social or mental wellbeing. Therefore, the inclusion of those potential effects in this assessment is required to consider the issue of attribution i.e. how the health outcomes in the current and future population could be impacted as a result of the Scheme. As a result, the study areas defined in the assessment methodology sections of each of the respective environmental chapters will also apply. These study areas are as follows:
  - Air quality (Chapter 7) – for human health receptors, within a 350m buffer from the Scheme boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance;
  - Noise and vibration (Chapter 8)
    - construction noise and vibration impacts – within a 300m buffer of the physical works associated with the Scheme;
    - rail traffic noise/operational noise impacts – within a 300m buffer of the outermost railway tracks;
    - rail traffic vibration/operational vibration impacts - within a 20m buffer of the outermost railway tracks;
    - ground borne noise impacts – within a 50m buffer of the outermost railway tracks; and
    - road traffic noise - within 300m of new road links or road links physically changed or bypassed by the project and 50m of other road links with the potential to experience a short-term noise change of more than 1.0dB(A).
  - Water environment (Chapter 11) – within a 1km buffer from the Scheme boundary;
  - Geology, soils and land contamination (Chapter 12) – within a 250m buffer from the Scheme boundary;
  - Public open space (Chapter 20) – the study area comprises the Scheme boundary and any area of identified public open space which extends beyond the Scheme boundary (i.e. is in part within the Scheme boundary); and
  - Socio-economics (Chapter 21) – the study area comprises the local area (the ward boundaries in which the Scheme is located, as shown in Figure 15-1), the Local Authority area (the administrative area of Kirklees, as shown in Figure 15-2), the Sub-regional area (West Yorkshire) and the Regional area (Yorkshire and The Humber, the North West and the North East).

15.3.4 It is considered that these study areas will capture any significant population and human health effects resulting from the Scheme, including those on physical and mental health and social wellbeing.

15.3.5 Depending on the specific wider determinant of health, locality of the physical and human receptors and nature of the potential effects on population and human health arising as a result of the Scheme, potential effects will be reported in the assessment for the core study area or the wider study area, whichever is applicable.

Assessment criteria

Identifying the sensitive receptors

15.3.6 Using professional judgement and best practice guidance, the assessment is based upon Institute of Environmental Management and Assessment (IEMA) guidance contained in 'Health in Environmental Impact Assessment: A Primer for a Proportionate Approach' and the World Health Organisation (WHO) definition of health used by the public health profession in the UK. Here, health is defined as a 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity'. A further consideration in the assessment is equity, or the distribution of effects (demographic, socio-economic, geographic), within the affected population.

15.3.7 This assessment considers the potential effects of the Scheme on two types of population. The first is the general or wider population (e.g. residents, passengers, workers, owners, operators and users of community and amenity facilities, visitors to and users of open spaces, recreation routes and sports facilities, and road users) and the second is vulnerable groups present within the general population.

15.3.8 The baseline study in Section 15.4 has been used to identify the key physical and human receptors with the potential to be affected by the Scheme, including the presence of any vulnerable or sensitive groups. The assessment considers the potential effects of the Scheme on two types of receptors. The first is physical receptors (e.g. physical assets such as residential properties, schools, community facilities, local businesses, commercial interests, railway infrastructure, roads, footpaths, public open space etc.) and the second is the human receptors present at or using these physical receptors.

15.3.9 In broad terms, the population closest to the location of changes occurring as a result of activities associated with the Scheme would be more exposed or sensitive to potential impacts or effects arising from the Scheme. Although these groups may not be 'vulnerable' in human health, social or other terms, they are likely to be more sensitive to change. Population groups specifically identified as being more vulnerable or susceptible to impacts arising from the Scheme depends on the characteristics of the local population and the nature and proximity of the proposed works associated with the Scheme. The sensitivity of an individual or population sub-group encompasses their ability to withstand exposures and the range of associated impacts or effects, and the physiological (e.g. co-morbidities or disabilities) and socio-economic factors that increase their susceptibility to the exposure.

15.3.10 The following vulnerable or sensitive population sub-groups have been identified as being present within the core and wider study areas and will be carefully considered in the assessment. The vulnerable groups identified are not mutually exclusive; an individual may fit into one or more of these categories:

- Families with children and adolescents (e.g. pregnant women, babies, children and adolescents);
- People who are physically or mentally disadvantaged (e.g. elderly people, people with physical and/or disabilities, people with other health problems or impairments);

- People of certain ethnicity and/or gender; and
- People who are materially disadvantaged (e.g. people on low income, people without access to a car, unemployed people).

15.3.11 The above vulnerable groups, along with the wider groups (e.g. characterised as residents, passengers, workers, visitors to, or, users of local facilities etc. in the proximity of the Scheme), are described in greater detail in Table 15-1.

Table 15-1 Overview of the Wider groups and Vulnerable or Sensitive sub-groups (adapted from IEMA, 2017)

Sub-group	General description of sub-group and their likely locality within the Scheme	Sensitivity or susceptibility of the sub-group to impacts or effects (both beneficial and adverse) arising from the Scheme
Wider groups – adults/usual residents/working people	Residents living in houses, operators and users of community land and facilities, users of open space, recreation and leisure-time facilities, workers at railway stations and local businesses, non-motorised users (NMU), users of the railway network, public transport users and vehicle travellers.	The key challenges to the physical health, mental and social wellbeing of the local resident population arises from inactivity and unhealthy lifestyle choices and are also linked to the local transportation and road network. Residents of properties in the core study area, operators and users of community land and facilities, employees and customers at the large number of retail, commercial and industrial businesses located throughout the area, walkers and cyclists using recreation routes and the local footpath/cycle network, visitors to nearby visitor attractions and public transport users are likely to be most exposed to health impacts arising from the Scheme. Network Rail and train employees, rail contractors constructing, maintaining and renewing the railway, the supply chain, lineside neighbours, passengers who travel on the rail network and members of the public who interact with the railway at places such as railway stations, bridges, underpasses and level crossings are also likely to be most exposed to potential health impacts or effects.
Sensitive group – families with children and adolescents (pregnant women, babies, children and adolescents)	Families living in houses, users of community services and facilities, users of healthcare services and other social infrastructure, users of commercial and retail premises, users of open space, recreation and leisure-time facilities, users of PRoW, local footpaths and cycleways, users of trains, railway stations and the railway network, users of public transport and local bus stops, vehicle travellers.	Children and adolescents constitute a sensitive population group due partly to their need to be able to move around freely to and from school, open space, recreation, and leisure-time facilities, whilst they lack the experience and judgement displayed by adults when moving around in traffic and public spaces[30] and when using public transport and related infrastructure, such as railway stations and level crossings. Hence, children and adolescents as pedestrians[31] and cyclists are at elevated risk from danger distributed by the rail network and motorised transport. They are also more prone to trespass on railway land and be affected by electricity, construction activities and construction sites. Furthermore, children are more sensitive than adults from the effects of air pollution[32], noise[33], odour[34] and other environmental factors and their bodies and minds are less able to deal with them. Particularly susceptible children are those from low-income[35] and/or black and minority ethnic (BME) backgrounds[36] and/or those living in the more deprived areas. Pregnant women may be more sensitive when travelling on trains and public transport as they may feel anxious or nauseous, especially at times of overcrowding, whilst women and/or men with babies or young children often carry additional child related equipment and require appropriate facilities to accommodate pushchairs for example[37]. Access steps, platform gaps and stepping distances can be a risk to people with small children and pushchairs. This can deter them from travelling unless their specific needs are catered for.
Sensitive group – People who are physically or mentally disadvantaged (elderly people, people with physical disabilities, people with other health problems or impairments)	Residents living in houses, residents living in care homes/nursing homes or non-residential institutions, users of community services and facilities, users of healthcare services and other social infrastructure, users of commercial and retail premises, users of open space and recreational facilities, users of PRoW, local footpaths and cycleways, users of trains, railway stations and the railway network, users of public transport and local bus stops, vehicle travellers	Elderly people constitute a sensitive group as they are more sensitive to a variety of impacts than young and middle-aged adults. Generally, the older people are, the slower their movement and reactions and the poorer their hearing[38]. They can be more at risk from injury and may fear falls, steps or lack of suitable access to railway stations, platform gaps and stepping distances. They can also be more susceptible to the effects of overcrowding, changes/disruptions to public transport, lack of safe crossing points and short crossing times at safe crossing points and other aspects of the surrounding built environment[39]. This can deter them from outdoor activity, especially walking, whereas walking is critical for muscle strength and reduces the risk of falls amongst other benefits. This group can find the neighbourhood and railway setting particularly anxiety-provoking and worrying leading to withdrawal and isolation or an increase in accidents. Elderly people can also feel more sensitive when using public transport[40],[41]. They also have a greater need to use or seek health or community services. Their continuing independence at home is often dependent on having available a range of transport modes, routes and travel options.

[30] World Health Organisation (2018, December) Adolescents: health risks and solutions (https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions)
[31] Child Accident Prevention Trust (2013) Child death from road traffic accidents (http://makingthelink.net/child-deaths-road-traffic-accidents)
[32] World Health Organisation (2018) Air pollution and child health: prescribing clean air (https://www.who.int/ceh/publications/air-pollution-child-health/en/)
[33] World Health Organisation Data and statistics (http://www.euro.who.int/en/health-topics/environment-and-health/noise/data-and-statistics)
[34] Agency for Toxic Substances and Disease Registry (2015, October) (https://www.atsdr.cdc.gov/odors/faqs.html)
[35] British Medical Journals, Wickham. S, Anwar. E, Barr.B, Law. C, Taylor-Robinson.D (2016, July) Poverty and child health in the UK: using evidence for action (https://adc.bmj.com/content/101/8/759)
[36] Parliamentary Office of Science and Technology (2007, January) (https://www.parliament.uk/documents/post/postpn276.pdf)
[37] Price, L., & Matthews, B. (2013). Travel time as quality time: Parental attitudes to long distance travel with young children. Journal of Transport Geography, 32, 49–55 (http://cel.webofknowledge.com/)
[38] Transport for London (2013, April) Older Pedestrians and Road Safety, Research Debrief (http://content.tfl.gov.uk/older-pedestrians-research-report.pdf)
[39] Asher. L, Aresu. M, Falaschetti. E, Minell. J (2012) Most older pedestrians are unable to cross the road in time: a cross-sectional study (http://ageing.oxfordjournals.org/content/41/5/690.full.pdf+html?sid=4b5142fa-92a1-4cd5-80b1-4eb35701432e)
[40] Shrestha.B.P, Millonig.A, Hounsell.N.B, McDonald.M (2017) Review of Public Transport Needs of Older People in European Context (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5656732/)
[41] https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/active-communities/rb_june15_the_future_of_transport_in_an_ageing_society.pdf (page 10)

Sub-group	General description of sub-group and their likely locality within the Scheme	Sensitivity or susceptibility of the sub-group to impacts or effects (both beneficial and adverse) arising from the Scheme
		People who are disabled and/or with physical and/or mental illnesses or impairments constitute a sensitive group as they may not be able to access many forms of transport or need special arrangements and/or support to access these[42]. They are more likely to find it difficult to walk or travel independently and can also be disadvantaged by the cost of transport. Access steps, platform gaps and stepping distances can be a particular risk to people with impairments. This can deter them from travelling unless their specific needs are catered for. Any changes in access, such as reduced accessibility, greater travel distances, diversions or bus replacement services can have particular impacts on this vulnerable group. Chronically ill persons (e.g. people with impaired lung function) can be more adversely affected by air pollution[43]. The same is true of hypersensitive individuals such as asthmatics[44]. Noise can cause hypertension and cardio-vascular problems[45]. Those who already have these conditions can be more troubled by noise than others. People with existing physical and mental illnesses, including sleep disturbance, anxiety and depression, are likely to be more sensitive to changes to amenity in their local environment.
Sensitive group – People of certain ethnicity and/or gender	Residents living in houses, users of community services and facilities, users of healthcare and other social infrastructure, users of commercial and retail premises, users of open space, recreation and leisure-time facilities, users of PRoW, local footpaths and cycleways, users of trains, railway stations and the railway network, users of public transport and local bus stops, vehicle travellers	Some people express concerns about using public transport and/or accessing local services and workplaces because of their gender or ethnicity or because they need to travel at certain times of the day or night[46]. These concerns include walking to, and waiting at, railway stations and bus stops. Women travellers may be more reliant and feel more sensitive using public transport, noting that women carry out a higher number of local bus stages per person per year (67 in England in 2016) than men (52 in England in 2016)[47]. Some women may also have more safety and security concerns when travelling alone or alone after dark[48]. Some people may experience or perceive social isolation, discrimination or social disadvantage, such as Black and Minority Ethnic (BME) Groups and people who identify as being part of faith, belief or other groups.
Sensitive group – People who are materially disadvantaged (low income, no car, unemployed)	Residents living in houses, users of community services and facilities, users of healthcare and other social infrastructure, users of commercial and retail premises, users of open space, recreation and leisure-time facilities, users of PRoW, local footpaths and cycleways, users of trains, railway stations and the railway network, users reliant on public transport and local bus stops, vehicle travellers	People on low incomes (living in deprived areas is a proxy measure for low income) and people without access to a car constitute a sensitive group as they are more likely to walk further[49] because they cannot afford public transport or own a car, and their lack of transport options may limit life experiences and work opportunities[50]. Those on low incomes may be less able to adapt to changes in access, such as disruptions to travel patterns, greater travel distance and time and/or alternative transport provision. People living in deprived areas tend to suffer the most from road traffic incidents (deaths and injuries), noise and air pollution, and other amenity effects, as these areas tend to be characterised by high traffic volume[51] as well as other environmental burdens such as proximity to industrial facilities and other urban infrastructure. This group is generally more likely to already have reduced access to health and social care[52] as well as reduced access to other services and amenities. This group may have increased stress levels due to the factors above. In addition, this group is more sensitive to food insecurity[53], which has an access dimension.

[42] House of Commons Briefing Paper (2018, October) Access to transport for disabled people, Number CBP 601 (https://researchbriefings.files.parliament.uk/documents/SN00601/SN00601.pdf)
[43] DEFRA UK AIR, Air Information Resource, Effects of air pollution (https://uk-air.defra.gov.uk/air-pollution/effects)
[44] Asthma UK (https://www.asthma.org.uk/advice/triggers/pollution/)
[45] Munzel T, Schmidt FP, Steven S, Herzog J, Daiber A, Sorensen M. Environmental Noise and the Cardiovascular System. J Am Coll Cardiol. 2018;71(6):688-97 (Extract from Journal of the American College of Cardiology 2018; http://www.intuition-physician.com/wp-content/uploads/2018/05/Evironmental-Noise-and-Cardiovascular-Health.pdf)
[46] Department for Transport (DfT) (2012) Transport for everyone: an action plan to promote equality
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/36211/equality-action-plan.pdf (Accessed: 7 May 2019)
[47] DfT (2017) Annual bus statistics 2016/17 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/666759/annual-bus-statistics-year-ending-march-2017.pdf)
[48] DfT (2012) Transport for everyone: an action plan to promote equality (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/36211/equality-action-plan.pdf)
[49] DfT (2018, January) Walking and Cycling Statistics, England: 2016 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/674503/walking-and-cycling-statistics-england-2016.pdf)
[50] Sheffield Hallam University - Centre for Regional Economic and Social Research (2017, June) Addressing transport barriers to work in low income neighbourhoods (https://www4.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/jrf-addressing-transport-barriers.pdf)
[51] Springer (2009, June) Understanding patterns of deprivation (https://link.springer.com/article/10.1057/rt.2009.7)
[52] Cookson. R, Propper. C, Asaria. M, Raine. R (2016) Socio-economic Inequalities in Health Care in England (source: Wiley Online Library, https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1475-5890.2016.12109)
[53] FRAC Food Research & Action Center (http://frac.org/obesity-health/low-income-food-insecure-people-vulnerable-poor-nutrition-obesity)

Wider health determinants

15.3.12 Wider health determinants are a diverse range of social, economic and environmental factors which influence people's mental and physical health and social wellbeing. Based on IEMA guidance and Barton and Grants 'Determinants of Health' model (see Insert 15-1), this population and human health assessment will consider several environmental, social and economic aspects considered relevant to the Scheme.

Insert 15-1 Determinants of Health model (source: Barton and Grant 2010)

15.3.13 By adapting the 'Determinants of Health' model, the following wider health determinants have been included for assessment:

- Natural environment – air pollution, soil and water pollution;
- Built environment – risk of injuries and death;
- Activities – housing, education, healthcare services and other social infrastructure, transport options, active travel and open space, recreation and leisure-time facilities;
- Local economy – work and training;
- Community – social cohesion and lifetime neighbourhoods; and
- Lifestyle – noise pollution and vibration.

Sensitivity of the physical and human receptors to changes to the wider health determinants

15.3.14 The potential impacts and effects (both beneficial and adverse) of the Scheme on the physical and mental health and social wellbeing of the local population depends on the sensitivity of the physical and human receptors to changes to the wider health determinants. The sensitivity of the physical and human receptors depends on whether the receptor is likely to be directly or

indirectly impacted or affected by changes to the wider health determinants caused by the Scheme and whether the receptors are well placed to deal with any of these changes. This is set out in further detail in Table 15-2.

Table 15-2 Sensitivity of the physical and human receptors to changes to the wider health determinants

Sensitivity of receptor	Physical receptor – high-level definition of sensitivity	Human health receptor – high-level definition of sensitivity
Very High	Physical receptor is of very high importance and rarity, international scale and very limited (i.e. no potential for substitution/replacement). Very high vulnerability to change, very well placed to take advantage of beneficial impacts, and/or very poorly placed to deal with any adverse impacts.	Human health receptor is expected to be directly affected. Receptor is very well placed to take advantage of beneficial impacts, and/or is very poorly placed to deal with any adverse impacts.
High	Physical receptor is of high importance and rarity, national scale, and limited potential substitution/replacement. High vulnerability to change, little ability to absorb change for the following (or similar) reasons: • Resource is frequently used • No reasonable alternative facilities, access routes or opportunities available	Human health receptor is likely to be directly affected. Receptor is well placed to take advantage of beneficial impacts, and/or is not well placed to deal with any adverse impacts.
Medium	Physical receptor is of medium or high importance and rarity, regional scale, and limited potential for substitution/ replacement. Medium vulnerability to change, limited ability to absorb change for the following (or similar) reasons: • Resource is semi-frequently used • Limited range of reasonable alternative facilities, access routes, or opportunities available	Human health receptor is likely to be indirectly affected. Average ability to maximise beneficial impacts or cope with adverse impacts.
Low	Physical receptor is of low or medium importance and rarity, local scale, and considerable potential for substitution/ replacement. Low vulnerability to change, can easily absorb changes due to the following (or similar) reasons: • Resource is infrequently used • Reasonable alternative facilities, access routes or opportunities available	Human health receptor is unlikely to be affected. Receptor is not well placed to take advantage of beneficial impacts, and/or is well placed to deal with any adverse impacts.
Negligible	Physical receptor is very low in importance and rarity, local scale, and ample potential for substitution/replacement	An impact that is likely to be temporary in nature, or which is anticipated to have a slight or no effect on health receptors

Note: Physical receptors include residential properties, schools, community facilities, local businesses, commercial interests, railway infrastructure, roads, footpaths etc. Human receptors are the individuals, groups or communities who live, play, use, work or are present at these physical receptors. Human health receptors are the entity which is vulnerable to any adverse changes to the baseline conditions.

Magnitude of impact

15.3.15 Identifying and assessing the likely impacts of the Scheme (both beneficial and adverse) depends on the sensitivity of the physical and human receptors to changes to the wider health determinants (for example, changes to air pollution, noise pollution and vibration etc.).

15.3.16 Where appropriate, the assessment will use the findings identified in the other environmental topics chapters of the ES (e.g. Chapter 7 (Air quality) Chapter 8 (Noise and vibration) Chapter 11 (Water environment), Chapter 12 (Geology, soils and land contamination), Chapter 14 (Traffic and transport)), Chapter 18 (Electromagnetic interference), Chapter 20 (Public open space) and Chapter 21 (Socio-economics)) and consider how these findings can be expected to impact health and well-being outcomes, including the distribution of any impacts within the local population. For example, certain individuals or groups may be more susceptible to certain exposures or impacts arising from the Scheme, such as people with respiratory issues who would be more susceptible to changes in air pollutants and people with underlying anxiety or mental health issues who may be more susceptible to changes to noise or vibration.

15.3.17 However, the wider health determinants of Risk of injuries and death; Housing; Education, healthcare services and other social infrastructure; Active travel; Work and training, and; Social cohesion and lifetime neighbourhoods are not covered by the other environmental topic assessments. Therefore, professional judgement, industry best practice and knowledge from the assessment of other transport schemes has been used to assess the impacts and effects from changes to these wider health determinants.

15.3.18 The magnitude of impact for any changes to the wider health determinants on physical and human receptors has been assessed according to the criteria set out in Table 15-3. The magnitude of impact is primarily derived from the following impact parameters:

- Geographical scale of impact;
- Secondary or cumulative;
- Short, medium or long-term;
- Permanent or temporary;
- Reversible or irreversible; and
- Beneficial or adverse.

15.3.19 For consistency, the criteria closely match that used in the technical assessment of the other environmental impacts of the Scheme.

Table 15-3 Magnitude of impact criteria for the physical and human receptors

Magnitude of impact	High-level description of the magnitude of impact for the physical receptors	High-level description of the magnitude of impact for the human receptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.	Permanent impact to the health determinant; impact affecting large number of people; impact affects sensitive population groups.
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.	Longer-term impact to the health determinant; impact affecting moderate to large number of people; impact affects some sensitive population groups.
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to one	Short-term impact to the health determinant; impact affecting low to moderate number of people; impact

Magnitude of impact	High-level description of the magnitude of impact for the physical receptors	High-level description of the magnitude of impact for the human receptors
	(maybe more) key characteristics, features or elements.	affects few sensitive population groups.
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements.	Slight or non-perceptible impact to the health determinant or to sensitive groups.
No Change	No loss or detrimental alteration to one or more characteristics, features or elements; no observable effects in either direction.	No impact to the health determinant or to sensitive groups.

Note: 'Resource' relates to land use or physical assets i.e. residential properties, schools, community facilities, local businesses, commercial interests, railway infrastructure, roads, footpaths etc.

Significance of effects

15.3.20 The significance of effects is the product of the sensitivity of the physical and human receptors and magnitude of impact. The significance of effects within the assessment has been measured according to the significance of effect matrix, set out in Table 15-4. The significance of effects has been determined by using professional judgement, best practice and knowledge from the assessment of other transportation schemes.

15.3.21 Significance of effects can be neutral, beneficial or adverse and has been further informed by considering the permanence of effect (temporary or permanent), type of effect (direct or indirect) and duration of effect (short-term or long-term). In general, temporary effects are for a limited period of time i.e. not permanent (this limited period can vary depending on the activity); short-term effects to the physical and human receptors are predicted to last for several months up to a few years and would generally apply for the duration of the construction period. Long-term effects are predicted to last beyond this, for several years.

15.3.22 Where Table 15-4 identifies two potential outcomes e.g. Moderate (significant) or Large (significant), or Slight (not significant) or Moderate (significant), professional judgement has been applied in the assessment to determine the appropriate level of significance.

Table 15-4 Significance of effect matrix

		Magnitude of impact/risk				
		No change	Negligible	Minor	Moderate	Major
Receptor sensitivity	Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate (or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

15.3.23 Using the described significance of effect matrix classification in Table 15-4, professional judgement, industry best practice and knowledge from the assessment of other transportation schemes, any significance of effects of the Scheme considered to be Very Large, Large or Moderate are deemed to be **significant** and those Slight or Neutral, to be **not significant**.

Scoping and consultation

15.3.24 This section describes the outcome of, and response to, the Environmental Scoping Report in relation to the population and human health chapter and also provides details of any ongoing technical engagement that has been undertaken with stakeholders.

Table 15-5 Environmental Scoping Report comments and response to comments

Stakeholder	Environmental Scoping Report comment	Response to Environmental Scoping Report comments
Kirklees Council	The ES should identify the Health benefits resulting from the Scheme (during the development phase and after), how they can be maximised, how health risks can be minimised and the proposed mitigation measures that support identified health impacts. The Council would also suggest that as part of the EIA, the socio-economic impacts associated with this proposal should be comprehensively considered and included as a separate chapter in the supporting ES.	The potential effects on human health are considered in a number of the technical chapters of this ES. The findings of which are summarised in this chapter. A socio-economic chapter has been produced and forms Chapter 21 of this ES.
West Yorkshire Combined Authority	"Developing inclusive growth that is accessible to all is vital to transforming our economy and TRU will support this. Early consideration of equality issues will help the engagement process with those that will be affected along the route and assist the challenges arising from both the construction period and where relocation of property's, businesses and facilities etc. is required. Businesses affected will need support in order to minimise disruption to their business operations and potential jobs losses. The Combined Authority responded to the Department for Transport's 'Accessibility Action Plan Consultation' last year. Delivering a more accessible transport system which meets user needs and reduces barriers to travelling needs to continue. Taking into consideration our aging population and those with long term health conditions it is important that these groups are considered throughout the process in order to ensure there are no physical barriers to travel. Inclusive design of physical environments is needed to ensure the same opportunities are available to all."	The design for the Scheme has considered the requirements under an Equalities Impact Assessment, such as improved accessibility to stations.

Cumulative effects

15.3.25 Population and human health assessment is by nature an in-combination assessment of the potential impacts or effects (both beneficial and adverse) arising from the environmental effects of the Scheme.

15.3.26 Cumulative impacts or effects can include intra-Scheme impacts and inter-Scheme impacts. Intra-Scheme impacts are where in-combination impacts arise from the Scheme, including where effects occur from interaction with other technical disciplines. Inter-Scheme impacts occur due to impacts from more than one scheme.

15.3.27 The assessment of cumulative effects is included in Section 15.8, with a detailed cumulative impact assessment provided in Chapter 22 (Cumulative effects) of the ES.

Assumptions and limitations

15.3.28 Whilst it is possible to identify some changes to the wider health determinants likely to arise from the Scheme that will impact or effect the physical and human receptors, health outcomes are dependent on multiple factors, some of which rest with individuals and/or outside the powers or influence of physical infrastructure and/or planning decisions. Identifying the impacts or effects of the Scheme and their significance will therefore be a largely qualitative exercise. The findings are based upon a desk-based study of the core and wider study areas and Scheme information, along with consultants' professional judgement and knowledge based on previous similar schemes. Information, where relevant, is also used from the other technical chapters of the ES to help to assess the impacts or effects of the Scheme on the physical and human receptors.

15.4 Baseline

Data sources

15.4.1 This chapter uses several data sources (listed in Appendix 15-2), providing direction on relevant issues such as population, human health, transport, land use and development. This along with the baseline data collated for the other technical chapters of the ES is used to inform the baseline assessment.

Baseline

15.4.2 Detailed baseline information relevant to the Scheme is presented in Appendices 15-4 to 15-9. This section provides a 'baseline profile', including baselines for each of the wider health determinants and is used to highlight the existing conditions found in the core and wider study area.

15.4.3 The baseline profile has been captured for different study area contexts depending on what is being reported. For example, receptor information (e.g. number of houses, schools, local businesses etc.) has been reported for the core study area using Ordnance Survey (OS) address base data which allows a 500m study area buffer to be applied. However, baseline information for population or general health profiles for example, cannot be encapsulated within the exact 500m core study area due to the way that census areas are geographically mapped and health statistics gathered. In these circumstances, the wider or specific study areas set out in Section 15.3 are used, as described in the following baseline profile.

15.4.4 As would be expected for a Scheme that encompasses a large built-up area, including the Huddersfield conurbation and the main settlements of Hillhouse, Fartown, Deighton, Bradley, Colne Bridge, Mirfield, Lower Hopton, Ravensthorpe and Westtown and a variety of different land uses, there is a large number and wide range of physical and human receptors present in the core and wider study area.

Baseline profile

15.4.5 Of the total 438,727 residents that live in the Kirklees local authority area, approximately

55,545 residents (12.7% of the total population of Kirklees) live in the Lower Super Output Areas (LSOAs)[54] within or near to the core study area for the Scheme, noting that it is not possible to encapsulate the exact population within the core study area due to the way that census areas are geographically mapped and statistics gathered. This LSOA population includes approximately 12,621 children aged under 16. Higher concentrations of children and adolescents are noted in the Dewsbury West and Crossland Moor and Netherton wards, with lower concentrations in the Dalton, Newsome and Mirfield wards. Lower levels of good development at age 5 and educational attainment at GCSE level are shown in the Dewsbury West and Dewsbury South wards and Dewsbury East ward compared to the Kirklees and England averages, though levels are generally higher in Mirfield ward.

15.4.6 50.4% of the total population of Kirklees is female. The highest proportions of women in the core study area are found in the Leeds Road, Sheepridge LSOA (55.9%) and Deighton LSOA (55.1%). The baseline study shows that many LSOAs within/in proximity to the core study area, particularly in Mirfield ward (24.4%), have a higher age profile when compared to the Kirklees (17.5%) and England (18.2%) averages. Dewsbury West ward (8.8%) has the lowest proportion of persons aged 65 and over, at roughly half the average for Kirklees (17.5%) and England (18.2%).

15.4.7 Average gross household income in the core study area is lowest in the Newsome (£28,613), Ashbrow (£31,283), Dalton (£31.500) and Dewsbury West wards (£31.540) which all fall significantly below the Kirklees (£37,799) and England (£40,487) averages. Average gross household income is highest in Mirfield ward (£41,575) (Route Sections 4 to 6), making it the only ward in the core study area with a higher average household income than the Kirklees (£37,799) and England (£40,487) averages.

15.4.8 This general distribution of income is also reflected in the patterns of home tenure across the core study area with Newsome (27.51%), Dewsbury West (26.84%) and Ashbrow wards (25.85%) all having higher than Kirklees (15.29%) and England (17.7%) levels of social renting and lower than Kirklees and England levels of outright ownership. Newsome ward, located to the west of the Scheme, has the highest level of social renting (27.5%) and lowest level of outright home ownership (44.03%) of all wards in the core study area.

15.4.9 The highest percentage of working age Department of Work and Pensions (DWP) benefit claimants is found in the Dewsbury West (18.3%) and Ashbrow wards (17.5%) which are both higher than the Kirklees (12.2%) and England (10.7%) average (2016). The only ward in the core study area that has a lower percentage of working age DWP benefit claimants than the Kirklees average is Mirfield ward (9.2%).

15.4.10 Local health profiles are also mixed in the core study area. For example, Crossland Moor and Netherton (78.1%), Ashbrow (78.2%) and Dalton wards (78.4%) all have lower levels of what residents consider to be good general health (i.e. very good health and good health) than the Kirklees (80.5%) and England (81.4%) averages and higher levels of general bad health (i.e. very bad health and bad health) at 7.2%, 6.9% and 6.6% respectively, than the Kirklees (5.8%) and England (5.4%) averages. Comparatively, general good health is slightly better in Mirfield ward (Route Sections 4 to 6) though the percentage of the population that consider themselves to have very bad health (1.4%) and the number of hospital admissions for Coronary Heart Disease (2.6%) in Mirfield ward are both higher than the Kirklees (1.3% and 2.5% respectively) and England (1.2% and 2.4% respectively) averages. This is generally reflective of the older age profile in that part of the core study area.

15.4.11 Morbidity rates across the core study area are consistently higher than the Kirklees and

[54] LSOAs (Lower Super Output Areas) are a geographical hierarchy designed to improve the reporting of small area statistics in England and Wales.

England average. Life expectancy for men in Dewsbury West (75.0 years), Newsome (75.9 years) and Greenhead wards (76.1 years) is 3.7 years, 2.8 years and 2.6 years lower than the Kirklees average (78.7 years) respectively. Life expectancy for women in Dewsbury West (79.8 years), Newsome (80.2 years) and Dewsbury East wards (81.5 years) is 2.7 years, 2.3 years and 1 year lower than the Kirklees average (82.5 years). Life expectancy in Mirfield ward (Route Sections 4 to 6) for both men (79.9 years) and women (83.9 years) is better than the Kirklees (78.7 and 82.5 years respectively) and England (79.5 and 83.1 years respectively) average.

15.4.12 Parts of the core study area such as Dewsbury West (52%), Dewsbury South (47%) and Greenhead wards (44.7%) have significantly higher than Kirklees (20.9%) and England (14.6%) levels of ethnicity, as shown by the BME population statistics. Generally, across Kirklees, research suggests that BME communities are more likely to live in over-crowded or poorer conditions, increasing the risk of developing physical and mental health problems[55].

15.4.13 This general profile for the core study area is also reflected in the indices of multiple deprivation (IMD) which shows that Dewsbury East and Dewsbury West wards in particular are generally significantly more multiply deprived than the Kirklees and England average whilst Mirfield ward is generally less deprived than the Kirklees and England average, performing well over most domains. Multiple deprivation occurs when a number of domains have a high concentration of deprivation (for example, income deprivation, employment deprivation and health deprivation) than for Kirklees and England.

Air pollution baseline

15.4.14 Air pollutants at high concentrations can have adverse effects on human health. Whilst there are a range of potential air pollution sources, air quality concerns within Kirklees are focused on the road network, with two primary pollutants identified – nitrogen dioxide (NO_2) and Particulate Matter. Current trends indicate the levels of these pollutants have fallen over the last 5 years; however, health-related objectives are still exceeded within the district. It is estimated that 78% of the Kirklees population are exposed to medium or high levels of NO_2 compared to 67% across England.

15.4.15 Air pollution in Kirklees is estimated to cause the equivalent of 145 deaths per year (PHOF, 2015)[56]. Approximately 1 in 3 people in Kirklees are reported to be exposed to high levels of pollution and approximately 1 in 20 deaths in Kirklees is attributable to air pollution. Pregnant women, children, the elderly and people with long-term conditions are most at risk to the effects of air pollution.

15.4.16 The baseline study for air quality (Chapter 7 of this ES) identifies Air Quality Management Areas (AQMA) and a large number of sensitive physical and human receptors that have the potential to be affected by the Scheme from changes to baseline air quality conditions and dust. These sensitive receptors include large numbers of residential properties, schools, nursing homes/care homes and community land and facilities, open space and recreation and leisure-time facilities.

Soil and water pollution baseline

15.4.17 The baseline study for geology, soils and land contamination (Chapter 12 of this ES) identifies a number of potential physical and human receptors and associated exposure/migration pathways for the Scheme that could have adverse impacts on population and human health.

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[55] Kirklees IAPT Black and Minority Ethnic (BME) Positive Practice Guide (2009)
[56] Public Health Outcomes Framework (2015/16, 2017)

15.4.18 On-site human health receptors (those within the Scheme boundary) include railway staff etc., members of the public, farm workers, and occupiers of residential/ commercial premises. Off-site human health receptors (those within 250m of the Scheme boundary) include occupants of residential housing, occupiers and users of educational and commercial/industrial properties, members of the public/workers accessing the surrounding area, farmers working on nearby agricultural land.

15.4.19 The principal contaminant exposure pathways for human health receptors include dermal contact and/or ingestion of contaminants in wind-blown soil-derived dusts and fibres, and inhalation of ground gases and/or vapours.

15.4.20 There are a number of surface water bodies that could be affected by the Scheme. In addition, there are several active surface water and groundwater abstraction licences located within the study area defined in the geology, soils and land contamination assessment. The principal contaminant exposure pathways for controlled water receptors include surface run-off, infiltration, leaching and vertical migration from soil into groundwater, lateral migration in groundwater and migration following preferential pathways (e.g. track drainage, new piled foundations).

15.4.21 A large number of on-site physical receptors have also been identified, including existing and proposed railway infrastructure, stations and associated buildings, plus residential, commercial and industrial buildings etc. Off-site physical receptors include commercial, industrial and residential properties, farms, schools, community facilities and sports fields. Other physical receptors include crops present within and adjacent to the Scheme boundary. The principal contaminant exposure pathways for physical receptors include direct contact with contaminants in soils and groundwater and migration of ground gases or vapours along preferential pathways and accumulation in enclosed spaces. For receptors such as crops, exposure pathways include absorption of contaminants, dermal contact and/or ingestion of contaminants in soil and within/on plants and inhalation of contaminants in soils/dust.

Risk of injuries and death baseline

15.4.22 The baseline study identifies a large resident population in the core study area, the majority of which live in the urban areas with dense populations, the railway line, stations and associated infrastructure, roads carrying large volumes of traffic, a large NMU network, and a number of physical and human receptors within or near the Scheme boundary that could be affected by, or contribute to, risk of injuries and death during construction.

15.4.23 The baseline indicates the presence of a number of vulnerable or sensitive groups within the core study area such as older people, people in poor health and people with physical and/or mental impairments. It also identifies a large number of children and adolescents and those from the more disadvantaged groups who are statistically more likely to be involved in incidents and accidents and be unaware of the dangers of electricity and electrical equipment. Contractors working on the Scheme would also be at risk.

Housing baseline

15.4.24 The baseline study highlights an association between housing, quality of housing, housing security and stability, and health outcomes in the core study area. This includes high levels of inequality between the strong and weak housing market areas, with variable house prices and tenure generally linked to income and status, skills and employment, physical and mental health, and levels of deprivation. In general, all wards in the core study area, with the exception of Mirfield ward, have higher levels of multiple deprivation than the Kirklees average, lower house prices, lower outright ownership and higher levels of social renting. The populations in and Crossland Moor and Netherton ward to the west of the Scheme and Dewsbury West ward to the east of the Scheme, in particular, have increased susceptibility to

any adverse impacts or effects arising from the Scheme.

15.4.25 There are approximately 20,100 residential properties within the core study area for the Scheme, with higher proportions of residential properties found in the more built-up areas such as Huddersfield, Hillhouse, Fartown, Deighton, Bradley, Mirfield, Lower Hopton, Ravensthorpe and Westtown. Approximately 2,070 residential properties are located within 50m of the Scheme boundary, with approximately 52 residential properties falling within the Scheme boundary. Most of the 52 residential properties are located within the Huddersfield and Ravensthorpe areas of the Scheme. No residential properties fall within the Scheme boundary in the Hillhouse/Fartown and Mirfield areas, however the curtilages of some residential properties in these areas do fall within the Scheme boundary.

Education, healthcare services and other social infrastructure baseline

15.4.26 The baseline study finds there are many parts of the core and wider study area with pockets of high deprivation, particularly in the Crossland Moor and Netherton wards and Dewsbury West and to the west and east of the Scheme, respectively. The baseline study also highlights lower levels of child development and educational attainment, particularly in the Dewsbury West, Dewsbury South and Dewsbury East wards to the east of the Scheme compared to the Kirklees or England averages, although Mirfield ward performs better than average. Therefore, maintaining access to services and essential facilities such as schools, nurseries and community facilities throughout the core study area is essential. It enables access to learning, enhances opportunities for physical activity, wellbeing, participation and community interaction. The quality of health and community services also depends on the personal factors of the physician and user, and other factors pertaining to the location of the facility, health or community setting and the broader environment.

15.4.27 The baseline study identifies 38 schools, 25 nurseries/creches, 32 care homes/nursing homes, 320 community facilities, 70 churches, 12 GPs, 13 dentists, one hospital and five emergency service centres within the core study area that could be impacted by the Scheme. For example, tens of thousands of children and adolescents attend, and travel to/from, the nurseries, schools and colleges in the core study area. In addition, Huddersfield has a large university student population (estimated 24,000 students) that reside and commute within the core and wider study area that could be affected by the Scheme.

15.4.28 Several community facilities lie within 50m of the Scheme boundary, with a small number of community facilities falling within the Scheme boundary. This includes Hope Church and the Yorkshire Children's Centre which are both located within Brian Jackson House, Huddersfield and Weaving Lane Household Waste Recycling Centre.

Open space, recreation and leisure-time facilities baseline

15.4.29 The baseline study highlights a relationship between access to open space, active lifestyles and improved outcomes for physical and mental health and social wellbeing in Kirklees, including within the scheme area. This is reinforced by Paragraph 97 of the NPPF and Kirklees Local Plan Policies LP47, LP50 and LP61 which seek to protect existing open space, recreation and leisure-time facilities.

15.4.30 A review of the online Kirklees Local Plan Policies Map indicates there is a large number of designated Urban Green Spaces throughout the Scheme area, including a number that fall within the Scheme boundary itself.

15.4.31 A review of the Local Plan Policies Map also indicates the Scheme boundary falls within the River Colne, River Calder and Spen Valley Corridors' which form part of the Strategic Green Infrastructure Network for Kirklees.

15.4.32 The baseline review in Chapter 20 (Public open space) identified a total of 12 areas of public open space within the Scheme boundary that may be impacted during the construction and/or operational phases.

Transport options baseline

15.4.33 The baseline study finds an association between rail and road travel and health outcomes in Kirklees, including in the core study area. Therefore, maintaining access to transport options during construction is vital. Accessibility is a critical component of locally based travel, which is influenced by socio-economic activity. Any effects on the railway, roads and public transport provision may disproportionately affect the lower income groups and sensitive or vulnerable groups identified in the core study area and could lead to social exclusion and/or contribute negatively to quality of life and health. Specific groups identified as being most vulnerable to changes to transport options in the core study area include children and teenagers, the elderly frail, persons with physical or mental impairments, job seekers, students and people living in the more remote locations that have fewer and less regular transport options.

15.4.34 There are four railway stations within the Scheme; Huddersfield, Deighton, Mirfield and Ravensthorpe. The Office of Rail and Road (ORR) records show that in 2019/20 there were a total of 5,332,308 trips (entries and exits) originating or terminating at these four stations, with 4,769,384 trips (entries and exits) originating or terminating at Huddersfield station alone. A large number of residents and workers live and work within a 10-minute walking catchment of the four stations, particularly Huddersfield Station.

15.4.35 A comprehensive highways network runs through the core and wider study area including the A62 and A644 and a series of local connector roads that cross, interact or run near the Scheme. The A62 in particular has reported issues of congestion, slow journey times and poor air quality that influence health outcomes; it is currently subject to ongoing highways improvements. Key roads have been identified in Chapter 14 (Traffic and transport) to have notable levels of traffic flows, however this list is not exhaustive and levels of traffic flows for all links/roads are shown in Figures 14-6 and 14-7.

15.4.36 Huddersfield Bus Station is situated within the core study area. A number of bus companies operate services to/from Huddersfield Bus Station to a large number of local, regional and national destinations, and the series of towns and villages spread across the core and wider study area. Across the core study area, several bus services operate, particularly between Huddersfield and Leeds. There are a large number of bus stops in the core study area and a significant number that fall within the Scheme boundary itself.

15.4.37 Car ownership in several parts of the core study area is lower than the Kirklees and England averages (e.g. particularly the Newsome, Greenhead, Dalton, Crossland Moor and Netherton wards) where higher proportions of households will need to rely on public transport. Therefore, maintaining the availability of transport options across the core study area and wider study area is particularly important.

Active travel baseline

15.4.38 The baseline study finds a defined relationship between active travel and health outcomes in the core study area. For example, cycling and walking is seen to help reduce emissions and has added benefits of improving health. Severance can occur if a community becomes separated by changes to rail or road infrastructure, changes to facilities for pedestrians and cyclists or by changes to rail or traffic flows.

15.4.39 A range of public accesses run throughout the core study area, including a series of footpaths, footways, roads and Public Rights of Way (PRoW), some of which cross, interact or run near the Scheme boundary. A series of recreation routes are also located within the Scheme

boundary including the Calder Valley Greenway, Birkby Valley Greenway and Spen Valley Greenway.

Work and training baseline

15.4.40 The baseline study finds an association between economic activity, including local procurement, and health outcomes in the core study area. Places of employment and commercial activity are generally protected by planning policy, as well as the transport network that allows customers and staff to access these areas. The baseline study shows that economic growth is a major focus for Kirklees, leading to thriving communities, growing businesses, high prosperity and low inequality and where people can enjoy better health. In making provision for new employment opportunities, new developments should be accessible to sustainable modes of travel.

15.4.41 The baseline study identifies more than two thirds of workers across Kirklees as a whole, live and work in Kirklees. Approximately 60,000 Kirklees residents work outside Kirklees and approximately 34,500 people work in Kirklees but live elsewhere. Out commuting allows Kirklees residents access to higher paid jobs, particularly in Leeds. This general pattern is likely to also apply to people working and living in the core and wider study area.

15.4.42 In total, there are approximately:

- 116 commercial premises, 12 offices/work studios, 30 industrial premises and 27 retail premises within the Scheme boundary;
- 680 commercial premises, 100 offices, 230 industrial premises and 180 retail premises within 50m of the Scheme boundary; and
- 4,840 commercial premises, 870 offices, 1,260 industrial premises and 1.700 retail premises within the core study area (500m).

15.4.43 The four railway stations within the Scheme, particularly Huddersfield Station, are shown to be well used by workers and students, with a large student and working population within walking distance and a large number of students and workers who travel from Huddersfield to Leeds and Leeds University.

Social cohesion and lifetime neighbourhoods baseline

15.4.44 Social cohesion refers to the aspect of togetherness and bonding exhibited by members of a community; the "glue" that holds a community together. This might include features such as a sense of common belonging or cultural similarity. Social identity is a person’s sense of who they are, based on their group membership(s).

15.4.45 Effects on social cohesion are broadly derived from the interaction between the magnitude of impact and the sensitivity of receptors. The main sensitive receptors in the core study area are people and homes, community facilities and public services, and open space, recreation and leisure-time facilities at various spatial levels. The social and community environment is a dynamic and adaptive one with constant background change and turnover, for example people moving in to and out of the core study area and changing jobs.

Noise pollution and vibration baseline

15.4.46 The baseline study for Chapter 8 (Noise and vibration) identifies a variety of land uses in the study area and a varied existing noise climate.

15.4.47 As the Scheme is an upgrade to the existing operational railway, railway noise is an existing part of the noise climate along the route. Other sources of noise include local roads (e.g. A62 and A644), industrial and commercial facilities and canal activities in certain parts of the study

area.

15.4.48 The baseline identifies a number of built up residential areas in the study area, comprising the main settlements. Residential house-boat moorings have also been identified in the vicinity of Wood Lane and Station Road in Mirfield. Both sites are located within residential areas which would be assessed as part of the assessment. Non-residential noise sensitive receptors (NSR) have also been identified, such as schools, religious buildings and healthcare facilities.

15.4.49 As outlined in (Chapter 8) Noise and vibration, the assessment baseline identifies three Railway Noise Important Areas (NIA) and 16 Road NIA in the study area.

15.5 Potential effects

15.5.1 The majority of the permanent works are broadly within the existing operational land owned by Network Rail. However, land outside Network Rail's ownership (third party land) will be required for both permanent and temporary works in order to facilitate the construction of the Scheme.

15.5.2 In brief, the potential impacts and effects of the Scheme on population and human health depends on the sensitivity of the physical and human receptors to changes to the wider health determinants (for example, from changes in air pollution, noise pollution and vibration, housing conditions etc.). The assessment also considers the distribution of any impacts or effects within the affected population by considering the likely effects on any vulnerable or sensitive population sub-groups that may be more susceptible to change. These vulnerable or sensitive sub-groups, along with the wider groups (e.g. residents and workers living/working in the proximity of the Scheme) have been considered.

15.5.3 For clarity, the assessment methodologies used for air quality and noise and vibration assessment do not use the same sensitivity matrix, as presented in Table 15-4, for assessing significance of effects. Therefore, this section reports the key findings identified in Chapter 7 (Air quality) and Chapter 8 (Noise and vibration) of the ES only, where they relate to physical assets or human health, and uses these findings to assess the health outcomes or distribution of effects within the various population groups, including those groups that are more susceptible to change. It does not attempt to re-run those findings through the sensitivity matrix in Table 15-4.

15.5.4 Whilst the assessments in Chapter 12 (Geology, soils and land contamination) and Chapter 11 (Water environment) do use the same sensitivity matrix as presented in Table 15-4 (in accordance with the respective Design Manual for Roads and Bridges (DMRB) guidance for each environmental topic), this section simply reports those findings where they relate to physical assets and/or human health and considers the distribution of effects within the affected population. It does not attempt to re-assess them.

15.5.5 This section also reports the findings of Chapter 18 (Electromagnetic interference) in relation to the wider determinant of health Risk of injuries and death, Chapter 20 (Public open space) in relation to Open space, recreation and leisure-time facilities, and Chapter 21 (Socio-economic) in respect of Work and training.

15.5.6 This section describes the potential significant effects of the Scheme on a range of physical and human receptors from changes to the wider determinants of health with embedded mitigation in place but prior to mitigation being enacted. Mitigation measures for each wider determinant of health is set out in Section 15.6 of this chapter, with consideration of effects with mitigation measures included (i.e. residual effects) described in Section 15.7.

Construction

15.5.7 Detailed assessment tables describing the potential construction impacts and effects of the Scheme on physical and human receptors for each of the wider health determinants are presented in Appendix 15-11. A detailed narrative of the potential effects is provided as follows.

Air pollution

15.5.8 The air quality assessment (Chapter 7 of this ES) identifies potential risk to human health from dust during the set up and operation of construction compounds, earthworks, works to structures and highways which, if left unmitigated could be significant.

15.5.9 Effects on local air quality during construction of the Scheme are predicted to result from changes to traffic flows on the local road network as a result of construction compounds and temporary road closures.

Soil and water pollution

15.5.10 The assessment in Chapter 12 (Geology, soils and land contamination) identifies potential effects from changes in topography, soil erosion, geohazards and excavated soils. There is also the potential for disturbance and mobilisation of existing contaminants and ground gas/vapour on human health and property.

15.5.11 The assessment in Chapter 11 (Water environment) identifies potential increased risk of pollution to watercourses, risk of release of hydrocarbons and oils, run-off from construction compounds and accidental release of contaminants to surface water and groundwater. Potential significant effects to humans may occur at the Huddersfield Broad Canal from risk of contamination at adjacent construction compounds and bridge works and from possible increase in surface water runoff that is not attenuated during construction.

Risk of injuries and death

15.5.12 Major accidents and incidents can occur for any large infrastructure project. Potential major risks for the core study area include tunnel collapse, ground collapse, offline train derailment/collision, major road traffic accident or incident, fire and/or explosion and collapse/damage to structures.

15.5.13 Construction works within the Scheme will not involve any potentially dangerous operation. Some chemicals may be present on-site during construction, though risks associated with such materials will be adequately managed by following regulatory guidelines and procedures to prevent pollution to air, water and land.

15.5.14 Potential for mental health related post-traumatic stress from serious injuries and death is noted but not assessed due to lack of evidence demonstrating quantifiable causal relationship.

15.5.15 The sensitivity of the physical and human receptors to the various risks of injuries and death varies and is determined on a case-by-case basis in accordance with the sensitivity criteria set out in Table 15-2 of this assessment. This is shown in the assessment tables in Appendix 15-11.

15.5.16 The magnitude of impact for any damage, vandalism, supply failures and/or mechanical problems to the electrical infrastructure itself (physical receptor) would be moderate adverse across the core study area, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct, short-term and reversible. Embedded mitigation includes fencing along the entire route and also raising of parapets to reduce risk of contact with

overhead lines. On balance, the magnitude of impact for people accessing, falling or accidentally or otherwise coming into contact with electrical equipment on site or during transportation, storage or assembly (human receptors) would be moderate adverse due to an elevated temporary, direct and short-term risk of electrocution that could result in serious injuries or death. This would result in **Moderate Adverse** effects for the wider group and all vulnerable groups, which is significant. The effects on the human receptors would generally be temporary, direct and short-term (potentially lasting for a few months or up to four years during the construction period); however, should any serious injuries occur, this could have long-term effects and death would be permanent. The significant effects would be the same for all groups, irrespective of whether the individuals fall within the wider group or one of the vulnerable groups.

15.5.17 There may be increased risks during construction works, particularly at construction sites located near the railway and the four stations along the route and whilst working on tunnels, bridges and structures. Moderate adverse impacts are predicted for the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct and short term, and also reversible for the physical receptor (e.g. damage to structures etc.) where it is expected that any physical structures damaged would be replaced on a like-for-like basis. The effects would be the same across the core study area and for all groups.

15.5.18 Trespass onto railway infrastructure, particularly at construction sites located near the railway and railway stations, would result in moderate adverse impacts for the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct and short-term, and also reversible for the physical receptors. The effects would be the same across the core study area and for all groups.

15.5.19 The magnitude of impact at construction compounds and construction sites from trespass, damage or conflict would be moderate adverse for the physical receptors, resulting in **Moderate Adverse** effects, which is significant. These effects would be temporary, direct, short-term and reversible. The risk of injuries and death from unauthorised access and trespass that could result in slips, trips, falls and conflict with plant, vehicles and materials would be minor adverse, resulting in **Slight Adverse** effects which is not significant. These effects would be the same across the core study area and for all groups. These risks would be temporary, direct and short-term, and reversible for the physical receptor. Unauthorised or criminal behaviour could lead to additional risks such as on-site conflicts and threats of violence.

15.5.20 The magnitude of impact on roads and vehicles (physical receptor) from the introduction of construction traffic, changes to traffic patterns and localised increases in traffic levels would be moderate adverse, resulting in **Moderate adverse** effects which is significant. These effects would be temporary, direct and indirect, short-term and reversible. For the human receptors, the magnitude of impact from the introduction of construction traffic (some of which will be carrying high volumes of materials), localised increases in traffic levels and an unawareness of altered traffic movements would also be moderate adverse, resulting in **Moderate adverse** effects which is significant. These effects would be temporary, direct and indirect, and short-term. The effects would be the same across the Scheme and for all groups, however vulnerable road users such as motorcyclists, elderly drivers, new drivers, children, pedestrians and cyclists may be most at risk.

15.5.21 The magnitude of impact of any damage, leaks and/or blocks to utility networks and buried services, such as water pipes, water mains, sewers, high pressure gas mains, electric circuits and telecommunications would be moderate adverse, resulting in **Moderate adverse** effects for the physical receptors, which is significant. These effects would be temporary, direct, short-term and reversible. For human health, the risk of injuries or loss of life for construction

workers from explosion or asphyxiation or other effects from leaks or damaged utilities would be moderate adverse, resulting in **Moderate adverse** effects, which is significant. These effects would generally be temporary, direct and short-term for the human receptor; however, any serious injuries could have long-term effects and death would be permanent. Whilst there may be some inconvenience and disruption effects, no significant risks are predicted for the rest of the wider group and the vulnerable groups i.e. non-contractors. The effects to the physical and human receptors would be the same across the core study area.

Housing

15.5.22 Construction works have the potential to adversely impact existing houses and housing conditions and future development coming forward.

15.5.23 During construction, a small number of private residential properties and land currently falling within the curtilage of private residential properties will be required for demolition or land take for construction purposes, or to accommodate the Scheme. A summary of the potential significant effects is as follows.

15.5.24 Permanent land take is required for the new fast lines to be constructed to the south of the existing track running through Heaton Lodge. This will result in the demolition of three residential properties (Numbers 1, 2 and 3 Heaton Lodge Cottages).

15.5.25 The magnitude of impact for the loss of these properties would be major adverse for the physical and human receptors, resulting in **Large Adverse** effects which is significant. These effects would be permanent, direct and irreversible; however, it forms an essential part of the works to facilitate the buildability of the Scheme and increase line speeds. Some of the affected residents may fall within the vulnerable groups that could be particularly sensitive to change (e.g. the elderly, persons who are physically or mentally impaired, children or adolescents), however the significant effects reported would be the same for all groups, irrespective of which group the residents/occupants fall within. No other demolition or loss of property is required during construction or to accommodate the Scheme, therefore there would be no significant effects from demolition or permanent displacement for people not living at these properties.

15.5.26 The permanent acquisition of land at Number 12 Lilac Court, Number 4 Glenfield Avenue and Numbers 82 to 86 Glenfield Avenue is required to accommodate the turning head in this location. The magnitude of impact for the permanent loss of garden space would be moderate adverse for the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. These effects would be permanent, direct and irreversible. The effects would be the same for all groups, irrespective of whether they fall within the wider group or the vulnerable groups. No permanent land take is required elsewhere in the Scheme area (excluding that detailed above), therefore there would be no significant effects from permanent land take for people not living at these properties.

15.5.27 Several residential properties would be affected by temporary land take and disruption effects. This includes:

- No. 8 & 15 Topaz Close;
- No. 9, 10, 11 and 12 Lilac Court;
- No. 13, 15 & 15A Whitacre Street;
- No. 682-684 Leeds Road;
- No. 5, 17, 19 & 21 Whitacre Street, and 2, 4, 6 & 8 Lilac Court;
- No. 2 to 28, and 76 to 86 Glenfield Avenue;
- Chadwick Fold;

- No. 24, 26, 28, 30 Brooks Yard; and
- No. 41 Thornhill Road, Dewsbury.

15.5.28 The magnitude of impact for this temporary land take and disruption effects would be moderate adverse for the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct, short-term and reversible. The effects would be the same for all groups. There would be no significant temporary land take effects for any people not living at these properties.

15.5.29 Whilst three residential properties would need to be demolished to accommodate the Scheme and permanent and temporary significant effects are predicted for a number of other residential properties, these effects are localised factors only and small scale in the wider context of all private residential properties in the core study area which consists of over 20,000 residential properties (i.e. only 0.2% of all residential properties will be significantly affected). In this wider context, the impacts of the Scheme on the wider health determinant 'Housing' across the whole of the core and wider study area, is not considered to be significant.

Education, healthcare services and other social infrastructure

15.5.30 No educational facilities, healthcare services or community facilities would need to be demolished to construct or accommodate the Scheme. No land currently falling within the curtilage of essential community facilities such as schools, healthcare services or care homes/nursing homes would be required for land take for construction purposes or to accommodate the Scheme.

15.5.31 During construction, there would be temporary disruptions effects and loss of amenity for children, parents and employees that attend, travel to/from or work at Hopton Primary School on Woodend Road from the introduction of construction traffic and increased vehicle movements along Woodend Road. On balance, Moderate adverse impacts are predicted for the school (physical receptor), resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct and indirect, short-term and reversible. Moderate adverse impacts are also predicted for the human receptors (i.e. families with children and people working at the school) from construction traffic which may also cause delays, temporary disruptions to access and/or amenity impacts, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary (for a limited time only; not permanent), direct and indirect, short-term (during the construction period, up to four years) and reversible. There would be no significant effects for the other wider groups or vulnerable groups i.e. people that do not attend, travel to/from or work at the school.

15.5.32 Modifications to the road network at Thornhill Road is likely to result in temporary disruptions to access, parking and drop-off and loss of amenity for workers, parents and children that attend Childs Play Day Care Nursery at Number 21 Thornhill Road. On balance, moderate adverse impacts are predicted for the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct, short-term and reversible. There would be no significant effects for people not working at or using the nursery.

15.5.33 Whilst temporary significant effects are predicted for these two education facilities, the effects are localised factors only and small scale in the wider context of the large number of education, healthcare facilities and other social infrastructure in the wider study area. In this wider context, the impacts of the Scheme on the wider health determinant 'Education, healthcare services and other social infrastructure' across the whole of the core study area, is not significant.

Open space, recreation and leisure-time facilities

15.5.34 The assessment in Chapter 20 (Public open space) identified recreational and visual amenity impacts in relation to six areas of public open space within the Scheme boundary.

15.5.35 Impacts on public open space include loss of visual amenity value from the clearance of the woodland/scattered trees and the presence of construction plant and equipment. There will also be some loss of some amenity value due to the restrictions on access to areas of public open space and disruption as a result of formal diversions.

15.5.36 Temporary adverse impacts are predicted for the physical receptor (public open space) and human receptors (users of the public open space) during construction, resulting in temporary significant adverse effects in relation to five areas of public open space (refs OS7, OS8, OS9 and OS10). No significant adverse effects are anticipated in relation to the remaining areas of public open space identified.

Transport options

15.5.37 People that use the railway stations, the railway, buses and motorised vehicle travellers in the core and wider study area are likely to face temporary disruptions to travel activity, delays and/or increased commuter times due to construction activities, introduction of construction vehicles, temporary closures, modifications and restrictions, diversion routes and traffic management. This will result in some wider groups and vulnerable groups having to change their travel patterns or find alternative arrangements. Lower income groups and vulnerable groups could be disproportionately affected by any impacts. Whilst some bus stops would be temporarily relocated during the proposed works, no significant effects are predicted.

15.5.38 There will be a requirement for the temporary closure of the four railway stations in the core study area as well as the railway itself during certain parts of the construction period (the design has sought to minimise this time). The magnitude of impact for the temporary closure of the stations and the railway, resulting in disruptions to normal services, reduced access and the need for railway users to find alternative travel options and/or temporarily change their travel patterns (likely to result in longer journey times and increased cost) would be major adverse for the physical receptors, resulting in **Large Adverse** effects, and moderate adverse for the human receptors, resulting in **Moderate Adverse** effects which is significant. In Route Section 2 and Route Section 4 where no railway stations are present, moderate adverse impacts are predicted for both the physical and human receptors, resulting in **Moderate Adverse** effects which is significant. All of these effects would be temporary, direct, short-term and reversible.

15.5.39 Some groups are likely to be particularly affected by these temporary disruptions to travel such as parents with young children, teenagers, the frail elderly, people with physical and/or mental impairments, job seekers and people living in the more remote locations that have fewer and less regular transport options. Rail replacement buses or coaches will be provided during the temporary railway closures; however, they may be more problematic for parents with prams or pushchairs and people with impairments or elderly customers.

15.5.40 To facilitate the construction works, the traffic and transport assessment (Chapter 14) in Volume 2i of the ES identifies the temporary closure and diversion of a number of roads during construction. The traffic and transport assessment identifies the following temporary significant effects that would be experienced by the physical receptors (links and roads) and human receptors (vehicle travellers, pedestrians and cyclists) in the core study area. This is described in greater detail in Table A15-31 of Appendix 15-10.

- Driver delay, pedestrian and cyclist delay and impacts on accidents and safety – temporary significant effects at 37 roads (comprising 48 links);

- Pedestrian and cyclist amenity – temporary significant effects at 27 roads (comprising 28 links);
- Fear and intimidation – temporary significant effects at 37 roads (comprising 48 links); and
- Severance – temporary significant effects at 42 roads (comprising 67 links).

15.5.41 Fear and intimidation in the context of traffic and transport, relates to hazard thresholds such as conditions, and changes to conditions, experienced by traffic volumes, composition and the presence or otherwise of protection such as wide footways or guardrails.

Active travel

15.5.42 During construction, there would be temporary disruptions, increases in journey length and time, and/or changes to travel patterns for pedestrians and others that use PRoW, footways, non-definitive footpaths and Greenways in the Scheme area, particularly on the routes that interact with the railway line and railway infrastructure and/or roads located near the construction works.

15.5.43 The baseline study indicates NMU trips in the core study area are likely to comprise a mix of commuter journeys and recreational trips. Recreational trips are generally considered less sensitive to changes in journey length in that users are not necessarily seeking the fastest or most direct route from their location to a specific destination. A variety of alternate routes not directly affected by the construction works are available in the core study area. Whilst changes in journey times and amenity effects are likely to be temporary and short-term, local communities may temporarily experience increased severance from local facilities such as shops, local businesses, schools, community and recreation facilities.

15.5.44 Construction traffic has the potential to increase traffic volume, particularly Heavy Goods Vehicle (HGV) trip numbers on the local highway network. Changes in traffic patterns and an unawareness of altered traffic movements can lead to detrimental impacts on active travel in the locations and local communities near the proposed works. This has the potential to temporarily make road crossing more difficult, dangerous, intimidating or time consuming. Any reductions in access to local facilities would have effects on the local population, particularly for vulnerable groups.

15.5.45 PRoW footpaths HUD/42/10, HUD/51/10 and KIR/240/10, PRoW Bridleway DEW/3/10 and a small part of the Birkby Bradley Greenway (NCN Route 69) would need to be permanently diverted during construction works, resulting in a significant increase in journey length and journey time. Moderate adverse impacts are predicted for the physical and human receptors resulting in **Moderate Adverse** effects which is significant. These effects would be permanent, direct and irreversible. These effects would continue to be observed during the operation phase and would be the same for all groups.

15.5.46 To facilitate the construction works, a number of PRoW, footpaths, canal towpaths and greenways in the core study area would need to be closed temporarily or diverted. Full details are provided in Table A15-32 in Appendix 15-10 and Table 2-4 in Chapter 2 (Scheme description) and on the PRoW drawing in Figure 2-2. Temporary moderate adverse impacts are predicted for the physical and human receptors, resulting in **Moderate adverse** effects which is significant. Most of these effects would be temporary, direct, short term and reversible, however the effects on PRoW DEW/1/10 would be temporary, indirect, short-term and reversible.

15.5.47 No loss, displacement or significant disruption effects are predicted for the other footways, footpaths, PRoW, Greenways and towpaths in the core study area.

Work and training

15.5.48 People who use the railway stations and the railway, buses and cars in the core study area to travel to work or education are likely to face temporary disruptions to travel activity, delays and/or increased commuter times due to construction activities, introduction of construction vehicles, temporary closures, modifications and restrictions, diversion routes and traffic management. This would result in some wider groups and vulnerable groups having to change their travel patterns or find alternative arrangements. Lower income groups and vulnerable groups could be disproportionately affected by any impacts. Whilst some bus stops would be temporarily relocated during the proposed works, no significant effects are predicted.

15.5.49 To avoid double counting, impacts on work and training from the temporary closure of the stations and the railway and associated impacts are covered by the Transport options assessment above.

15.5.50 To accommodate the Scheme one (currently vacant) commercial property at 67 Thornhill Road (Thornhill House), Dewsbury would need to be demolished.

15.5.51 The magnitude of impact for the loss of the property would be major adverse for the physical receptor (commercial property), resulting in **Large Adverse** effects and moderate adverse for the human receptors (i.e. owner(s) of the property), resulting in **Moderate adverse** effects which is significant. These effects would be permanent, direct and irreversible; however, it is an essential component for implementing the works within the Scheme. It is understood that the commercial property has been vacant for some time, therefore no adverse effects are predicted for any other parties.

15.5.52 Commercial/industrial premises at the Old Railway Sidings on Alder Street (i.e. Able Fuels, Gledhill Garage Services, PG & Son Stone Ltd., Truckline Services) will need to be displaced. However, these premises are leased on existing Network Rail land and Network Rail has been working with these local businesses to give sufficient notice to relocate and minimise any impacts. Ending a commercial property lease early is standard practice and this could happen with or without the Scheme. As a result, no significant effects are predicted. The same applies to the permanent removal of the kiosk at Huddersfield Station (believed to be currently used by Upper Crust) which would result in the use of standard rights to terminate the short-term lease.

15.5.53 In Route Section 4, a portal frame building which appears incomplete and in a poor state of repair will need to be demolished. Given that the building is not currently being used for employment purposes, its loss is not predicted to result in significant effects on the physical receptor or any human receptors.

15.5.54 A number of local businesses[57] have the potential to experience temporary significant effects during construction. These local businesses include:

- Route Section 1 – Tea rooms, Huddersfield Station; car wash and car park, Longroyd Lane;
- Route Section 2 – Montgomery's Engraving, Red Doles Road;
- Route Section 3 – Local businesses off the A62 Leeds Road, near to MVL3/102 A62 Leeds Road e.g. Sicame Electrical Developments, Huddersfield Audi;
- Route Section 4 – Heaton Lodge Sewage Treatment Works; industrial and commercial units off B6118 Colne Bridge Road; Unit 1 Recovery;

[57] Local businesses were identified during the desk-based assessment undertaken in 2020. Any potential subsequent changes to local businesses (including names) are not reflected in this chapter.

- Route Section 5 – Businesses off Lowlands Road junction with Hurst Lane; and
- Route Section 6 – Newlay Concrete Ltd. batching plant, Kirklees Waste Services, Thornhill Works, Calder Road; Armley Chairworks and Shackletons (plus other local businesses in the vicinity); Thornhill Power Station, Spenborough Engineering and the Veolia site (plus other local businesses in the vicinity).

15.5.55 Temporary moderate adverse impacts are predicted for the physical and human receptors for these local businesses, resulting in **Moderate adverse** effects which is significant. These effects would be temporary, direct, short term and reversible. For businesses such as the tea rooms at Huddersfield Station and other local businesses – particularly those located near the four railway stations, the effects would not only be reversible, but the Scheme is expected to result in beneficial effects in the operational phase and in the long-term.

15.5.56 No loss, displacement or potential significant disruption effects are predicted for the other local businesses in the core study area.

15.5.57 The socio-economic assessment in Chapter 21 (socio-economic) also identifies impact on business activity including potential disruption to business activity through ceased activity or required relocations, construction traffic, lower passing trade/customers and impacted access to business premises for employees and operation. However, effects identified would be temporary, direct and indirect, short-term and reversible and are not assessed to be significant.

Social cohesion and lifetime neighbourhoods

15.5.58 This section seeks to highlight any communities that are more likely to be affected by the Scheme. It is a review of the potential effects of the Scheme on the stability and viability of communities and on how people in the core and wider study area go about their daily lives.

15.5.59 Community cohesion and social identity are subjective and has the potential to be significant at the scale of individual households as well as at a community-wide scale. The significance matrix in Table 15-4 cannot be applied to determine the significance of effects on social cohesion; instead, a narrative is applied, using professional judgement.

15.5.60 A very small number of private residential properties would need to be displaced to accommodate the Scheme and there would be some disruptions in access to community facilities and social infrastructure. Community cohesion could also be affected by the temporary reductions in access to Huddersfield Station and the other railway stations in the core study area, temporary impacts to roads, PRoW, footpaths and access to local facilities. Construction impacts may also lead to several environmental issues (e.g. noise, construction traffic, severance, visual impacts, air quality, dust and odour etc.) and disruptions to access that will require mitigation. However, many of these impacts are localised and taken as a whole, the effects on social cohesion for the community as a whole in the core study area are not predicted to be significant.

15.5.61 Research[58] indicates an increase in population arising from a non-home-based workforce (i.e. construction workforce and contractors working on the Scheme) could have the potential to affect crime and anti-social behaviour, and consequent effects on local services. However, the number of non-home-based workforce is predicted to be low and the majority of workers are expected to travel to work and then go home. Therefore, any effects are not predicted to be

58 https://conferences.iaia.org/2018/finalpapers/Owen,%20Daniel%20%20Managing%20Social%20Impacts%20of%20Labour%20Influx.pdf

significant.

Noise pollution and vibration

15.5.62 There are a number of sources of construction noise in the study area. The set up and operation of compounds, works to the stations, structures and utilities, and highways works have the potential for the greatest impact. The noise assessment finds that 47 noise sensitive receptors (NSR) may be significantly adversely affected by construction noise during daytime periods. Non-significant adverse impacts would be expected to occur at approximately 2,000 NSR.

15.5.63 There is the potential for night-time construction activities at Hillhouse compound to cause significant adverse effects at nearby NSR, particularly on Hammond Street.

15.5.64 In terms of construction vibration, no significant effects are predicted at residential NSR. However, there may be significant effects at Dr Reddy's laboratories in Route Section 5. Potential adverse effects (not significant for EIA purposes) may be experienced at approximately 1,000 NSR due to compaction activities and approximately 2,200 NSR due to piling activities.

15.5.65 Construction vibration has the potential to cause cosmetic damage to 27 physical receptors throughout the study area without mitigation measures put in place, subject to further detailed assessment and surveys prior to construction works.

15.5.66 Temporary significant adverse effects are predicted from construction traffic noise at approximately 1,250 NSR across the study area associated with construction traffic and temporary diversions to 19 roads.

15.5.67 There are potential significant adverse effects at NSR on Hammond Street and Abbey Road during the evening and early morning from bus replacement services at Hillhouse compound.

Operation

15.5.68 The operation of the Scheme is anticipated to generate changes to wider health determinants. Any permanent land take effects from the construction period would continue to be observed during the operation phase, however there would be no additional land take during this phase. Any areas of temporary land take would be restored to their original condition on completion of the works. Therefore, there would be no additional significant land take effects during the operation phase.

Air pollution

15.5.69 The air quality assessment (Chapter 7) predicts minor changes to air quality during operation from rail emissions and road traffic emissions, however any effects are expected to be beneficial and not predicted to be significant.

Soil and water pollution

15.5.70 The assessment in Chapter 12 (Geology, soils and land contamination) identifies the potential for spills and leaks from chemicals associated with the operational railway which could have adverse impacts on human health receptors and controlled waters, however the use of bi-modal/electric trains reduces the potential risk from the Scheme as they will carry less fuel etc. than existing diesel-powered units.

15.5.71 The majority of impacts that might occur to receptors during operation are the same as those that were identified during construction and will be mitigated during construction. In a discrete

area in Route Sections 4, there is potential for significant beneficial effects to workers in fields/on nearby agricultural land (human receptors) who return to land that is underlain by a historical colliery after temporary use as construction compounds or access, which have the potential to be contaminated and remediated accordingly.

15.5.72 The water environment assessment (Chapter 11) identifies potential risks to human health during operation from drainage and disturbance to groundwater flow paths. However, only one significant effect is predicted from the impacts on floodplain functionality and in-channel training walls from Baker Viaduct Underbridge (RBA/2).

Risk of injuries and death

15.5.73 The baseline study identifies a large number of trips originating or terminating at the railway stations along the Scheme, comprising commuters and lineside neighbours who may be at risk of injuries and death during operation of the Scheme. Furthermore, the population in the core and wider study area predicted to rise further in future years which would introduce new sensitive receptors and vulnerable groups. Operatives and maintenance workers would also have the potential to be at risk whilst maintaining the Scheme.

15.5.74 The operation of the Scheme would not include any potentially dangerous operation, such as the use of nuclear or dangerous chemical materials or processes. Some chemicals may be present on-site, though risks associated with such materials would be adequately mitigated by following regulatory guidance and Network Rail procedures (NR/L2/ENV/015 – Environment & Social Minimum Requirements 2019) to prevent pollution to air, water and land. Railway incidents are a typical consideration of the operation of any railway. The risk of major accident or injuries is not considered to be of the magnitude targeted by the EIA Regulations. With thorough inspections in place, such as those carried out in the baseline, failure is unlikely to occur. In conclusion, there would be no significant change in the risk of a major accident or incident occurring in the core study area during operation compared to the baseline situation.

15.5.75 The introduction of overhead line equipment (OLE) and overhead transmission lines along the Scheme including through the railway stations would increase the risk of injuries and death compared to the current baseline. The magnitude of impact for any damage, vandalism, supply failures and mechanical problems to the physical receptor itself (electrical infrastructure) would be moderate adverse, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct, short-term and reversible, where it is expected that any OLE damaged would be replaced on a like-for-like basis. The magnitude of impact for people working with or maintaining the OLE and other electrical infrastructure, people accessing, falling or accidentally or otherwise coming into contact with the electrical equipment would be moderate adverse due to an elevated and potentially fatal risk of electrocution. This would result in **Moderate Adverse** effects for wider groups and all vulnerable groups, which is significant. These effects would be temporary, direct and short-term; however, more serious injuries could have longer-term effects and death would be permanent. The effects would be the same across the core study area and for all groups, however there would be increased risk where railway stations are present.

15.5.76 The magnitude of impact of unauthorised access/trespass onto the railway line/infrastructure, leading to slips, trips, falls and conflict with railway infrastructure and trains is predicted to be moderate adverse for the physical receptor, resulting in **Moderate Adverse** effects which is significant. These effects would be temporary, direct, short-term and reversible. No significant impacts are predicted for the human receptors. Trespass onto the railway line is a common risk meaning there would be no significant change to baseline operational conditions.

Housing

15.5.77 Other than the permanent effects observed for a very small number of residential properties

during the construction phase that would continue to be observed during operation, no other physical receptors (houses) would be lost, displaced or require land take to accommodate the Scheme. Operation of the Scheme is not predicted to result in any significant in-combination environmental changes (e.g. noise, air quality, odour).

15.5.78 There may be potential effects related to population growth and subsequent additional demand for housing in the core study area as a result of economic growth directly or indirectly arising from the Scheme. This could increase the demand on current housing and future/safeguarded sites coming forward for development, such as the large residential development proposed for Bradley and Dewsbury. However, any effects on the physical or human receptors is not predicted to be significant.

15.5.79 Both the local economy and local population, including the number of households in the core and wider study area, are projected to increase regardless of the Scheme. This growth is expected to be enhanced through additional population growth driven by an increase in jobs and accessibility to jobs. However, any effects on existing or future physical and human receptors is not predicted to be significant.

15.5.80 Whilst the Scheme could lead to some increased housing need within the core and wider study areas, this is expected to be generally met by the strategic housing need identified for Kirklees. The sensitivity of the housing market is low as it is adaptive to change and affected by wider factors. Therefore, no significant effects are predicted on physical and human receptors from additional demand for housing in the core and wider study area.

Education, healthcare services and other social infrastructure

15.5.81 No education, healthcare services or other social infrastructure would need to close in the core study area, or have their facilities relocated to accommodate the operation of the Scheme.

15.5.82 In general, the Scheme is anticipated to contribute to an overall improvement in accessibility to education, health care services and other community facilities by increasing network capacity and improving transport options across the core and wider study areas. This can help to address some of the current deficiencies, such as instances of poor living environment and barriers to services.

15.5.83 The Scheme, as part of the wider TRU Programme, is expected to contribute to population and household growth in line with Kirklees economic and development aspirations which may affect the demand for education, healthcare services and other social infrastructure. However, each type of facility will have its own sensitivity to change. At this stage it is not possible to predict the future demographic change in population, households or household composition in the core study area as a result of the Scheme and demand for education, healthcare services and other social infrastructure. Population and demand for local services in the core and wider study area will increase in future years with or without the Scheme.

15.5.84 Operation of the Scheme is not predicted to result in any significant environmental changes (e.g. noise, air quality, odour) or changes in access that would affect schools, healthcare services and other social infrastructure.

15.5.85 During operation, the design of the Scheme would not significantly alter journey distance, journey time or patterns for pedestrians and others to the degree to which a locality becomes subject to “community severance”. Potential wider benefits of the Scheme such as an increase in connectivity and the attractiveness of Kirklees as a visitor attraction could have beneficial effects on recreation usage in the wider study area, however this is not predicted to be significant.

Open space, recreation and leisure-time facilities

15.5.86 The functionality and wider access to the River Colne, River Calder and Spen Valley Corridors which would be temporarily affected by land take, disruptions and amenity effects during construction would be largely preserved following completion of the works.

15.5.87 The assessment in Chapter 20 (Public open space) identifies that, without mitigation, the Scheme would result in the permanent loss of around 26,261m^2 of public open space, which is significant.

15.5.88 With the implementation of embedded mitigation measures including replacement of public open space land where permanent acquisition of land is identified in line with the statutory requirements in Section 19 of the Acquisition of Land Act 1981. In total, 26,540m^2 of public open space will be provided as exchange land to replace the permanent loss of around 26,261m^2 of public open space to accommodate the Scheme.

15.5.89 With the mitigation measures implemented, no significant effects are expected during operation.

Transport options

15.5.90 As highlighted within the traffic and transport assessment (Chapter 14), the proposed permanent changes to the stations are unlikely to result in notable increases in traffic flows. Instead, these changes are expected to improve circulation and ease of access for non-motorised users and vulnerable groups. Operational effects across the Scheme are predicted to have a Negligible effect on road users and beneficial effects (non-significant for EIA purposes) on NMU, particularly in and around the stations.

15.5.91 In wider terms the Scheme is part of a wider TRU Programme which plans to update the railway between Manchester, Huddersfield, Leeds and York. The purpose of the Scheme is to deliver works for the upgrade and electrification of the existing railway serving the Transpennine route, to increase capacity and improve journey times and performance reliability of rail services along the route. The Scheme will also provide sustainability benefits as it will de-carbonise and electrify this section of the railway. Whilst this will bring several benefits to core study area, no significant effects are predicted on transport options during the operational phase.

15.5.92 The permanent changes resulting from the Scheme are likely to have an overall Neutral to Slight beneficial effect on Transport options, which is not significant.

Active travel

15.5.93 During operation, the design of the Scheme would not significantly alter the baseline conditions or change journey distance, journey time or patterns for pedestrians and others, to the degree to which a locality would notice “community severance”. The Scheme would have negligible beneficial impacts in drawing traffic away from congested routes in the core and wider study areas.

15.5.94 The permanent diversion/realignment of PRoW footpaths HUD/42/10, HUD/51/10 and KIR/240/10, PRoW Bridleway DEW/3/10 and a small part of the Birkby Bradley Greenway (NCN Route 69) would continue to be observed during the operation phase. The functionality and wider access to greenways, PRoW, footpaths and canal towpaths which would be temporarily affected by temporary closures, disruption effects, changes to access and increases in journey length and time during construction would be largely reinstated following completion of the works.

15.5.95 Connectivity for pedestrians and others will be improved at the railway stations through improved access, step free access and facilities and general improvements such as at A62 Leeds Road Overbridge (MVL3/102) and Wheatley's Overbridge (MVL3/103) to tie in with the existing facilities and cycleways. The realigned A62 Leeds Road Overbridge (MVL3/102) and realigned B6118 Bridge Road Overbridge (MVL3/107) for example would provide a line segregated cycle route (2m) on either side and footpaths which would improve safety for pedestrians and cyclists.

15.5.96 In broad terms, the Scheme, as part of the TRU Programme, would accord with the wider aspirations of the Kirklees Local Plan which aims to better connect places and encourage sustainable travel, increase opportunities for walking and cycling and improve links to other parts of Kirklees, the Leeds City Region and beyond. Whilst the Scheme, as part of the wider TRU Programme, can directly and indirectly play a part in improving connectivity and multi-modal options which would bring obvious benefits, any beneficial changes to active travel are not predicted to be significant.

Work and training

15.5.97 Improvements to the railway stations and railway infrastructure, in conjunction with the wider TRU Programme, would improve the passenger experience, reduce journey times and the platform extensions would have the potential to allow a greater number and longer trains that could tackle overcrowding issues. These Scheme improvements will have a beneficial effect overall on access to local businesses in the Scheme boundary and education in the core and wider study areas and the Local Authority economy in terms of encouraging new development opportunities and jobs that could be generated directly and indirectly by the Scheme. This is likely to be of the highest impact magnitude around Huddersfield Station. It is judged that these business activity impacts may be significant for the Local Authority area. However, they may be more significant in the Sub-regional and Regional area in combination with the wider TRU upgrade programme.

15.5.98 The Scheme may directly or indirectly connect businesses to each other and employees and allow the efficient movement of goods and services. This can have benefits for various social groups in the core and wider study area such as improving health, providing financial security and contributing to self-esteem. However, any benefits are not expected to be significant.

Social cohesion and lifetime neighbourhoods

15.5.99 The Scheme, as part of the wider TRU Programme, forms an important part of the essential infrastructure required to deliver the spatial strategy of the Kirklees Local Plan.

15.5.100 Overall, improvements to the railway stations and the railway infrastructure may have positive effects on community cohesion by improving the attractiveness of the railway for all users, reducing congestion and making the neighbourhoods near and beyond the railway infrastructure more attractive to pedestrians and others. The Scheme could also improve access to work and training, education and community facilities for those in the core and wider study areas which can help to tackle inequality and give all residents the opportunity of a healthy lifestyle. Any effects are not predicted to be significant.

Noise pollution and vibration

15.5.101 The noise and vibration assessment (Chapter 8) identifies the potential for operational noise impacts due to changes in the number and type of trains, changes in train length, changes in line speed and changes to the track alignment. The noise assessment identifies there is the potential for significant adverse effects at 65 residential NSR during daytime periods (within all Route Sections) and 34 residential NSR during night-time periods (within Route Sections 3 to 5). Whilst there is the potential for significant adverse effects at Kingdom Hall during night-

time periods, it is not expected to be occupied during night-time periods therefore the effects would not be significant.

15.5.102 There will be no significant effects from operational railway vibration or ground-borne noise in the study area. However, significant effects are predicted at two residential NSR at Brooks Yard due to the realignment of Thornhill Road in Route Section 6. There are predicted significant adverse effects on NSR on Hammond Street, Abbey Road and Alder Street due to the temporary and permanent operation of stabling sidings at the Hillhouse compound in Route Section 2, particularly due to idling trains during night-time periods.

15.6 Mitigation measures

15.6.1 The assessment of potential effects has been undertaken with consideration of embedded mitigation. In relation to the wider determinants of health, embedded mitigation in the form of design optioneering has ensured the following, where possible:

- Potential access/contact with OLE is minimised;
- Potential land take affecting individual sensitive receptors is minimised;
- Access to community facilities and local businesses is maintained;
- Access for NMU and vehicle travellers is maintained;
- The railway and public transport routes/stops are maintained, and disruption is minimised where possible, and;
- Actual and perceived severance for communities nearby is minimised.

15.6.2 Embedded mitigation has also been considered in the assessments for each of the environmental topic chapters.

15.6.3 Where significant effects have been identified in the assessments, additional mitigation measures are proposed.

15.6.4 Where significant effects have been identified for the wider determinants of health in the environmental topic assessments (e.g. air quality, geology, soils and land contamination, water environment, noise and vibration, traffic and transport, electromagnetic interference, public open space and socio-economic), the additional mitigation measures proposed are provided within the environmental topic chapters.

15.6.5 Where significant effects have been identified for wider determinants of health assessed solely in the population and human health assessment (Housing & Education, healthcare services and other social infrastructure, Active travel, Work and training and Social cohesion and lifetime neighbourhoods), are detailed in this section. Table 15-6 provides further cross-reference details to these measures. Further details in relation to the mitigation measures proposed during construction and operation are detailed in Tables A15-36 and A15-37 in Appendix 15-12.

Table 15-6 Additional mitigation measures

Wider determinant of health	Environmental topic	Additional Scheme-wide mitigation measures
Air pollution	Air quality	Section 7.6 in Chapter 7 (Air quality) of this Scheme-wide Assessment
Soil and water pollution	Water environment	Section 11.6 in Chapter 11 (Water environment) of this Scheme-wide Assessment
	Geology, soils and land contamination	Section 12.6 in Chapter 11 (Geology, soils and land contamination) of this Scheme-wide Assessment
Risk of injuries and death	Electromagnetic interference	Section 18.6 in Chapter 18 (Electromagnetic interference) of this Scheme-wide Assessment
	Population and human health	Section 15.6 in Chapter 15 (Population and human health) of this Scheme-wide Assessment
Housing & Education, healthcare services and other social infrastructure	Population and human health	Section 15.6 in Chapter 15 (Population and human health) of this Scheme-wide Assessment
Open space, recreation and leisure-time facilities	Public open space	Section 20.6 in Chapter 20 (Public open space) of this Scheme-wide Assessment
Transport options	Traffic and transport	Section 14.6 in Chapter 14 (Traffic and transport) of this Scheme-wide Assessment
Active travel	Population and human health	Section 15.6 of this chapter
Work and training	Population and human health	Section 15.6 of this chapter
	Socio-economic	Section 21.6 in Chapter 21 (Socio-economic) of this Scheme-wide Assessment
Social cohesion and lifetime neighbourhoods	Population and human health (Chapter 15)	Section 15.6 of this chapter
Noise and vibration	Noise and vibration	Section 8.6 in Chapter 8 (Noise and vibration) of this Scheme-wide Assessment.

Construction

15.1.1 Best practice environmental management measures will be implemented on site through application of a Code of Construction Practice (CoCP). Part A of the CoCP is provided in Appendix 2-1. Part B of the CoCP will incorporate specific/detailed plans including a Nuisance Management Plan (NMP), a Pollution Prevention and Incident Control Plan (PPICP), an External Communications Programme, a Noise and Vibration Management Plan (NVMP), a Materials Management Plan (MMP) and a Waste Management Plan (WMP). The contents of these documents will be submitted to and agreed by the Local Authority pursuant to a condition to be attached to the deemed planning permission[59] prior to the construction works commencing.

15.6.6 A Construction Traffic Management Plan (CTMP) which will be submitted to and approved by the Local Authority pursuant to a planning condition to be attached to the deemed planning permission, which will include measures to reduce impacts of temporary traffic management arrangements.

Risk of injuries and death

15.6.7 Mitigation measures will be in the form of standard Health and Safety procedures, which will be incorporated into Part A of the CoCP. The assessment in Chapter 18 (Electromagnetic interference) includes mitigation measures relating to specific receptors and/or processes to protect against the effects of electricity and electrification.

Housing

15.6.8 Mitigation measures have been incorporated to avoid or prevent effects on housing; and then (if this is not possible), to reduce or abate the effect; and then, if necessary, to offset them. An External Communications Programme under Part B of the CoCP will include measures to minimise potential effects on residents. Network Rail will also enter into meaningful negotiation with affected receptors.

15.6.9 Where temporary land is required from residential properties, a schedule of condition will be prepared, and the land restored to its original condition on completion of the works. Wider measures to minimise disruption and amenity effects will be covered in Part A of the CoCP.

Education, healthcare services and other social infrastructure

15.6.10 Mitigation measures will be incorporated into the External Communications Programme under Part B of the CoCP, to minimise effects on community land and facilities.

Active travel

15.6.11 Mitigation measures will be incorporated to minimise disruption to local communities and users of PRoW, footpaths etc. Details are provided in Part A of the CoCP and will be included in the CTMP. Measures will include NMU routes being kept open at all times where practicable, temporary and permanent diversions and realignments implemented where applicable where construction prevents access, local resident access maintained at all times where possible, and new temporary provision provided if required.

Work and training

15.6.12 Mitigation measures will be incorporated to ensure that any temporary disruptions to local

[59] On making an order under the Transport and Works Act 1992, the Secretary of State may direct that planning permission shall be deemed to be granted, subject to such conditions (if any) as may be specified in the direction.

businesses and access to work and training is minimised. Details are provided in Part A of the CoCP and will be included in the CTMP.

15.6.13 Mitigation will seek to avoid or prevent effects on local businesses; and then (if this is not possible), to reduce or abate the effect; and then, if necessary, to offset them. An External Communications Programme under Part B of the CoCP will set out measures for informing local businesses of the commencement and likely duration of the construction work activities to ensure effective engagement.

15.6.14 These documents will include details on diversion routes, signage and support provided for business access (for operations, workers and customers) and implemented during construction.

15.6.15 Network Rail will also engage in meaningful negotiations with affected receptors, and the Scheme contractor will liaise with local businesses throughout the construction process.

Social cohesion and lifetime neighbourhoods

15.6.16 No significant effects were identified during construction for this wider determinant of health, however measures will be incorporated to ensure that any effects on the local community and social cohesion are minimised as far as reasonably practicable, with details provided in Part A of the CoCP.

15.6.17 An External Communications Programme under Part B of the CoCP will ensure that engagement continues with Kirklees Council and local communities.

15.6.18 Operation

Risk of injuries and death

15.6.19 Mitigation measures will be in the form of standard Health and Safety procedures and are included in Part A of the CoCP. The assessment in Chapter 18 (Electromagnetic interference) includes mitigation measures relating to specific receptors and/or processes to protect against the effects of electricity and electrification.

Other wider health determinants

15.6.20 As no additional significant operational effects on the wider health determinants are reported, no additional mitigation measures are proposed.

15.7 Residual effects

15.7.1 This section identifies any significant residual effects following the application of the mitigation measures outlined in Section 15.6 and those outlined in the environmental topic chapters. Only those receptors/effects for which potential significant effects have been identified in Section 15.5 and potential mitigation measures considered in Section 15.6 are included within this section.

Construction

15.7.2 With the application of mitigation measures, there is predicted to be no significant residual effect on the following wider health determinants: Air pollution, Soil and water pollution, Risk of injuries and death, and Social cohesion and lifetime neighbourhoods. Mitigation measures for Air pollution, Soil and water pollution and Risk of injuries and death are included in the associated environmental topic chapters and reduce the effects identified to a level where no significant residual effects remain for these wider determinants of health.

15.7.3 For Social cohesion and lifetime neighbourhoods, no significant effects were identified during construction and therefore no significant residual effects remain following the implementation of the measures outlined in paragraph 15.6.15.

15.7.4 Significant residual effects are predicted for the wider health determinants: Housing, Education, healthcare services and community facilities, Transport options, Active travel, Work and training, and Noise pollution and vibration. These effects are outlined in the following sections.

Housing

15.7.5 Significant permanent adverse residual effects are still predicted from the loss of three residential properties and permanent land take at five other residential properties.

15.7.6 Significant temporary adverse residual effects are still predicted from temporary land take and disruption effects at a number of residential properties, as set out in Table 15-7.

Table 15-7 Significant adverse residual effects for housing

Wider health determinant	Route Section	Significant residual effects
Housing	2 – Hillhouse and Fartown	• Temporary land take and disruption effects at Topaz Close, Fartown
	3 – Deighton and Bradley	• Permanent loss of garden space at Number 12 Lilac Court, Deighton, Number 4 Glenfield Avenue and Numbers 82 to 86 Glenfield Avenue, • Temporary land take and disruption effects at Numbers 2, 4, 6, 8, 9, 10, 11 and 12 Lilac Court, Numbers 5, 17, 19 and 21 Whitacre Street, the rear gardens of Numbers 2 to 28 and 76 to 86 Glenfield Avenue, Deighton, and land take to the rear of Numbers 682-684 Leeds Road
	4 – Colne Bridge and Battyeford	• Permanent loss of Numbers 1, 2 and 3 Heaton Lodge Cottages, Colne Bridge
	5 – Mirfield and Lower Hopton	• Temporary disruption effects at Chadwick Fold, Mirfield
	6 – Ravensthorpe and Westtown	• Temporary disruption effects and land take to Number 41 Thornhill Road, Dewsbury • Temporary land take and disruption effects at Numbers 24, 26, 28 and 30 Brooks Yard

15.7.7 Whilst significant adverse effects are predicted for the above physical and human receptors, these effects are localised and small scale so do not constitute significant residual effects on Housing as a whole, in the context of a core study area which comprises approximately 20,100 residential properties (i.e. only 0.2% of all residential properties will be significantly permanently or temporarily affected).

Education, healthcare services and community facilities

15.7.8 Significant temporary adverse residual effects are still predicted for one education facility, as set out in Table 15-7.

Table 15-8 Significant residual effects for education, healthcare services and other social infrastructure

Wider health determinant	Route Section	Significant residual effects
Education, healthcare services and other social infrastructure	6 – Ravensthorpe and Westtown	• Temporary disruptions to access and severance effects at Childs Play Day Care Nursery, 21 Thornhill Road, Dewsbury

15.7.9 Whilst significant adverse residual effects are predicted for this one educational establishment, in relation to temporary disruptions to access and severance for workers, parents and children that attend the nursery, this effect is localised and small scale so does not constitute significant residual effects on Education, healthcare services and other social infrastructure as a whole, in the context of a core study area which comprises approximately 510 education, healthcare and other community facilities.

Open space, recreation and leisure-time facilities

15.7.10 As identified in Chapter 20 (Public open space) even with the implementation of mitigation measures, temporary significant adverse residual effects are anticipated in relation to four areas of public open space during the construction phase. However, these effects are temporary. It is anticipated that there will be no long-term significant effects as a result of the operation of the Scheme.

Transport options

15.7.11 Significant temporary adverse residual effects are still predicted following the temporary closure of the railway and railway stations, the temporary closure of several local roads which cross or are located near to the railway line and construction impact on the highway network and receptors, as set out in Table 15-8.

Table 15-9 Significant residual effects for Transport options

Wider health determinant	Route Section	Significant adverse residual effects
Transport options	All Route Sections	• Temporary closure of railway stations (where present) and the railway, rail diversions and bus replacement
		• Temporary traffic and transport effects: Driver delay, pedestrian and cyclist delay, and accidents and safety; Pedestrian and cyclist amenity; Fear and intimidation, and; Severance
	1 – Huddersfield	• Temporary closure of John William Street, Springwood Street, Castlegate and the Viaduct, and Northgate
	2 – Hillhouse and Fartown	• Temporary closure of Hillhouse Lane and Emerald Street
	3 – Deighton and Bradley	• Temporary closure of the A62 Leeds Road, Whitacre Street and Lilac Court
	4 – Colne Bridge and Battyeford	• Temporary closure of B6118 Colne Bridge Road
	5 – Mirfield and Lower Hopton	• Temporary closure of Station Road
	6 – Ravensthorpe and Westtown	• Temporary closure of Calder Road and Thornhill Road/Fall Lane

15.7.12 The temporary closure of the railway and four stations, temporary closure and diversion of a

number of roads (and links), and construction effects on the highway network represents a temporary significant adverse effect for the physical and human receptors in the core study area.

Active travel

15.7.13 Significant temporary adverse residual effects are still predicted for a number of PRoW, footpaths/cycle provision and the Birkby Bradley Greenway and Calder Valley Greenway from temporary closures, diversions and/or disruption effects, as set out in Table 15-9.

Table 15-10 Significant adverse residual effects for Active travel

Wider health determinant	Route Section	Significant residual effects
Active Travel	1 – Huddersfield	• Temporary closure of the existing passenger subway (MVL3/91) at Huddersfield Station and Springwood footpaths and temporary closure and diversion of PRoW footpaths HUD/327/10, HUD/327/20, HUD/327/10, HUD/328/10, HUD/328/20, HUD/328/30, HUD/329/10, HUD/338/10 and HUD/338/10
	2 – Hillhouse and Fartown	• Temporary closure, diversion and disruptions and temporary land take effects on the Birkby Bradley Greenway at Field House Overbridge (MVL3/98) and to accommodate works to Whitacre Street Overbridge (MVL3/101). • Temporary closure, diversion and disruption effects at PRoW footpaths HUD/57/10, HUD/42/10, HUD/44/30 HUD/41/10, HUD/44/20, HUD/44/40 and PRoW byways HUD/41/20, HUD/58/10, HUD43/40, HUD/43/50
	3 – Deighton and Bradley	• Permanent closure and diversion of PRoW footpath HUD/51/10 and a small part of the Birkby Bradley Greenway (NCN Route 69) • Temporary closure, diversion and/or disruption effects at the Birkby Bradley Greenway, Calder Valley Greenway, PRoW footpath HUD/51/10, footpaths and cyclist provision along the A62 Leeds Road and Whitacre Street
	4 – Colne Bridge and Battyeford	• Permanent closure and diversion of PRoW footpath KIR/240/10 • Temporary closures and/or disruption effects during construction works at the Calder Valley Greenway (NCN No. 66), PRoW footpath KIR/240/10, PRoW Bridleways KIR/251/10 and MIR/106/10, the footpath at B6118 Bridge Overbridge (MVL3/107) and canal towpath to the south of B6118 Colne Bridge Road
	5 – Mirfield and Lower Hopton	• Temporary closure, diversion and disruption effects on part of the Calder Valley Greenway (NCN No. 66), and at PRoW footpaths MIR/50/10 and MIR/50/20 • Temporary closure and disruption effects at PRoW footpath MIR/75/10, PRoW bridleways MIR76/10, MIR/76/20, KIR/251/10 and MIR/106/10 and the footpaths/cycle provision along Station Road.

Wider health determinant	Route Section	Significant residual effects
	6 – Ravensthorpe and Westtown	• Permanent closure and diversion of PRoW Bridleway DEW/3/10, resulting in increases in journey length and time • Temporary closures, diversions and disruption effects at PRoW bridleway DEW/1a/10 and PRoW footpaths DEW/117/20 and DEW/117/30 • Temporary closure (no diversions proposed) and/or disruption effects at PRoW footpath DEW/155/10, DEW8/50, DEW/12/10, DEW/5/20, DEW/15/10, DEW/16/10, DEW/12/30 and PRoW Bridleways DEW/3/10, DEW/116/20 and DEW/116/30, DEW/8/30, DEW/6/10, DEW/6/20, DEW/6/10, DEW/6/30, DEW/6/50, DEW/12/40, DEW/94/10, DEW/6/60 and the Calder and Hebble towpaths from Ravensthorpe Bridge to Long Cut End Bridge and from Long Cut End Bridge to Schofield Railway Bridge and the footpaths/cycle provision along Fall Lane/Thornhill Road • Temporary closure of PRoW Bridleway DEW/1/10 during construction works due to closure of DEW/1a/10 and DEW/3/10.

15.7.14 Whilst significant effects are predicted for a number of PRoW, footpaths/cycle provision and greenways across the core study area and in relation to disruption effects, increases in journey distance and times and severance for the physical and human receptors, these effects are localised, so do not constitute significant residual effects on Active travel as a whole, in the context of a core study area which comprises a large number of options for NMU.

Work and training

15.7.15 To avoid double counting, impacts on work and training from the temporary closure of the stations and the railway and associated impacts are covered by the Transport options assessment above.

15.7.16 Significant permanent and temporary adverse residual effects are still predicted from the loss of a small number of local businesses, land take and disruption effects, as set out in Table 15-10.

Table 15-11 Significant adverse residual effects for work and training

Wider health determinant	Route Section	Significant residual effects
Work and training	1 – Huddersfield	• Temporary significant effects on the tea rooms at Huddersfield Station and the car wash facility and car park on Longroyd Lane.
	2 – Hillhouse and Fartown	• Temporary disruptions effects on Montgomery's Engraving during works at Red Doles Road, Red Doles Road Underbridge (MVL3/96) and to accommodate the construction compound.
	3 – Deighton and Bradley	• Temporary significant effects on local businesses off the A62 Leeds Road, particularly Sicame Electrical Developments and Huddersfield Audi, and businesses

Wider health determinant	Route Section	Significant residual effects
		in the local and wider study areas during the temporary closure of the A62 Leeds Road.
	4 – Colne Bridge and Battyeford	• Temporary closure of B6118 Colne Bridge Road which would have significant effects for local businesses off Colne Bridge Road itself and businesses in the local and wider study areas that are reliant on goods access via Colne Bridge Road.
	6 – Ravensthorpe and Westtown	• Permanent effects from the demolition of the local business at Number 67 Thornhill Road • Temporary disruption effects to Newlay Concrete Ltd., Kirklees Waste Services, Armley Chairworks and Shackletons near Thornhill Road and Thornhill Power Station, Spenborough Engineering and the Veolia site near Calder Road, and businesses adjacent to the Veolia site (e.g. GNT Developments), due to their proximity to the proposed works and other local businesses near Calder Road and Thornhill Road.

15.7.17 Whilst significant adverse residual effects are predicted for these local businesses (notwithstanding the wider effects from the closure of the railway and railway stations), resulting in permanent effects for the physical receptor (commercial property) and the human receptors (owner(s) of the property), the effects are localised so does not constitute significant residual effects on local businesses as a whole, in the context of a core study area which comprises approximately 8,670 commercial, office, industrial and retail premises (i.e. only 1% of all local businesses are significantly permanently or temporarily affected).

Noise pollution and vibration

15.7.18 As confirmed by the findings in Chapter 8 (Noise and vibration), significant temporary residual effects are still predicted from road traffic noise at NSR due to temporary diversions and construction traffic along affected routes, as set out in Table 15-11.

Table 15-12 Significant adverse residual effects for noise and vibration

Wider health determinant	Route Section	Significant residual effects
Noise and vibration	1 – Huddersfield	• Road traffic noise from construction traffic and diversions at NSR due to the temporary diversion along Alder Street
	2 – Hillhouse and Fartown	• Road traffic noise at NSR along Alder Street and Woodhouse Hill due to temporary diversions and construction traffic along these affected routes
	3 – Deighton and Bradley	• Noise at NSR due to temporary diversions and construction traffic along affected routes (e.g. Sheepridge Road/Deighton Road up to Keldregate, Keldregate, Deighton Road between Keldregate and Whitacre Street, Whitacre Street, and Deighton Road between Whitacre Street and Leeds Road
	4 – Colne Bridge and Battyeford	• Road traffic noise at NSR on Dalton Bank Road due to temporary diversions and construction traffic along this route
	5 – Mirfield and Lower	• Road traffic noise at NSR along the affected routes at Station Road, Hopton New Road, Back Station Road,

Wider health determinant	Route Section	Significant residual effects
	Hopton	Granny Lane, Hopton Lane/Hopton Hall Lane (down to Upper Hopton and Liley Lane), Calder Road and Newgate
	6 – Ravensthorpe and Westtown	• Road traffic noise at NSR along Warren Street and Forge Lane due to temporary diversions and construction traffic

15.7.19 Whilst significant adverse effects are predicted for the above physical and human receptors from noise pollution and vibration, these effects are localised and small scale so does not constitute significant residual effects on noise and vibration as a whole, in the context of a core study area which comprises approximately 20,100 sensitive residential receptors (i.e. only a very small proportion of all residential properties will be significantly affected) and thousands of sensitive non-residential receptors.

Operation

15.7.20 Significant residual effects during operation are predicted for the wider health determinants: Noise pollution and vibration and Work and training. These are outlined as follows.

Noise pollution and vibration

15.7.21 Significant adverse residual effects are still predicted for the external amenity areas during daytime periods at the following NSR:

- No. 43, 45, 47, 49, 51 and 54 Whitacre Close;
- No. 11 & 13 Whitacre Street;
- No. 11 & 12 Lilac Court;
- No. 682 & 684 Leeds Road; and
- No. 24 & 26 Brooks Yard.

Work and training

15.7.22 As confirmed by the findings in Chapter 21 (Socio-economic), significant residual effects arising from the operation of the Scheme are identified as resulting from improved journey times, reliability, and capacity in the Local Authority area and in turn at the Sub-regional and Regional level. These improvements are judged to be likely to bring direct significant benefits to local businesses and the labour market through improved access and in providing opportunities around Huddersfield Station through spend and business activity uplifts.

15.7.23 No significant residual effects are predicted for the other wider health determinants.

15.8 Cumulative effects

15.8.1 Cumulative effects can include intra-Scheme impacts and inter-Scheme impacts. I

- Intra-Scheme effects (or in-combination synergistic effects) are the combined impact from a single project on a single receptor or resource;
- Inter-Scheme effects are the combined impact of a number of different projects within the vicinity (in combination with the Scheme) on a single receptor.

15.8.2 Further consideration of cumulative effects is provided in Chapter 22 (Cumulative effects) of this ES.

Intra-Scheme (synergistic) impacts

15.8.3 Potential intra-Scheme effects may occur from interaction with other environmental topics.

15.8.4 The population and human health assessment is by nature an in-combination assessment of the population and human health impacts resulting from the environmental effects of the Scheme.

Construction

15.8.5 Several significant residual effects have been identified for the Scheme.

15.8.6 The temporary closure of the railway and stations will result in significant adverse effects across the study area, albeit with slightly greater impact in the Route Sections that have direct access to a railway station. Temporary modal shift from rail to road (not considered to be significant) and temporary disruptions to roads, particularly the roads that cross the railway line such as the A62 Leeds Road, Whitacre Street, Colne Bridge Road, Station Road, Newgate/Newgate Street, Calder Road and Thornhill Road/Fall Lane has the potential to result in in-combination effects. However, the cumulative assessment in Chapter 14 (Traffic and transport) finds that any cumulative effects would not be significant.

15.8.7 The Scheme will require temporary stopping up of a number of PRoW across the Scheme area during the construction phase. Where possible temporary diversion routes are proposed, however there are certain areas where formal diversions are not feasible due to a lack of suitable alternatives, mainly due to the distance involved. The temporary stopping up of PRoW will have a cumulative effect on users of the network given the works required. Figure 2-2 demonstrates the planned temporary closures and proposed diversion routes. This affects the following Route Sections specifically:

- Route Section 2 – temporary closures of the PRoW network are required to facilitate construction works to structures from Red Doles Road Underbridge (MVL3/96) to Peel's Pit Underbridge. The closures will be phased such that alternatives are available and so a moderate cumulative effect is anticipated which is the same as the individual effects reported in Chapter 15 (Population and Human Health) of this ES.
- Route Section 6 – temporary closures of the PRoW network are required to facilitate construction works of the new Ravensthorpe Station and the realignment of Calder Road Overbridge (MNV2/202) as well as works to construct the new Baker Viaduct (RBA/2). When considered with the closures required on the area of land to the south of the railway at the new Ravensthorpe Station to facilitate the overhead power line works a very large adverse cumulative effect is expected due to the lack of suitable alternatives. Access to the PRoW network will be severely limited during the construction period.

15.8.8 Significant effects are reported for the Scheme for the wider health determinants: Housing, Education, healthcare services and other social infrastructure, Active travel, Work and training, and Noise pollution and vibration, however these effects are mostly localised and spread throughout the Scheme meaning there would be limited potential for significant in-combination effects.

15.8.9 As discussed in this chapter, physical and human receptors will be subject to a small amount of permanent and temporary land take as well as amenity impacts particularly in terms of noise but also air, dust, traffic and visual impacts arising during the construction period. As such, the assessment of potential effects in Section 15.5 identifies receptors likely to experience adverse effects, with any residual effects reported in Section 15.7. Having considered these findings, it is not predicted there would be any significant in-combination amenity effects for the Scheme. Any potentially significant and residual dust, soils, water, noise, visual and traffic effects are assessed in greater detail in Chapters 7 (Air quality),

Chapter 8 (Noise and vibration), Chapter 10 (Landscape, townscape and visual), Chapter 11 (Water environment) and Chapter 12 (Geology, soils and land contamination).

Operation

15.8.10 There are potential cumulative effects at NSR due to the various sources of operational noise including rail noise, road noise, and public address (PA) system noise. Cumulatively, the effects may be significant at Deighton Station and Mirfield Station where there is an increase in rail noise and PA system noise. Mitigation measures are proposed in relation to PA system design to minimise the adverse effects as far as practicable. No further measures are required to reduce potential cumulative effects. However, with appropriate mitigation for PA, no significant cumulative effects are predicted.

15.8.11 There are potential cumulative effects in relation to operational railway noise and the road realignments at Thornhill Road, both of which will cause significant adverse effects at Numbers 24 and 26 Brooks Yard. However, with appropriate mitigation such as a new retaining wall between the proposed realignment of Thornhill Road and the rear garden of 26 Brooks Yard which would serve as a noise barrier to reduce noise levels in external amenity space and ground floor areas, along with the offer of noise insultation at these properties by Network Rail if assessed to meet the relevant thresholds, any cumulative effects, are not predicted to be significant.

15.8.12 No significant cumulative effects on the PRoW are expected during the operational phase.

15.8.13 It is not considered there would be any significant in-combination effects from cumulative changes to the other wider health determinants during operation.

Inter-Scheme effects

15.8.14 Inter-Scheme cumulative effects may occur from interaction with other proposed developments (Reasonably Foreseeable Future Projects (RFFPs) located near the Scheme. When combined with the works in the Scheme these could cumulatively affect sensitive receptors. Inclusion of RFFPs includes their proximity to the Scheme, likely impacts and timing of construction and operation.

15.8.15 The potential inter-Scheme cumulative effects in relation to Population and Human Health are set out in Table 15-13.

Table 15-13 Potential inter-Scheme cumulative effects

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effects	
						Construction	Operation
1 – Huddersfield	2020/90014	Demolition of existing building and erection of car sales and speculative B1/B2 unit with associated parking and access	11, The Triangle, HD1 4RN Adjacent to Scheme boundary	Conditional Full Permission – March 2020	No supporting environmental information	The Scheme works are located circa 350m from the RFFP (although the construction compound locations is only around 100m from the RFFP. Therefore, any potential impacts would be localised and temporary. No significant cumulative effects are expected.	No significant cumulative effects are predicted.
1 – Huddersfield	Strategic highway scheme	Highways improvements to the junction of Huddersfield Ring Road/Southgate/ Northumberland Street.	This junction is located east of Huddersfield Station.	Strategic Scheme	No information available.	The junction of Huddersfield Ring Road/Southgate/Northumberland Street lies further to the east and south of the proposed works and roads that are predicted to be temporarily directly affected by the Scheme. No significant cumulative effects are predicted.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location.
1 – Huddersfield	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Lower Fitzwilliam Street/Gasworks Street.	This junction is located north-east of Huddersfield Station.	Strategic Scheme	No information available.	The junction of Leeds Road/Lower Fitzwilliam Street/Gasworks Street lies further to the east of the proposed works and roads that are predicted to be temporarily directly affected by the Scheme. No significant cumulative effects are predicted.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location
1 – Huddersfield 2 – Hillhouse and Fartown	Strategic highway scheme	A62 Smart Corridor (Leeds Road – Phase 1)	A62 is located to south-east and parallel to the railway	Strategic Scheme	No information available.	Given the distance between the Scheme and the RFFP and the works proposed, no significant cumulative effects are predicted	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location
1 – Huddersfield 2 – Hillhouse and Fartown	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Thistle Street/Hillhouse Lane.	This junction is located south-east of Hillhouse construction compound.	Strategic Scheme	No information available.	The junction of Leeds Road/Thistle Street/Hillhouse Lane lies further to the east of the proposed works. No significant cumulative effects are predicted.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location
2 – Hillhouse and Fartown	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Old Fieldhouse Road.	This junction is located south-east of Field House Overbridge (MVL3/98) adjacent to the Scheme boundary	Strategic Scheme	No information available.	The junction of Leeds Road/Old Fieldhouse Road lies further to the east of the proposed works. Whilst both the Scheme and these highway improvements have the potential to impact on Leeds Road, the cumulative effects are not predicted to be significant.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location
3 – Deighton and Bradley	2017/91111	Outline application for erection of industrial development for B1 (business), B2 (general industry), and B8 (storage and distribution) uses	Station Road, Bradley, HD2 1UT Within Scheme boundary	Conditional Outline Permission August 2017	No EIA but application is supported by environmental assessments in relation to contaminated land, transport, arboriculture, ecology as well as a FRA	The RFFP is located adjacent to the Scheme boundary. Potential Inter-Scheme effects would arise in relation to noise and vibration and air quality during the construction phase as well as the potential for impacts on land contamination. Temporary impacts on the local landscape character and visual amenity would arise as a result of the construction works of the RFFP. However, based on the understanding of the proposed development, the anticipated effects would be localised and temporary and with the implementation of good practice measures by the RFFP and the	The RFFP would appear to be in keeping with the existing baseline context given the surrounding land uses and the Scheme will not introduce any changes to the rail environment that are not in keeping with the existing baseline environment. It is considered that vegetation along the northern boundary of the proposed development is retained. Therefore, no significant cumulative effects are anticipated.

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effects	
						Construction	Operation
						mitigation identified in relation to the Scheme no significant cumulative impacts are identified.	
4 – Colne Bridge and Battyeford	2016/93896	Erection of 4 dwellings and associated works	Site off, Station Road, Bradley, Huddersfield, HD2 1US Within Scheme boundary	Conditional Full Permission – February 2017	No EIA – application is supported by a Design and Access Statement.	Given the scale of the RFFP, no significant cumulative impacts are expected due to the minor works proposed for the RFFP.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location.
4 – Colne Bridge and Battyeford	2017/91208	Outline application for erection of industrial development of up to 3684 sqm B1c/B2/B8, with means of access (to, but not within, the site) from Colnebridge Road	Land adjacent to Colnebridge WWTW, Colnebridge Road, Bradley 30m south-west of Scheme boundary	Conditional Outline Permission – Nov 2017	No EIA but application is supported by environmental assessments in relation to noise, transport, arboriculture, ecology as well as a FRA.	The RFFP is located adjacent to the Scheme boundary. Potential Inter-Scheme effects would arise in relation to air quality during the construction phase as well as the potential for impacts on land contamination however these are not considered to be significant given the works proposed.	The proposed RFFP development would be in keeping with the existing baseline context of the area which houses a number of industrial units. The works to the Scheme would be similar to baseline conditions in terms of railway provision, however a new PSP building is proposed in this area however again this would be in keeping with the industrial backdrop. Therefore, no significant cumulative impacts are identified
4 – Colne Bridge and Battyeford	Strategic highway scheme	A62/A644 Wakefield Road (Cooper Bridge) - The junction of A62 Cooper Bridge/A644 Wakefield Road/A62 Leeds Road lies further to the north of the proposed works.	The junction of A62 Cooper Bridge/A644 Wakefield Road/A62 Leeds Road	Strategic Scheme	No information available.	The junction of A62 Cooper Bridge/A644 Wakefield Road/A62 Leeds Road lies further to the north of the proposed works. No significant cumulative effects are predicted.	No significant cumulative impacts identified as no significant changes to the existing baseline environment of the Scheme at this location
4 – Colne Bridge and Battyeford	Strategic housing scheme	Kirklees Local Plan Allocation HS11 – housing allocation for 1,460 dwellings with potential for a further 498 dwellings beyond the plan period	Land north of Bradley Road, Bradley. 900m north-west of the Scheme.		No information available.	This committed scheme lies further to the north and north west of the Scheme, outside the core study area. Due to the significant distance between the Scheme and this housing allocation, no significant cumulative effects are likely.	Due to the distance between the RFFP and the Scheme there are no significant cumulative effects.
6 – Ravensthorpe and Westtown	2017/94119	Demolition of existing building, erection of new building for educational classroom, cafe and toilets, upgraded access road, car parking, cycle parking, picnic and play areas.	Land off Sands Lane, Mirfield, WF14 Within the Scheme boundary	Conditional Full Permission – May 2018	No EIA but application is supported by a bat survey and FRA sequential test.	The Scheme is limited to four-tracking and OLE in this area. Given the limited civil engineering works for the Scheme and the small scale development of the RFFP no significant cumulative effects are predicted.	No significant changes to the baseline environment of the Scheme at this location. Therefore, no significant cumulative effects are anticipated.
6 – Ravensthorpe and Westtown	2017/90443	Erection of 3 units for B1 (light industrial) and B8 use, erection of two storey office building and alterations to existing building	Ratcliffe Mills, Forge Lane, Thornhill Lees, Dewsbury, WF12 9BU Within the Scheme boundary	Conditional Full Permission – Nov 2017	No EIA but application is supported by environmental assessments in relation to agriculture, transport as well as a FRA.	Due to the distance between the RFFP and the Scheme there are no significant cumulative effects.	Due to the distance between the RFFP and the Scheme there are no significant cumulative effects.

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effects	
						Construction	Operation
6 – Ravensthorpe and Westtown	2016/94241	Non-Material Amendment to previous permission 2007/91742 for erection of 7 terraced industrial units	Calder Bank Road, Thornhill Lees, Dewsbury, WF12 9QB Adjacent to Scheme boundary	NMA Approved – May 2017	No information available.	Construction is currently in progress and is therefore anticipated to be complete prior to the Scheme construction works commencing. No significant cumulative impacts identified	No significant cumulative effects are predicted.
6 – Ravensthorpe and Westtown	2016/94118	Outline application for residential development	Land off Ravensthorpe Road, Dewsbury Within the Scheme boundary	Conditional Outline Permission – April 2017	No EIA but application is supported by environmental assessments in relation to contaminated land, ecology, arboriculture and transport. A conservation/heritage assessment and FRA have also been submitted.	Residents of Ravensthorpe Road in proximity to the Scheme compounds and the RFFP are likely to experience adverse effects due to the combined effects of noise and vibration and visual impact however these will be localised and temporary in nature. These will be minimised through the implementation of good practice measures.	Development would introduce new built form into the area and so would have visual impact implications, however this would be dominated by the new housing development and so no significant cumulative effects are anticipated.
6 – Ravensthorpe and Westtown	2016/94117	Outline application for 120 residential units at Lees Hall Road	Land off Lees Hall Road, Dewsbury 400m east of the Scheme boundary	Conditional Outline Permission	No EIA but application is supported by environmental assessments in relation to contaminated land, ecology and transport. A conservation/heritage assessment and FRA have also been submitted.	Residents of Ravensthorpe Road in proximity to the Scheme compounds and the RFFP are likely to experience adverse effects due to the combined effects of noise and vibration and visual impact however these will be localised and temporary in nature. These will be minimised through the implementation of good practice measures.	Development would introduce new built form into the area and so would have visual impact implications, however this would be dominated by the new housing development and so no significant cumulative effects are anticipated.
6 – Ravensthorpe and Westtown	2017/94080	Erection of precast concrete production unit, demolition of existing casting shed and ancillary buildings, associated site works to modify external storage areas and installation of gantry cranes – condition to vary plans and specs (2019/92570)	C R Longley And Co Ltd, Ravensthorpe Road, Thornhill Lees, WF12 9EF Within the Scheme boundary	Conditional Full Permission – July 2018 (approval of condition November 2019)	No EIA but application is supported by environmental assessments in relation to noise, air quality, ecology and transport. A conservation/heritage assessment and FRA have also been submitted.	There is the potential for minor disruption to the site entrance, however given the distance to other sensitive receptors no significant cumulative effects are predicted.	No significant cumulative effects are predicted.
6 – Ravensthorpe and Westtown	Strategic housing scheme	Kirklees Local Plan Allocation HS61 (Dewsbury Riverside) – housing allocation for 4000 units (1869 units during plan period, with potential for a further 2131 beyond the plan period).	Land off Ravensthorpe Road, Dewsbury Within the Scheme boundary		Dewsbury Riverside Masterplan document is available.	This large housing allocation lies partly within the core study for the Scheme (i.e. predominantly within Route Section 6). Whilst the allocation will be brought forward in phases, there is the potential for cumulative effects during construction should the Scheme and the allocation be constructed at the same time, particularly at Ravensthorpe Road/Calder Road and sensitive receptors within this area. Multiple access points will be required to implement the housing development such as changes to Sands Lane, at Calder Road Overbridge (MVN2/202), Steanard Lane and its junction with the A644 and this has the potential to result in cumulative effects. However, any cumulative effects are not predicted to be significant.	No significant cumulative effects are predicted.

15.8.16 It is anticipated that any developments brought forward will be subject to National and Local Policy as well as legislative requirements and application of best practice measures and will be required to ensure that mitigation and control measures are adopted during construction of the RFFPs.

Operation

15.8.17 The local area and local economy would likely see a positive cumulative effect from the committed developments in core study area which includes highways improvements, new residential dwellings and community facilities. This will have benefits for the health and social wellbeing of local communities via improved highways and the provision of much needed housing, education and community facilities in areas where there are known barriers to housing and deprivation in the living environment.